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# Can we get there from here? Ecosystem based governance in the Bay of Fundy/Gulf of Maine region

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CAN WE GET THERE FROM HERE?  
ECOSYSTEM BASED GOVERNANCE IN THE BAY OF  
FUNDY/GULF OF MAINE REGION

BY

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DISSERTATION

Submitted to the University of New Hampshire

In Partial Fulfillment of

the Requirements for the Degree of

Doctor of Philosophy

In

Natural Resources and Environmental Studies

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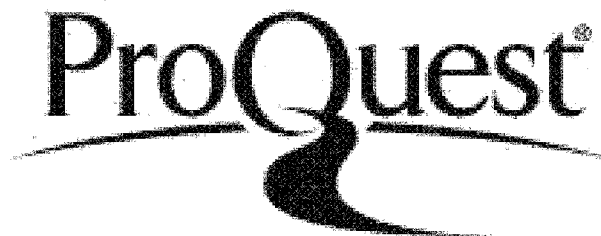


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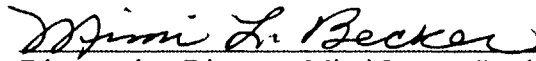
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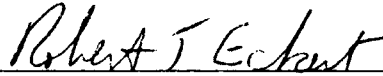
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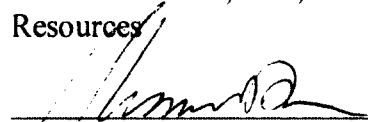
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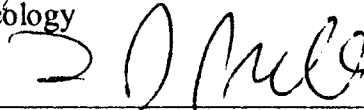
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Date

DEDICATION

To Helen, Hannah, Aryn, and Hallie

## ACKNOWLEDGEMENTS

For Helen, without whose help and support this endeavor would have remained but a dream. To Hannah, Aryn, and Hallie, whose lives I have totally scrambled for the last decade and who may soon be able to finally answer the question: “What does your dad do?”

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## ABSTRACT

### CAN WE GET THERE FROM HERE?

### ECOSYSTEM BASED GOVERNANCE IN THE BAY OF FUNDY/GULF OF MAINE REGION

By

John R. Coon

University of New Hampshire, May, 2012

Decades, even centuries, of resource extraction and exploitation by humans have taken a toll on the Bay of Fundy/Gulf of Maine ecosystems. The very real threats posed by population growth and coastal development, climate change, habitat loss, overharvesting, chemical pollution, nutrient overloading, and invasive species invasions show no sign of abating. Traditional methods of managing the human activities that impact the Bay of Fundy/Gulf of Maine are proving unable to keep pace with the growing threats. The Gulf of Maine Council and others have joined in the chorus calling for a broader, more holistic ecosystem approach to the governance of the human activities that impact the coastal margin. This study uses the framework of the Policy Sciences to suggest a model of Problem Orientation, Social Process, and Decision Process characteristics indicative of an ideal ecosystem-based approach to governance. The model is first used to analyze the governance regime that existed in the Great Lakes Basin during the first two decades under the International Joint Commission's oversight of activities under the Great Lakes Water Quality Agreement. The framework model is

then used to analyze the current governance regime in the Gulf of Maine/Bay of Fundy region. Using this analysis, the study concludes that an ecosystem-based approach to governance is not possible in the region as currently configured. The study further concludes that it will not be possible to transition to an ecosystem-based approach without the education and significant outreach necessary to create a knowledgeable and activist public able to understand the issues and threats and willing to press governance for improvement. Further, ecosystem-based governance will require the creation of an overarching and accountable entity that, with significant input from public and stakeholder partnerships can collect reliable ecosystem indicator data from both sides of the border, analyze the data, and direct the implementation of policy solutions, and change course as necessary.

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## I. INTRODUCTION

This study involves the governance regime in the Bay of Fundy/Gulf of Maine watershed and whether governance regime in the region has the capacity to implement a more ecosystem-based approach to governance. When research and preparation for this study commenced some 8 years ago I was prepared to learn about the human activities and natural resource exploitation in the region, how those activities impacted the environment, and how those activities might be moderated to permit some “sustainable” level of impact through better governance. After a career as a trial lawyer, involved mostly in complex litigation in environmental, toxic tort, and labor/management cases I was prepared to find that governance could be improved through broader citizen participation and greater institutional collaboration.

I was unprepared, however, for the magnitude and complexity of threats that confront not only the Bay of Fundy/Gulf of Maine, but the planet Earth in general. I have also been numbed by the significant and complex challenges that confront governance regimes. Issues involving the environment and natural resources simply cannot be viewed in isolation. Economics, culture, domestic and geopolitics, public attitudes and opinion, and notions of equity and justice all weave their way through our society’s tapestry.

This study is an attempt to examine, from the perspective of one person the overwhelming number and impact of the interactions of some of the decision-makers and institutions whose activities are pertinent to the threats extant in the Bay of Fundy/Gulf of Maine. As part of this process I have attempted to identify the values and perspectives of many, but not nearly all, of the policy actors in the region. The level of complexity in these areas prohibits any in-depth or broad-based inquiry by one person acting alone. There is much to be evaluated, both in terms of the ecosystems in the region and with respect to the multi-level governance scheme. Human impacts on ecosystems may not be examined or regulated without an understanding of the social and economic interconnections. One thing is clear: The ecosystems in the Bay of Fundy/Gulf of Maine are under siege by human-driven forces and existing governance is doing little, if anything, to stem the activities responsible for the harm. With this in mind, we can begin to focus on the ecosystem dynamics, economics, sociocultural status, and policies that impact the Bay of Fundy/Gulf of Maine.

From a physical standpoint, the high tides and cold, nutrient rich waters of the Bay of Fundy/Gulf of Maine, a semi-enclosed sea extending from Cape Cod to the Bay of Fundy, support several thriving ecosystems which are both complex and diverse (Smith 1997). Economically the market value of the goods and services derived from the overall ecosystem, measured in traditional economic terms, to the economies of the federal, state, and provincial jurisdictions that border the Bay of Fundy/Gulf of Maine, totals in the billions of dollars. In addition, ecosystem functions and services that are vital to the region and the planet that do not appear on the ledgers of traditional economics include carbon sequestration, nutrient cycling, waste recycling and storage, recreation, aesthetic

value, educational opportunities, and countless others (GOMC 2007). Despite the importance of the Bay of Fundy/Gulf of Maine, however, the integrity and resilience of its ecosystem functions are threatened by anthropogenic factors (Pesch and Wells 2004).

Conditions in the Bay of Fundy/Gulf of Maine should not be viewed in isolation. Indeed, largely land-based human activities have now been found to have adversely affected nearly all of the world's oceans (Halpern, Selkoe et al. 2007; Halpern, Walbridge et al. 2008). It is not surprising, therefore, that human activities in and around the Bay of Fundy/Gulf of Maine watershed and beyond have led to increasing ecosystem alterations in a variety of forms due chiefly to overextraction of marine organisms, invasions of nonindigenous (exotic) species, chemical pollution, eutrophication, toxic phytoplankton blooms, alteration of physical habitat, and the consequences of global climate change (Steneck 2001).

The need to manage the human activities that contribute to the degradation of vital coastal ocean ecosystems in a sustainable manner has never been more apparent. The pressure on coastal and ocean resources has increased relentlessly. While federal and related state and provincial environmental laws and regulations enacted in the 1970's have had an undeniable positive impact in the form of cleaner air, lakes, and rivers, locally and regionally rapid population growth, coastal development, and increasing user conflicts have degraded natural resources and led to declines in both environmental integrity and general productivity (Ullsten 2003). The coastal areas that provide essential habitats for a significant portion of commercially valuable marine species are reeling from the effects of habitat loss, pollution, and overfishing that have reduced populations of coastal fish and other species to historically low levels of abundance and diversity

(VanderZwaag 1995; Sutinen, Clay et al. 2000). Further, larger coastal population leads invariably to larger sewage treatment facilities, expanded solid waste landfills, increased recreational use, and other environmental pressures (Cicin-Sain and Knecht 1998). As the Joint Ocean Commission Initiative in the United States observed: “It is clear that these invaluable and life-sustaining assets are vulnerable to the activities of humans. Our failure to properly manage the human activities that adversely affect our oceans and coasts is compromising the health of these systems and diminishing our ability to fully realize their potential” (JOCI 2006, 6-7).

Certainly the overall picture is bleak. Yet stressed, degraded and overpopulated coastal areas still provide critical ecosystem goods and services, including fish and shellfish for market, coastal transportation, tourism, pollutant detoxification, oil and gas potential and a wealth of other benefits. In terms of traditional economics, coastal counties in the United States account for more than half of the nation’s gross domestic product (GDP) (JOCI 2006). Despite the frail condition of the coastal ecosystems, and though sadly in need of relief, the reality is that humans continue to flock to the coasts to live, work and play, adding to the countless stresses already in existence, reducing ecosystem. Diversity and resilience are undoubtedly eroding and the deterioration of ecosystem functions is likely accelerating at a global scale, with potentially catastrophic social consequences if current trends are not significantly mitigated (Worm, Barbier et al. 2006).

## From the *Status Quo* to Ecosystem-Based Governance

Local communities, national governments, NGOs, and international institutions face difficult choices concerning goals, priorities, investments, policies, and accountability needed to address systemic challenges driven by development and the environment (MilleniumEcosystemAssessment 2005a). Nearly all of the human activities that pose threats to the Bay of Fundy/Gulf of Maine ecosystem, including pollution, coastal development, and overfishing, are still managed, some more intensely than others, on a traditional media-specific sector-by-sector basis (JOCI 2006). Current laws, which have largely emerged from a patchwork of specific institutional reforms, have resulted in “a hapless confusion of institutional purposes, authoritative controls, and governmental boundaries” (Skowronek 1982, 287). *Status quo* governance regimes reflect the traditional tendency of government agencies and departments charged with responsibilities for natural resources and coastal ocean activities to be limited to some particular type of activity such as logging or fishing. Traditional scientific approaches relying upon the isolation and control of variables and replication, however, do not fare well in the study of ecosystem dynamics (Ludwig, Hilborn et al. 1993; Gunderson 2003). State and federal agency efforts are often directed to the harvest of optimum yield (e.g. fisheries) instead of managing toward the health and resilience of the ecosystems that produce the desired yields (Christie 2004). Thus management focus has historically been narrow or sectoral and typically concerned with increasing production of desired commodities (Juda 2003). It is, however, “...understood that the collective result of these



individual jurisdictional efforts is not enough to ensure the long-term sustainability of the entire Gulf of Maine region” (Hildebrand, Pebbles et al. 2002). Clearly “... the Gulf of Maine is at a critical juncture, with new management approaches needed to protect its valuable ecosystems for generations to come” (Pesch and Wells 2004).

With respect to the governance and management of the human activities that impact the integrity and resilience of ecosystems, there is a growing sense that traditional scientific management approaches are failing, and may in fact be making the problems worse. The ruling paradigm, that we need to optimize targeted ecosystem components in isolation of the rest of the system, is proving inadequate to deal with the dynamic realities of the environment (Walker and Salt 2006). Yet the institutional structures that have developed for decades around this paradigm are proving remarkably resistant to fundamental change (Skowronek 1982; Brunner, Steelman et al. 2005). Given the reality that ecosystems are complex, dynamic systems that may not be understood by reduction to and study of its component parts, it is becoming increasingly clear that the significant problems we face cannot be solved by the same level of thinking that created them (Einstein 1995).

While there have been repeated calls for a broader, more holistic ecosystem approach to environmental management of the coastal oceans has been the pronounced response to the perceived failure of traditional scientific sector-based management (Haskell 1992; F.A.O. 1995a; Constanza 1998; EPAP 1999; Juda 1999; Sherman and Duda 1999; Costanza, Low et al. 2001; Macpherson 2001; Sherman and Duda 2001; Link 2002; Policy 2002), considerable thought must be given to how such an ecosystem-based approach could effectively be implemented in the Bay of Fundy/Gulf of Maine region.

Management focus in the region needs to shift from an emphasis on satisfying the needs of humans through output objectives to an emphasis on protecting the ecosystem functions that provide those goods and services. Sustainability requires ecosystems be viewed as non-linear complex systems with self-organizing properties, resilience, and inherent uncertainty (Berkes, Colding et al. 2003). Conventional natural resource models that assume some quantifiable equilibrium or “climax” phase of ecosystems must begin to recognize that nature is not necessarily equilibrium-driven but is, for the most part, inherently unpredictable (Regier and Baskerville 1986; Barron 2003; Berkes, Colding et al. 2003; Gunderson 2003).

Transitioning traditional governmental institutions into an integrated and holistic regime capable of managing human activities in a sustainable manner is no easy task. Change, particularly in the form of innovation is, frankly, hard (Steelman 2010). While sustainable conditions may have occurred in some cultures in some places in the past, the answer to the question of how modern societies can live sustainably has been deemed “...the greatest challenge facing humankind...” (Mangel, Hofman et al. 1993, 573). Put more succinctly, while many have cited the need for sustainable governance, there exist few real-world examples of institutional arrangements designed for the sustainable regulation of natural resource protection and use.

Thus the transition from traditional natural resource sector-by-sector management to the broader, more holistic, collaborative, and integrated ecosystem-based approach poses a daunting challenge. There is an inextricable link between prescribed policy and the institutional arrangements and processes that fulfill and implement the policies. Institutions and agencies do not merely stand down for new policies formulated by

legislatures or other law-making bodies, for the institution itself “...provides an environment in which policies can be devised, altered, interpreted, advocated, ignored, or otherwise transformed” (Donahue 1988). Decades of institutional development since the turn of the 20<sup>th</sup> century have resulted in a labyrinth of specialized environmental and economic interests that generate profound ideological separation that will be difficult to abolish through tools currently available to leaders in society. The effect has been to multiply divisions among interests in society and to organize those interests to compete in a more complex society. Central authorities find it more difficult to satisfy public expectations as more agencies, institutions, and interest groups organize to be able to block each other (Brunner, Steelman et al. 2005).

Contributing to the inability to change the behavior of people and institutions so that policy actions are undertaken for the public good rather than to promote special interests is that democracy – or negotiating interests by relying on fair play, honest dialogue, and mutual respect – has lost much of its meaning to the modern public. Democracy as perceived presently is treated as something we already *have*, not something we *do* (Lappe 2006). As this study points out in later chapters, there is a need to move beyond the “Thin Democracy” of the present toward a more engaging “Living Democracy” (Lappe 2006). Certainly many of the structures for democracy are in place, and this study examines some of them and the missions and values inherent in those institutions. Democracy, and the ability to implement change, however, requires more than structural formalities; more than multi-level governments and competing governmental agencies, commissions, and boards. Democracy requires public engagement. Public participation, a constant theme in this research, requires a public that

no longer prefers to leave our futures to others (Becker 1993; Wondolleck and Yaffee 2000; Burger, Ostrom et al. 2001; Weber 2003; Brunner, Steelman et al. 2005; Lappe 2006; Sachs 2011):

We need to reconceive the idea of a good society in the early twenty-first century and to find a creative path toward it. Most important, we need to be ready to pay the price of civilization through multiple acts of good citizenship: bearing our fair share of taxes, educating ourselves deeply about society's needs, acting as vigilant stewards for future generations, and remembering that compassion is the glue that holds society together (Sachs 2011, 5)

Thus while division, fragmentation, and stalemate remain stubborn legacies of governance at the national, state, and provincial levels, there is opportunity for the mitigation of these barriers at the local and regional level, especially with an active and determined public (Fischer 2000; Prugh, Costanza et al. 2000; Wondolleck and Yaffee 2000; Brunner, Colburn et al. 2002; Weber 2003; Walker and Salt 2006). In Chapter III we will discuss how more and more authors are calling for a greater role for local and regional decision-making and adaptive, flexible governance with greater public participation in order to keep up with the rapidly changing conditions extant in the social-economic conditions present in the real world.

While attitudes are beginning to change, and various iterations of ecosystem-based decision making theories and experiments, there is little sign that stresses on the coastal regions are abating. In fact the problems impacting critical coastal and aquatic habitats appear to be worsening. Given the increasing adoption of ecosystem based approaches to resource management in both watersheds and coastal marine areas, why do many stresses and threats to ecosystem integrity of these systems still persist, or in some

cases, appear to be increasing? What lessons can be learned from the governance regimes in other regions, including the Great Lakes, where ecosystem approaches to resource management have been mandated by Great Lakes Water Quality Agreement between Canada and the United States since 1978 (1987)?

### **Research Focus**

It is the goal of this dissertation research to examine whether the existing governance regime of the Gulf of Maine has the capacity<sup>1</sup> to implement an integrated, adaptable ecosystem approach to restore and sustain, over time, the integrity of the respective ecosystems, including the functions upon which the humans in the ecosystem rely. Related questions include: what, for instance, are the current goals of the governance system (units and subunits) in relation to the human uses and anthropogenic threats to the ecosystem in the Gulf of Maine and how do these differ or resemble those of similar ecosystem restoration projects? What are the barriers that may prevent the current governance regime in the Gulf of Maine and comparable ecosystem restoration areas from managing the living marine resources in the region in a sustainable manner? What measures have been adopted in more veteran regions with more experience implementing ecosystem-based governance models to modify and improve the governance and management regime so that the critical functions of the ecosystem can be preserved or enhanced while at the same time competing interests can be harmonized in a

---

<sup>1</sup> The term *capacity* is used herein in a relational perspective and focuses on the ability of individuals, institutions, communities and governments to establish and achieve their own goals and agendas. Factors associated with capacity include those that block or promote these ends and may encompass technical, financial, human resource, and institutional components. Karkkainen, B. C. (2001). "Collaborative Ecosystem Governance: Scale, Complexity, and Dynamism." Virginia Environmental Law Journal 21: 189 - 243..

fair and equitable manner? How can these innovations be incorporated in the Gulf of Maine, if at all? How can the policies, priorities, and actions of local, state, provincial and federal entities be integrated to assure a sustainable approach to the management, use and development of coastal ocean resources across political boundaries?

## II. RESEARCH APPROACH AND METHODS

The purpose of this research is to examine whether the existing governance regime of the Gulf of Maine has the capacity to implement an integrated, adaptable ecosystem approach to restore and sustain, over time, the integrity of the respective ecosystems, including the functions upon which the humans in the ecosystem rely. This inquiry, together with the related questions set forth at the end of Chapter 1, necessarily involves an exploration of the complex, non-linear and dynamic interplay of social, economic, and ecological forces (Holling 1995; Cicin-Sain and Knecht 1998; Clark 2002; Gunderson and Holling 2002; Holling, Gunderson et al. 2002; Berkes, Colding et al. 2003; Gunderson 2003).

In order to attempt to assess the multiple factors impacting the policy process in the Bay of Fundy/Gulf of Maine region this comparative case study uses qualitative research guided by the analytical framework provided by the policy sciences. The policy sciences approach was developed by Harold Lasswell as a problem-solving process to examine complex, interrelated problems (Lasswell 1971; Clark 2002). The approach recognizes that policy making is a result of the interactions of many actors, each with different interests, information, and perspectives (Clark 2002). The framework itself, described more fully below, permits researchers to examine a given policy process as a system, moving beyond conventional reductionist views to step back and examine the

bigger picture in an attempt to engage difficult problems more fully (Lasswell 1971; Brewer and deLeon 1983; Clark 2002). The framework often permits researchers to explain the failure of a system to achieve sustainable resource management without resorting to “the same old causes such as lack of money, outside interference, or too little research” (Clark 2002, 12). The framework also permits researchers to shift attention to facets of the policy process that have been largely overlooked by a trend that traditionally dwells on congressional or governmental policy making (Keller 2009).

### **The Policy Sciences Analytical Framework**

The analytical framework provided by the policy sciences recognizes that we need to ask a significant array of questions of participants and actors in a governance regime. The policy sciences analytical framework divides the policy process into stages and highlights distinctive features of each stage. The framework contributes to an understanding of the dynamic processes in which actors, resources, and participation change from one setting to the next. The approach has evolved to reject, however, any assumption that policy making proceeds from stage to stage and acknowledges that activities in each stage occur in parallel with a confluence of multiple streams of activity that connect ideas, solutions, and political will (Keller 2009).

The framework approach permits the development of context that helps to explain environmental trends and the conditions that drive result from the complex interaction of humans with their environment. Context is critical where, as in most environmental issues, there exist human problems that have been created at many times and in many places, under a variety of political, social, and economic systems (Ludwig, Hilbon et al.



1993). From a policy sciences perspective, “the ongoing interaction of people in their efforts to achieve what they value is the foundation of all policy, including that of natural resources” (Ludwig, Hilborn et al. 1993, 36). From a public policy perspective, therefore, public policy-making is a “never ending process whereby people attempt to clarify and secure their common interests. Management is the actual manipulation of people and resources through programs” (Clark and Willard 2000, 8).

Policy sciences analysis therefore recognizes that public policy involves more than state and federal legislative initiatives but recognizes the importance of values and the ever-changing nature of remarkably intricate social, political and environmental problems:

Humanity’s highest ambition can thus be defined as defined as a desire to analyze problems to improve the human situation. Because no one can fully appreciate a problem in terms of all who are affected by it, analysts must be careful to include relevant human perspectives, desires, and values as much as possible (Brewer and deLeon 1983, 5).

Thus the policy sciences looks beyond *government*, defined herein as the exercise of power by political and public agencies and officials, and expands inquiry into *governance*, or beyond state actors and institutions to include systems of rule at all levels of human activity – from the family to international organizations, by which people and institutions strive to secure their values, goals and interests (Kjær 2004).

Given the complex interplay that defines governance, the importance of context, human perspectives, and values to policy science inquiry cannot be overestimated. From the values perspective, this study proposes that the overriding goal is the quest for human

dignity<sup>2</sup>, encompassing freedom, the sharing of power among the many instead of the few, and the widespread participation in all other value processes (wealth, power, rectitude, etc.). With human dignity as the goal, democracy may remain humane even as circumstances change (Brewer and deLeon 1983).

Human dignity is fundamental. The policy-making that leads to the achievement of such a desired state requires the review and understanding of the competing interests and values of those involved. Human dignity requires an approach that identifies the common interests that rest within a given conflict or complex issue. Thus the purpose of the policy sciences approach is to clarify and secure the common interests (Lasswell 1971; Clark 1997; Clark 2002).

*Common interests* are those that are widely shared within a community and demanded on behalf of the whole community. This should be contrasted with *special interests* that benefit only part of a community as the expense of the rest of the community (Brunner, Colburn et al. 2002; Clark 2002; Steelman 2010).

Generally a policy process serves common interests if it:

- Is inclusive and open to broad participation
- It meets the valid expectations of participants
- As implemented, or tested, it is responsive and adaptable in achieving the goals as the context changes i.e. it is adaptive (Lasswell 1971; Brewer and deLeon 1983; Clark 2002).

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<sup>2</sup> Human dignity is used to mean the equal opportunity to shape and share in democracy and the values of society, including wealth, power, respect, health, well-being, enlightenment, skill, affection, respect, and rectitude. Lasswell, H. D. (1971). *A Pre-View of Policy Sciences*. New York, American Elsevier Publishing Company, Inc. ; UN (1948). Universal Declaration of Human Rights. U. N. G. Assembly, UN.

In order to provide an analytical basis for policy making that aspires to human dignity and seeks to clarify and secure the common interest, some method of data organization and inquiry direction must be employed. The policy sciences framework is a useful and flexible tool that allows a researcher to gather a complex array of data from a variety of sources and still understand the context of the present situation and ultimately invent possible alternatives.

The framework operates in three principal dimensions: social process mapping, decision process mapping and problem orientation. These dimensions provide a flexible but stable frame of reference that allows analysts to look beyond technical particulars to see the functional relationships that are present. Thus, rather than ask agency and department heads directly whether they are employing an ecosystem-based management approach to the issues presented within their jurisdictions, the policy sciences analytical framework as used in this study attempts to review the literature and primary documents to establish the foundation to ask questions designed to explore the social process, decision process and problem orientation practices utilized by government and other institutions as well as stakeholders, interested parties and the public. In this manner it may be possible to determine the extent to which the components of an overall ecosystem-based governance regime are in place (Lasswell 1971; Brewer and deLeon 1983; Clark 2002).

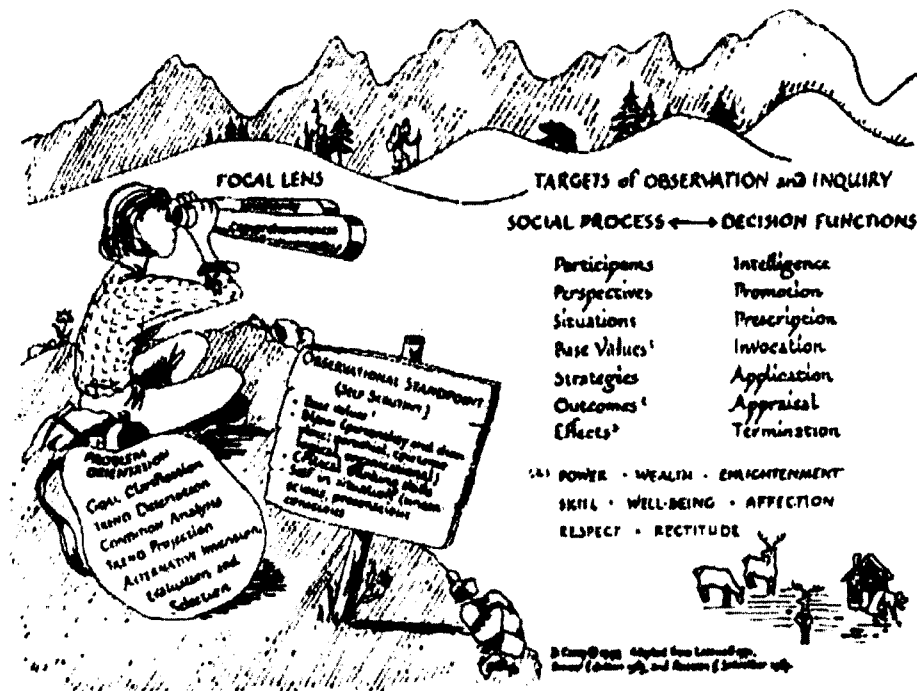


Figure 1 The Policy Sciences Approach (Used with Permission of Susan G. Clark)

It is important, however, to discuss for a moment the observational standpoint held by the author: me. “Standpoint consists of an individual’s value orientations and biases resulting from personality, disciplinary training, experiences (parochial/universal; epistemological assumptions, and organizational allegiances...All observers and participants, especially professionals and analysts, should seek to be clear and realistic about their own standpoint and those of others, using both selective and comprehensive ‘lenses’” (Clark, Willard et al. 2000, 21). (See Figure 1)

My research and writing comes from my perspective as a graduate student within the Natural Resources and Environmental Studies Ph.D. program (NRES) at UNH. The program permits students to take classes for two years in various departments in order to develop a broader perspective on the problems and issues of interest to the student.

Perhaps more relevant is the background, education and prior disciplinary training and experiences that brought me to the NRESS program at the age of 46. I was raised in a military/working class family. I attended law school and went on to practice law for more than 20 years prior to my admission to UNH. My law practice encompassed representation of a broad spectrum of clients. I have represented labor unions as well as management in employment and labor conflicts. I have represented injured individuals seeking redress against those companies whose negligence or product design caused them harm. Most of the last ten years of my practice, however, involved the litigation of complex multi-jurisdiction toxic tort and superfund cases. My clients were Fortune 500 companies that I defended in civil cases involving injuries alleged to be caused by them either to individuals or to the environment.

As a result of my tenure as a trial attorney involved in complex environmental litigation, I became frustrated that millions of dollars were spent with the express goal of assigning blame. Seldom was there a resolution that actually served to remediate a superfund site. Fairness and justice were generally an afterthought – there was only evidence. It was this frustration that led me to talk to Dr. Becker about the possibility of other means of resolving disputes and making meaningful changes. My biases clearly steer me toward a desire to see justice, human dignity, and equal access to governance for all; for actions and policies that foster the public good over often more-powerful private interests.

I should also note that in addition to my career as a trial attorney, I am also a Registered Investment Advisor with a series 65 license from the Financial Industry Regulatory Authority – or FINRA. I have been involved first-hand with investment and

portfolio management decisions and strategies over the last 20+ years and have also been a member of a hedge fund advisory board that helped hedge fund managers and others develop strategies and research opportunities for the investment portfolios of clients. In this role I have observed the growing power of corporations, financial leaders, and corporate officers in the political and governance process and have watched what, from my standpoint, a continuing shift away from governance for the public good and toward private interests.

With that brief explanation of my observational standpoint, a description of the three principal dimensions of the policy sciences analytical framework is probably in order at this point (Table 1). Social process review tends to examine the particular social contexts in which problems are embedded. A set of conceptual categories are used to describe or map any social process or problematic situation. The categories will include participants, their particular perspectives, and their values or assets to the extent they are known. Participants use whatever values they have (“assets” or “base values”) and use various strategies to achieve desired outcomes that have effects. Values, both what people strive for and the assets that are used to acquire more of them, are created and exchanged (shaped or shared) through social interactions to gain more values. There are eight values that, where relevant, are dealt with: power, wealth, enlightenment, skill, well-being, affection, respect, and rectitude. Social and decision processes have outcomes and effects that may be characterized as indulgent or deprivational in terms of whether values are gained or lost for participants. Critical to the analysis of governance process are the values of the participants that drive the political and institutional framework. Understanding these values helps to identify the social participation gaps

that need to be filled in order to make governance more broadly representative of human dignity and common interests.

**Table 1 Social and Decision Processes**

<b>Social Process</b>	<b>Decision Process</b>
Participation	Intelligence
Perspectives	Promotion
Values	Prescription
Strategies	Implementation
Outcomes	Appraisal and Termination

Another principal dimension of the framework is the decision process. The decision process as practiced in a given ecosystem governance regime requires an analysis of the seven interlinked functions of intelligence, analysis is the fundamental view that in all human interactions, people tend to act in ways they perceive will leave them better off than if they had acted otherwise (Lasswell 1971). With respect to ecosystem-based governance, social process mapping plays an important role in determining the degree of involvement of the public in all stages of the promotion, prescription, invocation, application, termination, and appraisal (See Table 1). This systematic analysis can turn up flaws in the decision process that cause restoration and management plans to fail. By knowing how a decision process works, or doesn't work, participants can maintain good practices or correct a poorly functioning one. A decision process can be a way of reconciling or at least productively managing competing interests and policies through politics. Politics will always be with us because people seek

different policies that reflect their particular, or “special”, interests. As discussed above, however, in natural resources management, people must reconcile interest differences to clarify and secure their common interest. Investigation should reveal who establishes what the common interests are or should be. In terms of ecosystem-based governance, trends can be determined that might indicate whether intelligence data is reliable and linked to the appropriate scales within an ecosystem, whether such intelligence is being communicated to policy makers in a meaningful manner and, ultimately, whether a structure exists that allows for decision makers to react to intelligence in an adaptive fashion. Note that ecosystem-based governance requires a decision process that is open and transparent, not slanted toward special interests, wealth, and power (Lasswell 1971; Clark 1997; Clark 2002).

**Table 2 Problem Orientation**

<b>Problem Orientation</b>
Clarifying goals
Describing trends
Analyzing conditions
Projecting developments
Inventing, evaluating, and selecting alternatives

Finally, problem orientation is a strategy to address problems and invent solutions. It requires goal clarification. So in terms of ecosystem conservation or restoration, the question is what should a sustainable, viable, functioning, resilient ecosystem look like? These questions need to be answered by the community only after



considering the problem's context or social and decision process. If these questions have been answered and policy determined, who were the participants? What was the process? Were common interests defined or did special interests influence the process?

Social process inquiry sneaks in here so that process, participants, their values and interests, and other factors can be evaluated to determine whether the approach used to define the problems or propose the goals was in some way flawed. Further, trends must be described with ample input from the natural sciences. Are conditions trending toward the goals established by the community? If not, there is a problem and action needs to be taken. Conditions need to be analyzed to determine the reason(s) for the environmental breakdowns and developments need to be projected, including the likely outcome if no action is taken (Clark 2002).

### **Methods**

Few studies have systematically examined the effectiveness of ecosystem-based governance. Conventional science, while good at solving certain kinds of problems, especially those with tightly controlled variables carefully selected by the scientist, has proven less than successful at attacking complex issues that demand policy responses (Brewer and deLeon 1983). Where it is not possible to isolate and control independent/dependent variables, develop theory through hypothesis testing, or carefully select the narrow problems against which hypotheses can be tested, conventional science has little to offer in terms of help for practical policy dilemmas (Brewer and deLeon 1983; Clark 2002).

In order to attempt to assess the governance regime in the Bay of Fundy/Gulf of Maine region to determine whether it has the capacity to implement a broader, more holistic, ecosystem approach to the management of human activities that impact the environment, this study, guided by the policy sciences analytical framework, relies upon a comparative case study methodology. Qualitative research is multi-method in focus and permits the study of subjects and issues in their natural settings in an attempt to make sense or interpret phenomena in terms of the meanings people bring to them (Cresswell 1998). Case studies provide a methodology capable of illuminating decisions, or sets of decisions: why they were taken and with what result. A case study approach is also suited to research that examines contemporary events where, as here, there is no reason (or even ability) to control historic behavior or variables (Yin 1994). Finally, where research is dependent upon context, case studies seem to be the most appropriate to method to use to answer questions about “how” and “why” a selected ecosystem approach decision-making initiative was more or less successful in the achievement of a region’s designated goals.

In order to examine the current governance regime of the Bay of Fundy/Gulf of Maine to determine whether the management human activities that impact the Gulf ecosystem could become more sustainable with the implementation of a more integrated and ecosystem-based approach to management of the region’s resources this research was conducted in three phases.

### **Phase 1: Literature Review and Identification of Comparative Case Study**

Phase 1 of this study involved a review of scientific literature, primary documents, government reports and texts to gain an understanding of ecosystem dynamics and the human behaviors that impact the function and resilience of those ecosystems. Insight was also gained into the institutions and prescriptions that govern those human behaviors in both Canada and the U.S. and the provinces and states that border the Bay of Fundy/Gulf of Maine. In furtherance of the research questions, research was also devoted to literature that helped cull out the characteristics of ecosystem-based approaches to the management of those human activities that impact ecosystems. Review of literature and reports that advocate various ecosystem-based management initiatives helped derive a set of characteristics or traits that would be representative of the “ideal” management scheme. Literature discussing the policy sciences analytical framework was used to help nest the traits of ecosystem-based governance and management within the principal dimensions of the framework as set forth in Chapter III.

Phase 1 also included a review of the literature relevant to a variety of potential comparative case studies. After this preliminary review of treaties, laws, jurisdictional issues and ecological challenges the governance regime in place in the Great Lakes Basin under the Great Lakes Water Quality Agreement (“GLWQA”) and the Great Lakes Fisheries Commission (“GLFC”) during the time period of the 1970s and 1980s was selected. This choice was made because the challenges to meaningful policy development in the Great Lakes offer meaningful parallels to those present in the Bay of Fundy/Gulf of Maine.

The primary threats to the health of the ecosystem in the Gulf of Maine appear to be posed by overharvesting, pollution, shoreland development, habitat destruction, and global climate change (Steneck 2001; Clark 2002; Steneck, Vavrinec et al. 2004). These threats are not dissimilar to those present in the Great Lakes Basin during the relevant time period (Dempsey 2004; Botts and Muldoon 2005). Further, governance in both systems has been challenged by the fragmented and often confusing array of local, state, provincial, and federal regulatory bodies that frequently form bureaucratic barriers to integrated and holistic management of the activities that threaten the health of their respective ecosystem (Pesch and Wells 2004; Botts and Muldoon 2005). The governance regime in the Great Lakes Basin also provides interesting insights into ecosystem-based initiatives because a basin-wide ecosystem approach to management has been mandated under the GLWQA and the GLFC since the 1970s.

The choice of the governance regime in place in the Great Lakes watershed was also influenced by the fact that a review of the literature reveals that many of the characteristics typically attributed to ecosystem-based management, discussed further in Chapter 3, were in place in the Great Lakes regime during the 1970s and 1980s. During the 18<sup>th</sup> and 19<sup>th</sup> centuries the Great Lakes Basin, like the Bay of Fundy/Gulf of Maine watershed was widely exploited for its natural resources, including forest products and fisheries. In the Great Lakes Basin, however, The Boundary Waters Treaty of 1909 between Canada and the US created the International Joint Commission (IJC) mostly to mediate border disputes between the signatories. Under the treaty, however, the IJC was also given a role to investigate pollution issues between the two countries (1909). With the continued degradation of water quality and the ultimate collapse of the commercial

fishing industry (1909; Dworsky 1988; Dempsey 2004), the IJC, galvanized by a determined public, determined government officials, and unique NGO collaborations, instructed both the United States and Canada to take action on the water pollution issues in the Great Lakes.

After the two countries negotiated a basic water pollution agreement for the waters of the Great Lakes in 1972, continued degradation and increasing public activism resulted in another amendment in 1978 (Donahue 1988; Becker 1993; Dempsey 2004; Botts and Muldoon 2005). The amended agreement was far more comprehensive and included the declared purpose to "...restore and maintain the chemical, physical and biological integrity ...of the waters of the Great Lakes Basin Ecosystem." The ecosystem was defined as "the interacting components of air, land, water and living organisms, including humans." Further evidence of the fact that the 1978 agreements had morphed into the restoration of ecological integrity as the major goal, not just improved water chemistry through pollution control, can be found in the definition of the Great Lakes system as all of "...the streams, rivers, lakes and other bodies of water that are within the drainage basin" (Becker 1993; GLWQA 1987). Thus the Great Lakes experience may provide valuable lessons to future governance changes in the Bay of Fundy/Gulf of Maine region. A more comprehensive explanation of the importance of these and related developments in the basin-wide efforts of agencies, NGOs, and the public in the Great Lakes during the relevant time period is set forth in Chapter IV.

## Phase 2: Data Collection

Validity and trustworthiness of the data and analysis in any study is, obviously, critical. Validity is considered a goal rather than a product and it provides an avenue for the reader or researcher to assess both the processes and outcomes of a study (Maxwell 2005; Greear 2011). Validity is defined by Maxwell (1996) as the “correctness or credibility of a description, conclusion, explanation, interpretation, or other sort of account” (Maxwell 2005, 87).

In addition to the validity and trustworthiness of data as it is collected, equal care has been taken in the logic of the analysis used for the research. As has been discussed above and is more thoroughly explained below, this study has been guided by the policy sciences analytical framework. Thus information and data have been organized into the principal dimensions, tasks, or processes delineated under that framework. Thus data has been accumulated and organized under three major categories – problem orientation, social process, and decision process. Within each of the categories, data is further organized and analyzed as tasks. The social process, for instance, consists of some six tasks: participants, perspectives, strategies, values, outcomes, and effects (See Table 3).

Trustworthiness of the analysis extends beyond the collection and initial organization of the data. One of the strengths of qualitative research is that it allows the researcher to explain the processes that led to the outcomes (Maxwell 2005). The explanations in a qualitative study, however, are necessarily dependent on a sound and thorough method for the inquiry into the data (Siccama and Penna 2008). This study used qualitative data analysis software, NVIVO 9.0, to analyze interview transcripts and observational data. NVIVO was used to organize participants and data into case files

called case nodes. In hierarchical fashion, sub-nodes were created to hold data relevant to the nodes. Finally, attributes were created for the interview participants. Attributes are demographic or other categorical information about participants and enabled the researcher to compare and contrast the contents of cases based on the attribute values assigned to them (Siccama and Penna 2008)(Table 3).

In this study, the collection, organization, and analysis of the data proceeded in parallel fashion guided by the policy sciences analytical framework. Thus not only were data collected and organized in the principal dimensions of problem orientation, social process, or decision process matters, but the coding strategy in NVIVO 9.0 was defined

Table 3 Interview Participant Attributes

<b>Canadian NGO</b>		<b>1</b>
<b>Canadian Business Employee</b>	<b>2</b>	
<b>State Employee</b>	<b>1</b>	<b>3</b>
<b>US Federal Employee</b>	<b>2</b>	<b>3</b>
<b>Canadian Business Employee</b>		

in the same manner by the framework as well. The questions asked of interviewers, for instance, were outlined to be consistent with the framework (See Appendix C). When the transcripts were coded, the coding strategy paralleled the framework so that the researcher simply coded responses into categories that mirrored and expanded upon the

framework categories. In addition to nodes and sub-nodes that paralleled the framework, additional coding categories were added within the sub-nodes that permitted the researcher to code responses to categories that more specifically referenced indicators of ecosystem-based governance as gleaned from the literature and explained in the narrative. For example, interview responses that elaborated on jurisdictional limitations of a particular agency, could be coded under the principal node of “decision process,” then further coded under the sub-node of “prescription,” and finally under a category of “jurisdiction.” This enables the researcher to easily structure inquiries to reveal all comments related to jurisdictional limitations.

In addition to the above, attributes were incorporated into the coding strategy establishing the position of the participant (e.g. Canada Federal Government employee, U.S State government employee, etc.) and the case the participant was involved with (i.e. Great Lakes Basin or Bay of Fundy/Gulf of Maine) permitting interrogation that allowed for analysis of response patterns that might be explained by an attribute. Thus an inquiry that seeks information about the extent of significant public participation, for example, can easily be broken down to determine whether significant public participation was mentioned more by Canadian participants as opposed to their counterparts in the United States.

NVIVO, as a qualitative research software tool, helps organize and enable enquiry of a large amount of information. Software, however, is only as reliable as the data underlying the inquiry. Trustworthiness of the underlying data is a critical element of this inquiry. Qualitative research involving comparative case studies requires the use of multiple sources of evidence in order to answer or at least explain the research questions.



Recognized sources of evidence include documentation, archival records, interviews, direct observation and participant observation (Yin 1994). It is important that these sources are trustworthy. Trustworthiness, or “internal validity,” of the sources used in this study rests with the verifiability of the information, legal statutes, treaties, opinions and other documents reviewed, all of which are in the public domain. Further, audio tapes and transcripts of the interviews conducted for this study have been retained. Observations are set forth in notes that were taken contemporaneously with the events by the author and are available for review. These multiple methods provide a solid basis for triangulation of the data that form the basis of the explanations and conclusions formed in this dissertation. Trustworthiness may also be established through an open and transparent logic chain that is set forth in the narrative (Maxwell 2005).

Documentation relevant to both cases was reviewed. Prescriptions in the form of statutes and treaties were reviewed along with newspaper accounts, primary documentation in the form of meeting minutes and other sources, and government and NGO reports. Further, every effort was made to stay current with reports and publications that became available during the time of this study. Much of this latter documentation has forwarded by dedicated and cooperative individuals who were aware of this research and who took it upon themselves to keep me informed of developments. A review of this documentation provided key leads to help with the identification of key institutions and individuals that have been or are involved in the policy process in both the Great Lakes Basin during the relevant time period and the Bay of Fundy/Gulf of Maine.

The identification of institutions and individuals led to site visits and attendance at a variety of meetings of groups associated with the governance regimes in both locations. Most visits were associated with meetings of groups or individuals responsible for some aspect of governance. Thus I attended numerous meetings of the New England Fishery Management Council (“NEFMC”) and the Gulf of Maine Council on the Marine Environment (“GoMC”) between 2001 and 2010. Meetings involving the Gulf of Maine Council also included quarterly meetings of the GoMC Working Group. I have attended two meetings of the Bay of Fundy Ecosystem Partnership in St. Andrews, NB. In the Great Lakes Basin I have been present at two meetings of Great Lakes United (GLU), an alliance of NGOs, government agencies, industry, conservation groups, labor unions, and citizens groups from Canada and the United States whose mission since the 1970s has been to develop and promote effective and coordinated policy initiatives, carry out education programs, and promote citizen action and grassroots leadership to assure clean water and air across borders in the region and to work together to safeguard and protect the health of people and wildlife in the Great Lakes Basin (Jackson 2005). I have also attended two biannual meetings of the International Joint Commission (IJC) in Kingston, Ontario (2005) and Chicago, Illinois (2007), and three meetings of the International Association of Great Lakes Researchers (IAGLR) in Windsor, Ontario (2006), Ann Arbor, Michigan (2005), and Toledo, Ohio (2009). IAGLR is a scientific organization of nearly 1,000 researchers studying the Laurentian Great Lakes that meets annually to discuss and debate research and issues pertinent to the Great Lakes Basin. In May, 2008, I attended the Coastal Zone Canada conference in Vancouver, BC, devoted to a

discussion of managing our coasts for a sustainable and prosperous future. Finally, I have attended at least one meeting of the Northeast Regional Oceans Council (“NROC”).

The direct observation at these events contributed to the richness of the data collected and enabled me to observe participants in their real-life roles using strategies such as negotiation and diplomacy to further their interests and achieve their goals and values. It also provided the opportunity to interact with participants on a formal and informal basis permitting to gain insight into their thoughts, motivations, and frustrations.

In addition to direct observation, this research afforded a variety of opportunities for participant observation. Participant observation is a special mode of observation in which the researcher goes beyond the role of passive observer and actually participates in the events being studied. I was fortunate to have been afforded a number of opportunities to participate in this manner. In June, 2002, for instance, I worked with Dr. Andy Rosenberg, Dr. Mimi Becker, and staff from the National Marine Fisheries Service (“NMFS”) and the New England Fishery Management Council (NEFMC”) for three days and nights to bring together fishers, government scientists, and NGOs to try and negotiate an agreement on Amendment 13 to the Groundfish Fisheries Management Plan. In July and August, 2003, at the invitation of the East Coast Pelagic Association, a group of mid-water trawlers that together accounted for nearly 90% of the herring catch on the east coast of the United States, invited Dr. Mimi Becker of the University of New Hampshire and I, with the help of staff from the NEFMC, to mediate and facilitate an agreement on a herring fisheries management plan encompassing jurisdictional, catch-rate, area designations, and participant eligibility issues to propose to the NEFMC.

In addition to passive observation at meetings of the Gulf of Maine Council on the Marine Environment I have had the opportunity provide reports to the Council on matters related to this study under contract on two occasions. One report submitted on November 1, 2005, involved a survey and synthesis of significant U.S. laws influencing governance in the Gulf of Maine region (Coon 2005a). The second contract gave me the opportunity to conduct a phone survey of Council members on a series of questions provided to me by the GoMC Working Group concerning their views on the role and effectiveness of the GoMC (Coon 2005b). In addition, in March, 2006, I was asked to help facilitate a meeting of the Climate Change Task Force sponsored by the Gulf of Maine Council on the Marine Environment in Dartmouth, Nova Scotia. The purpose was to recommend measures to be taken in light of changes in the environment due to climate change and to pass those recommendations on to the GoMC for inclusion in their five-year action plan (See GOMCc 2007).

Other significant participant observation opportunities have arisen more recently. In June, 2007, I was part of a group in Toronto, Ontario, that helped to facilitate a discussion between an invited panel of government regulators, NGOs, scientists, academicians, and First Nation representatives to develop and recommend alternative governance structures for the human activities that impact the ecosystem of the Great Lakes Basin. Finally, in January, 2009, I was asked by the newly-formed New Hampshire Coastal Protection Partnership to facilitate their first meeting attended by a group of representatives from business, NGOs, and community members to attempt to set goals and objectives for a new initiative to bring diverse interests in seacoast New Hampshire to speak with one voice on social, economic and ecological issues in the

region.

In addition to direct and participatory observation, interviews of key informants provided essential information for this study. Interviews were conducted in accordance with the approved guidelines of the University of New Hampshire's Institutional Review Board ("Appendix A: "Institutional Review Board Approval;" "Appendix B: "Informed Consent Form"). Interview questions generally followed the form of a "Focused Interview Questions" form (Appendix C) but questions were largely open-ended in nature, although participants were encouraged to expand on their answers and provide their opinions and insights on issues relevant to this research. The interviews were taped using a microcassette recorder and transcribed either by me or at my direction. Transcripts of the tapes were then forwarded to each participant by email with instructions to contact me if there were any inaccuracies or corrections.

Interview subjects were selected based upon their role and involvement in governance or policy making in either the Great Lakes Basin or the Bay of Fundy/Gulf of Maine watershed and their availability and willingness to participate in this research (See Table 3 for a distribution of the participants). Those who were interviewed were chosen because they were available and willing to participate in this study. Four of the participants were veterans of the Great Lakes Water Quality Agreement development, negotiation, implementation, and adaptation in the 1970s and 1980s.

Participants from the United States include current and former employees of federal and state agencies with jurisdiction over some aspect of the human activities that

Table 4 Social Process Coding Categories

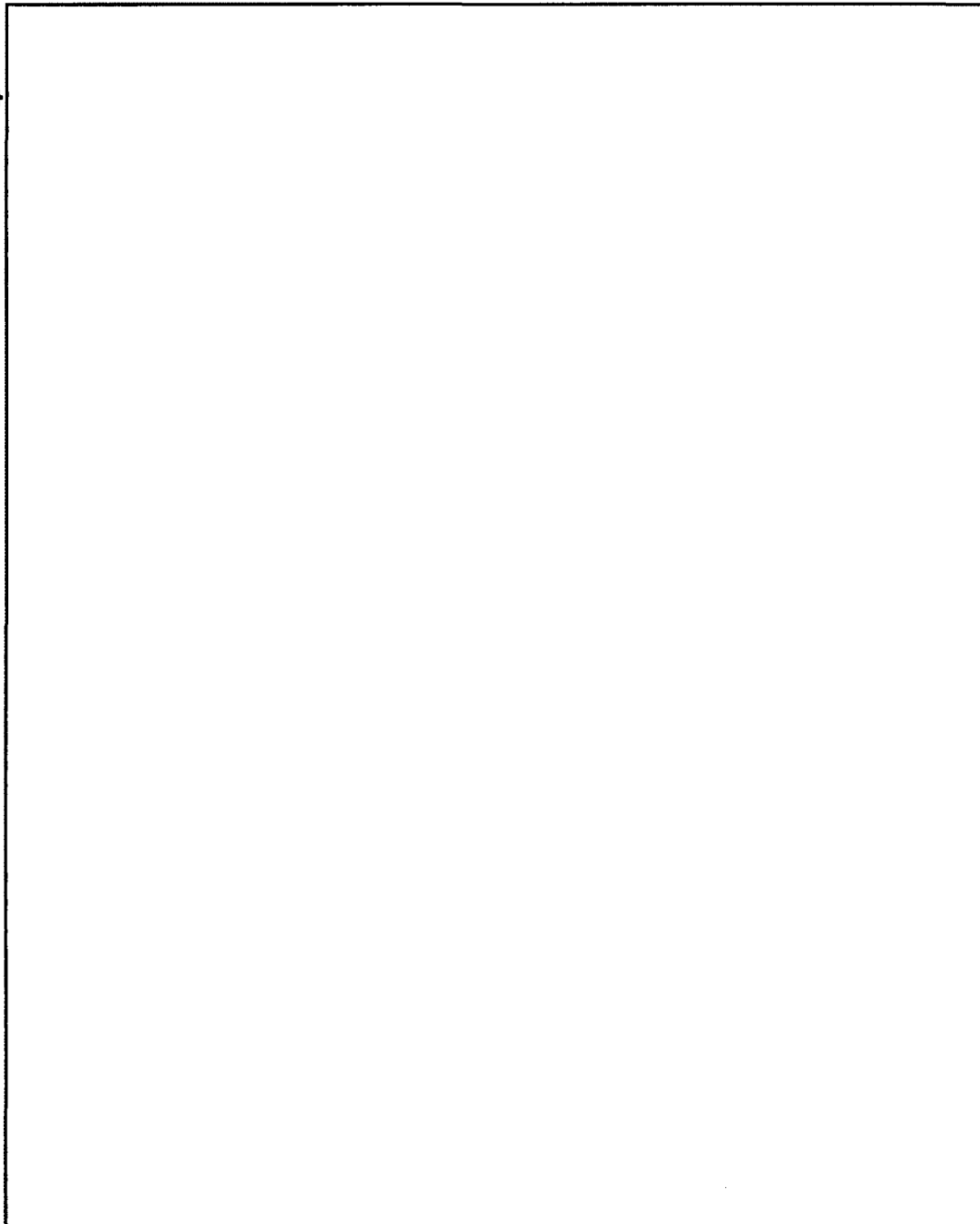
Framework Node Social Process	Subnode	Characteristics
○	Participants	Meaningful Public Participation Expert Participation
○○	Perspectives	Common Interests Special Interest Demands
○○	Situations	Ongoing and iterative Conflict and crisis
○○	Base Values	Power Wealth Enlightenment Well-being Skill Affection Respect Rectitude
○○	Strategies	Diplomatic Ideological strategies Litigation Economic Military
○○	Outcomes and Effects	

impact the greater Bay of Fundy/Gulf of Maine ecosystem or the Great Lakes Basin. Similarly, Canadian participants are generally either current or former federal or provincial employees in positions of responsibility for environmental policy and implementation in their respective regions. Most of the government employees interviewed in the Bay of Fundy/Gulf of Maine region also play some role in the Gulf of Maine Council, either as Council members or as members of the GoMC Working Group. Two NGO representatives were interviewed in the United States and one NGO

representative/community activist participated in Canada. The phone survey of all of the GoMC council members conducted under a GoMC contract in 2005 also provided helpful information.

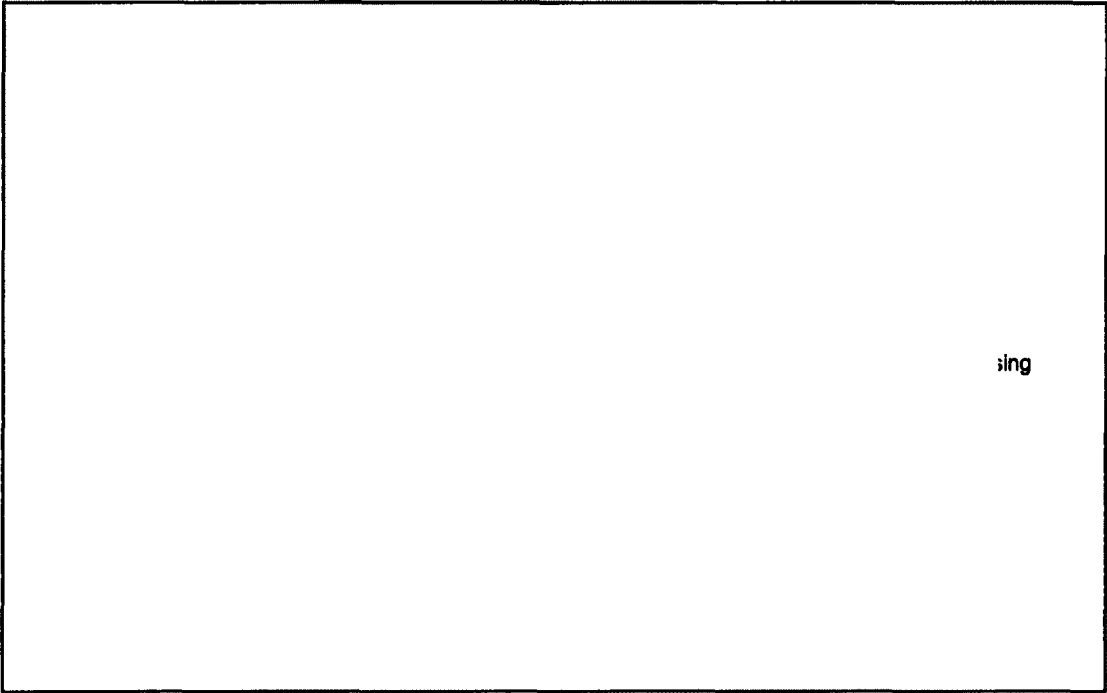
**Phase 3: Analysis**

In the third phase, the interview transcripts were coded using NVIVO and the data



was analyzed using the framework of the policy sciences. Codes were assigned using the content set forth in the policy sciences analytical framework and categories (“nodes”) and sub-categories (“sub-nodes”) that correspond with the interview questions (Appendix C). In addition, relevant text could be coded into characteristic sub-nodes within the task sub-nodes. Characteristics are essentially elements of a framework task that have been identified in the literature as a part or characteristic of the sub-node. The actual NVIVO node summary for the social process, decision process, and problem orientation coding are set forth in Tables 4 – 6.

Codes were assigned in order to group the information provided by participants



interviews and observations in the manner depicted below enabled the data to be compared and analyzed, contributing to an understanding of how the social and decision processes in each region may have contributed the trends and conditions extant in each



region. Tables 4 – 6 depict the categories and codes used to organize and analyze interview data, meeting minutes, and observation notes by region and category. It is also important to note that NVIVO coding categories for the interview transcripts and other data, like the questions asked the interviewees as set forth at Appendix C, parallel the organization and tasks provided by the policy sciences analytical framework. By using the framework approach consistently through the data collection and data analysis phases, then continuing the approach through the drafting of this dissertation, a high level of consistency was maintained throughout a process that could easily have become unwieldy.

It bears repeating that the purpose of this study is to assess the governance regime in the Bay of Fundy/Gulf of Maine region to determine whether it has the capacity to implement a broader, more holistic, ecosystem-based approach to the management of human activities that impact the environment. It is critical that governance and management recognize that ecosystems are dynamic and that related socio-economic governance must manage for surprising events (Holling 1986; Holling 1995; Berkes and Folke 1998; Berkes, Colding et al. 2003; Gunderson 2003; Daly and Farley 2004; Halpern, Selkoe et al. 2007). The policy sciences analytical framework provides a vehicle that lends support to the research questions in this study by focusing on a quest for governance arrangements that focus on common interests (Lasswell 1971; Brunner, Steelman et al. 2005).

There is no question that a totally comprehensive evaluation of the governance regime in the Bay of Fundy/Gulf of Maine is beyond the scope of this study. What this study proposes, however, is a qualitative methodology and contextual mapping strategy

that will assist researchers in the future to determine whether existing governance regimes have the capacity to provide a structure that is able to clarify and secure common social, economic, and ecosystem-sustaining interests consistent with the general concept of ecosystem-based governance, as that term is further explored in Chapter III.

The results of the data and information obtained, organized, and analyzed in the manner described above are presented in this study in the following manner. Chapter III describes the literature pertaining to the dynamic nature of ecosystems and the evolution of our fragmented scientific management policy process. It then distills the characteristics of ecosystem-based governance and, using the policy sciences framework, attempts to describe an “ideal” structure in terms of real-life decision and social processes. Chapter IV applies the policy sciences framework developed in Chapter III to the policy processes that guided policy development in the Great Lakes Basin in the 1970s and 1980s and compares those processes to “ideal” model. Chapter V uses the framework to focus on the binational governance regime in the Bay of Fundy/Gulf of Maine. Finally, chapter VI compares the governance regime in the Bay of Fundy/Gulf of Maine region to both the “ideal” ecosystem approach and the regime extant in the Great Lakes Basin in the 1970s and 1980s and suggests recommendations for change in the governance that could promote the common interests relevant to the collaborative and inclusive regulation of the human activities that impact the Bay of Fundy/Gulf of Maine ecosystem.

### III. THE ECOSYSTEM APPROACH AND THE PUBLIC GOOD

#### Introduction

The need to manage the human activities that contribute to the degradation of vital coastal ecosystems in a sustainable manner has never been more apparent. The pressure on coastal and ocean resources has increased relentlessly. Federal and related state and provincial environmental laws and regulations enacted in the 1970's have had an undeniable positive impact in the form of cleaner air, lakes, and rivers, locally and regionally (Ullsten 2003). These laws and the authorized agencies that promulgate regulations to protect the air, water, and other environmental resources have largely transformed the private sector. The nation spends some \$200 billion annually to carry out these laws. An elaborate patchwork of regulatory efforts mandate an exhaustive system of reporting, inspections, and penalties is relied upon to compel the population to follow the rules. Indeed, since the early 1970's it is estimated that \$3-4 trillion (in 2004 dollars) has been spent on environmental regulation mostly related to the requirements of federal regulation (Fiorino 2006). Given the fact that air and water pollution from large industrial point sources have been reduced, and many harmful chemicals have been banned or removed from the environment, there is ample evidence that environmental protection in the United States since the 1970s has been a major domestic policy success (Easterbrook 1995).

This study acknowledges the fact that the environmental regulatory scheme developed over the last 40 years served us relatively well. The problems, however, are changing. Ecosystems are dynamic, governance is evolving, and the problems we face as a society now and in the future differ materially from the low-hanging fruit of point-source pollution and water and air quality issues tackled mainly by government enforcement measures through legislation that harkens back to the 1970s. In other words, there is a need for fundamental change. As the Brundtland Commission noted:

The time has come to break out of past patterns. Attempts to maintain social and ecological stability through old approaches to development and environmental protection will increase instability... We are unanimous in our conviction that the security, well-being, and very survival of the planet depend on such changes, now (WCED 1987, 22-3).

Change is inevitable. It may be denied, ignored, or concealed behind a deceptive façade of normalcy, yet change remains inevitable (Smil 1993). And, no question about it, change and innovation are difficult, as one person's change may be another's destruction (Steelman 2010). Thus the purpose of this research: to examine whether the existing governance regime of the Gulf of Maine has the capacity to change - to innovate - in order to implement an integrated, adaptable ecosystem approach to restore and sustain, over time, the integrity of the respective ecosystems, including the functions upon which the humans in the ecosystem rely.

Commentators have spared no ink to offer their version of how governance of human activities that impact ecosystem integrity needs to be changed. The role of this chapter is to distill the literature to describe the underpinnings for change set forth in the case studies and analysis of chapters IV, V, and VI. The end of this chapter proposes a

framework for an “ideal” governance scheme against which other regimes may be compared so that gaps can be identified and remedied.

### **Ecosystem Dynamics and Managing for Surprise**

The notion of limiting or in some way managing the human activities that impact our ecosystems is not new. Robin Hood and his Merry Men gained fame avoiding fish and game laws in medieval England, after all. Thus before we can begin to examine the governance and management challenges related to the human activities that impact ecosystems, we first need to briefly explore the ecosystem dynamics that make governance such a challenge. Some history may help put the regulatory perspectives into context.

Much of the initial formal scientific research arose from issues surrounding fish populations and related harvests. Although on land there were laws that forbade poaching and set other limitations, bounty from the sea seems to have been taken for granted for much of recorded history. Into the late 1800s or early 1900s ocean fisheries were generally regarded as inexhaustible resources. While fisheries populations fluctuated and occasional fisheries collapses occurred, they were tolerated. Following the introduction of steam-powered trawlers in the late 19<sup>th</sup> century, however, the possibility that there were limits to exploitation caused some government agencies and scientists to believe that commercially important species were at risk unless their population dynamics were better understood and new scientific knowledge could better inform management efforts (Scheiber 1997).

It was largely the work of scientists in northern Europe and Great Britain that began to introduce a new way of looking at fisheries populations and dynamics. As Scheiber (1997) details, between the late 1800s and 1930, scientists in the region began to advance knowledge on the “big picture” – the ecological dynamics that impacted the fisheries. Hjort’s studies in the North Sea and North Atlantic were designed to develop an understanding of fishery habitats and ecosystem relationships. Schmidt studied the Atlantic deep sea eel population to correlate migrations with the species’ chemical and meteorological environment. Nansens’s work in the Arctic in 1893 established a link between physical environment, atmospheric conditions plankton and fishery dynamics (Scheiber 1997, 638).

The importance of these and related studies cannot be underestimated. “These theories conceived of fisheries ecosystem management as superior to a CPUE [catch per unit effort] approach, with systematic evaluation of the condition of stocks to be based not only on harvest data but also upon the holistic collection and analysis of data on the entire ecosystem (chemistry, atmosphere conditions, currents and upwelling, etc.) relating to the fishery environment, as well as biological data relating to population groupings, migration patterns, inter-species competition , nutrients, and other characteristics of the biomass and its dynamics” (Scheiber 1998, 24). Thus scientists in the early 1900s were beginning to look beyond total catch-related numbers and population dynamics equations in order to understand what was happening to fish populations and other components of the ecosystem.

The term “ecosystem” was apparently first coined by A.G. Tansley in Great Britain in 1935. At that time it was largely believed that ecosystems went through a process of gradual attainment of complete dynamic equilibrium. Equilibrium, once obtained, was deemed “perfect” and “its degree of perfection is measured by its stability” (Tansley 1935, 301). Tansley linked ecology to advances in the physical sciences and mathematics by inclusion of the term “system” and noted that these ecosystems were of various kinds and sizes. He went on to encourage ecosystem studies that combined ecology with other disciplines in order to study the interactions between biotic and abiotic components (Tansley 1935; Aber and Melillo 2001 Annex 12).

Others followed Tansley by using the term “ecosystem” and the study of ecosystems began to encompass the important processes and complex interactions between living and organic material. More research began to correlate the function of ecosystems with the transfer of energy from green plants (producers) to animals (consumers) and ultimately to microbes (decomposers) (Aber and Melillo 2001). In an argument apparently novel for the time, Odum (1969) took it one step further and opined that the principles of ecological succession bear importantly on the relationship between man and nature (Odum 1969). His definition of the term “ecosystem” included humans in the mix:

The ecosystem, or ecological system, is considered to be a unit of biological organization made up of all of the organisms in a given area (that is "community") interacting with the physical environment so that a flow of energy leads to characteristic trophic structure and material cycles within the system (Odum 1969, 262).

With the inclusion of humans, perhaps the most dominant species in terms of ecosystem impacts, ecosystems are now defined and generally described as the complex of organisms (including humans) that appear together in a given area and their associated abiotic environment that interact through the flow of energy to build biotic structure and materials cycles (MilleniumEcosystemAssessment 2005; Ruhl, Kraft et al. 2007). The types of processes utilized by ecosystems to move and transform energy and materials include photosynthesis, chemosynthesis, plant nutrient uptake, microbial respiration, nitrification and denitrification, plant transpiration, mineral weathering, vegetation succession, predator-prey interactions, and decomposition (Valiela 1995; Ruhl, Kraft et al. 2007).

The functions and processes interacting within ecosystems permit such systems to play a fundamental role in supporting life on earth. Ecosystems produce renewable resources (e.g. timber, fish, etc.) and ecological services. Such services include maintenance of the composition of the atmosphere, carbon sequestration, flood control, waste assimilation, nutrient recycling, soil generation, crop pollination, and many others (Berkes, Colding et al. 2003; MilleniumEcosystemAssessment 2005; Folke, Lowell Pritchard et al. 2007; Ruhl, Kraft et al. 2007). These and the many other ecosystem services that sustain life at global, regional, and local scales do not result from ingredients drifting in a uniformly mixed “soup.” Interactions occur. Time and space matter (Mann and Lazier 1996).

The relationships between the physical and biological processes that influence ecosystem function are subtle and complex both in the terrestrial and marine environments (Holling 1986; Gunderson, Holling et al. 1995; Mann and Lazier 1996;



Aber and Melillo 2001; Costanza, Low et al. 2001). The study of these same processes in coastal regions influenced by both land-based and marine factors provides even greater challenges. On land, terrestrial organisms are relatively easy to observe and manipulate while in the ocean marine organisms are more difficult to access and monitor. Nutrients required by terrestrial organisms are generally provided by the decaying remains of nearby entities while decaying matter containing nutrients in the oceans generally sink and leave the sunlit euphotic layer where photosynthesis occurs and only return to the photic layer through upwelling, which may occur a half a world away (Mann and Lazier 1996; Jennings, Kaiser et al. 2001; Norse and Crowder 2005). The sea is larger and more three-dimensional than the terrestrial environment. The low buoyancy of air strictly limits the number of creatures that can fly or otherwise escape a benthic terrestrial existence. Functional groups critical to ocean processes that are scarcer and much less important on land include suspension-feeders, plankton, and nekton (Jennings, Kaiser et al. 2001; Norse and Crowder 2005).

While there are challenges to collaboration and to the collaborative study of the coastal ocean margin, there are some important similarities that could link studies at the land-water interface. Natural and anthropogenic biological and physical processes located both on land and sea interact in critical ways. In addition, ecosystem functions on land and sea are threatened by the same largely anthropogenic factors: overexploitation, physical alteration of ecosystems, pollution, alien species, and global climate change. In both land and sea small populations are at special risk. Top carnivores, other keystone species, and structure-forming species are protection priorities because of their

exceptionally important relationship with other species and on ecosystem processes (Jennings, Kaiser et al. 2001; Steneck and Carlton. 2001; Norse and Crowder 2005).

The natural world, unlike the controlled environment of a laboratory, poses additional problems for the study, understanding, and management of marine ecosystems. In addition to the physical factors and biological processes that impact ecosystem function, there are other factors and conditions that impact the processes themselves. Water temperature can significantly affect the rates at which biological processes proceed. Currents, turbulence (including tidal mixing), and stratification can bring nutrients into the euphotic zone and influence the availability of nutrients to the bottom of the food chain (Mann and Lazier 1996). Also significant, from an ecosystem perspective and, ultimately, as a management issue, is the scale at which many of the processes occur. Scale may be defined as the “physical dimensions, in either space or time, of phenomena or observations” (Reid, Berkes et al. 2006, 7; Folke, Lowell Pritchard et al. 2007).

There are geographic scales that range from the size of the ocean, the maritime boundaries of regions impacted by the forces of circulation, and, in the case of the Bay of Fundy/Gulf of Maine, the strength and location of the Gulfstream, the North Atlantic Oscillation, vigorous tidal mixing, upstream inputs from the Gulf of St. Lawrence, and *inter alia*, the volume of dense slope water that enters the Gulf of Maine through the Northeast Channel (Xue, Chai et al. 2000). At the other extreme, processes that involve physical events like the inertial forces of turbulent fluctuations in the water and the related changes in the methods and locomotion and composition of zooplankton and phytoplankton can represent the shortest of length and smallest of geographic scales

(Mann and Lazier 1996; Balch, Drapeau et al. 2007). To make things more confusing from a management perspective, time scales must be added as an additional factor that play a role in biological and physical processes. Time scales are often correlated to length scales. Globally, thermohaline circulations are estimated to take a 1,000 years to complete a circuit (Mann and Lazier 1996). Finally there are an abundance of cross-scale interactions "...where events or phenomena at one scale influence phenomena at another scale" (Reid, Berkes et al. 2006, 8). The draining of a wetland, for example, takes place at a local scale, but may influence regional hydrology by reducing water storage capacity and thereby increasing flood threats, while also affecting rates of carbon emissions that ultimately impact climate change on a global scale (Reid, Berkes et al. 2006).

Thus ecosystems depend upon an abundance of processes in order to continue to function in a sustainable manner. The assemblage of processes, inputs, and systemically important ingredients necessary for the continued viability of ecosystem health are incredibly interlinked and dynamic. No longer can we assume that the services provided by ecosystems are a natural result of some "perfect" stage of environmental evolution infinitely capable of providing goods and services to humans. Ecosystems, in any form, have limits. We've come a long way since Thomas Huxley, an esteemed director of the UK Royal Commission on the Sea Fisheries, addressed a gathering in 1883 at the International Fisheries Exhibition in London and assuaged the fears of those concerned about reports of declines in fish catches by confidently opining that it was inconceivable that the great fisheries for cod, herring, and mackerel could ever be exhausted (Sims and Southward 2006).

More realistically, the view that nature exists at or near an equilibrium condition has been described as the “myth” of *nature balanced* (Holling, Gunderson et al. 2002, 12). Under this view equilibrium, if disturbed, will return to a similar if not identical equilibrium through negative feedback (in systems terms). Nature is considered to be infinitely forgiving and thus forms the basis for maximum sustainable yield and of achieving fixed carrying capacity for animals and humans; the effect being the imposition of static, rigid goals on dynamic systems. As we will see later, it is these static assumptions that can create the environmental surprise and crisis that management seeks to avoid. Given this, however, the myth of *nature balanced* may not be wrong, just incomplete since inevitably there are forces of balance in the world; it’s just that those forces can be overwhelmed (Holling, Gunderson et al. 2002).

Since Huxley (1883) and Tansley (1935), the fundamental views of ecosystem function and processes have changed. One of the major changes has been the recognition that ecosystems do not progress in linear fashion to a climax or equilibrium state. Nature is seldom linear and predictable. Indeed structure and processes, whether it be in ecology, economics, social institutions, or any number of other areas are dominated by uncertainty and nonlinear phenomena (Gunderson and Holling 2002; Berkes, Colding et al. 2003; Gunderson 2003; Folke, Lowell Pritchard et al. 2007). Natural systems, as well as social and economic systems, are complex. Problems related to natural resources and ecosystem degradation are thus complex systems problems involving the additional complexity of interactions between natural and social systems often operating at different scales (Holling 1995; Berkes, Colding et al. 2003)

Thus while ecosystems can be studied at the level of their individual processes or components, it should be stressed that in reality ecosystems are more than the sum of their parts (Holling 1986; Francis 1993; Mann and Lazier 1996; Costanza, Low et al. 2001; Gunderson 2003). Synergistic feedbacks between organisms and their environment exist and sustain the functioning and structure of ecosystems (Folke, Lowell Pritchard et al. 2007). The interactions among species in an ecosystem, or food webs within an ecosystem, together with their relations to water flow, temperature, and quality and to biogeochemical cycling are complex and non-linear and riddled with lags and discontinuities, thresholds, and limits (Francis 1993; Gunderson, Holling et al. 2002; Holling, Gunderson et al. 2002).

Since ecosystems are complex, self-organizing systems nested across temporal and spatial scales, any factor or process stemming from either internal changes or outside disturbance can push ecosystems over a threshold and result in a regime shift (Gunderson and Holling 2002; Gunderson 2003; Folke, Lowell Pritchard et al. 2007). The functions and services that survive regime shift may not be those that humans need or even expect. As self-organizing systems, with a complex array of dynamic structures and processes exerting influences, ecosystems are evolutionary, not mechanical, and exhibit limited predictability (Costanza, Low et al. 2001). Thus complex natural systems are not easily understood, let alone predictable. Despite the lack of predictability, humans continue to become more dependent on ecosystem services even as ecosystems become more vulnerable to unexpected events (Gunderson 2003).

Given the vulnerability of ecosystems, the issue becomes how they are able to maintain their function and structure despite significant perturbation and disturbance.

This ability to absorb shock and maintain its functions relate to the ecosystem's *resilience*. Resilience can be used as a way to describe the return time to a steady-state equilibrium following a perturbation. In ecosystems that do not show signs of a steady-state equilibrium phase, where instabilities can flip a system into another stability domain or regime of behavior, resilience is the measure of the magnitude of disturbance that can be absorbed before the system flips into a another stability domain by changing the variables and processes that control behavior (Gunderson 2003; Walker and Salt 2006). Further, stressed ecosystems, like those weakened from resource overexploitation, tend to change in lurches, not gradually, after passing through a threshold, creating surprises, or reactions that differ from predictive models both quantitatively and qualitatively (Holling 1986; Gunderson, Holling et al. 1995; Holling 1995; Berkes and Folke 1998).

Thus the structure and resilience of ecosystems play a huge role in determining how well such ecosystems perform from the perspective of human predictions and expectations. Given the challenges posed by the co-evolving systems of humans and nature, however, surprises are common and tend to be the rule, not the exception (Gunderson and Holling 2002; Gunderson 2003). With no lack of ecosystems that have been weakened by resource overexploitation, poor planning, etc., effective governance will have to enable adaptive management capable of learning and able "...to deal with the unpredictable interactions between people and ecosystems as they evolve together" (Berkes and Folke 1998, 11).

Given that ecosystems are not linear and do not function in predictable fashion, what are the implications for the management or governance of the human activities that impact ecosystems? How are resilience and management related? And how can we

transition from management for human needs and sustainable yields to management for resilience and “surprise?” The next section discusses these management and governance issues.

### **Institutional Efficiency and the Legacy of Scientific Management**

Humans need not travel in order to witness or be immersed in nature. There is no need to head to the mountains or the shore. Humans are, without doubt, and without more, an integral part of the ecosystems upon which they depend. Systems of people and nature in fact co-evolve in what some have described as an ‘adaptive dance’ (Gunderson 2003). Resilience and adaptive behavior play critical roles in the choreography. As discussed above, the interactions that occur in ecosystems between fast- and slow-moving processes as well as between processes with vastly different spatial dimensions result in a nonlinear, unpredictable system. These self-organizing, nonlinear, and unpredictable assemblages of processes and structures are marked by alternating stable states and regular movements of biotic and abiotic variables between those states (Gunderson and Holling 2002; Gunderson 2003).

It turns out that this variability is not necessarily a bad thing. In fact it is essential for ecosystem maintenance. There is now an understanding that variability and diversity are created by internal biotic and abiotic disturbances as well as external forces that help maintain and renew the resilience and resistance of ecosystems. “Reducing variability and diversity produces conditions that cause a system to flip into an irreversible (typically degraded) state controlled by unfamiliar processes” (Gunderson and Holling 2002, 9).

There is a propensity for society to reduce variability in order to feed some social or economic need that frequently causes ecosystem function and, ultimately, services to decline. Holling (1986) studied twenty-three examples of managed ecosystems. In each case he examined both the way the ecosystems were organized and the way they were managed. With respect to organization his study suggests that "...the great diversity of life in ecosystems is traceable to the function of a small set of variables, each operating at a qualitatively different speed from the others" (Holling 1995, 6) More importantly his study suggests that any attempt to manage ecological variables (e.g. fish, timber, water) resulted in less resilient ecosystems, more rigid management institutions, and more dependent societies. So, and as will be discussed more fully *infra*, success ultimately leads to failure in the management of ecosystem activities (Holling 1995).

The intersection of unpredictable ecosystem processes and complex human systems makes environmental problems doubly complex (Dryzek 1997). Yet there is an understanding that there is a general pattern to unexpected changes and ultimately to resource crisis. The pattern, as distilled by Holling's (1986) so-called 'science of surprise', starts with a sequence of events that begins with exploitation of a resource (Berkes and Folke 1998). As experience with the resource grows, and more and more social and economic interests begin to use and rely on its existence, the resource is exploited more efficiently (Berkes and Folke 1998; Gunderson and Holling 2002).

Efficiency, of course, is a major consideration in economics. To many if not most economists efficiency refers to the use of resources in such a way as to maximize the production of goods and services (Daly and Farley 2004). Thus successful suppression of spruce budworm infestations using sprayed insecticides during the mid-1900s in Eastern



Canada not only served to preserve a waning pulp and paper industry, but encouraged expansion of pulp mills, leaving the forest and the economy exposed to "... more intense extensive tree mortality than had ever been experienced (Gunderson, Holling et al. 1995, 509). Exploitation of fresh water resources in the Everglades by a hodgepodge of government agencies and private interests intent on funneling fresh water to developers and agricultural enterprises has precipitated a steady series of environmental and human crises in the form of flooding, drought, and unprecedented environmental degradation (Gunderson, Holling et al. 1995). Similarly, passage of the Magnuson-Stevens Act (1976) in the United States was designed to encourage and subsidize a U.S. fishing fleet with the goal of catching fish sufficient to achieve optimum sustainable yield, or "a yield which provides the greatest benefit to the United States as determined on the basis of the maximum sustainable yield...as modified by relevant ecological, economic and social factors." The act "loosed an unprecedented expansion of fleets, landings, and exports" (Weber 2002, 84 - 85). The brutal efficiency enabled by Magnuson-Stevens (1976) was clearly a key factor in the exhaustion and collapse of the New England groundfish fishery by the mid-1980s (Kurlansky 1997; Dobbs 2000; Weber 2002). Economic efficiency in terms of resource exploitation seldom leads to sustainable and resilient ecosystem viability.

Efficiency is also a key element of scientific management – the natural resource management approach underpinning our past and present governance regime. As Teddy Roosevelt proclaimed: "The Conservation of our national resources is only preliminary to the larger question of national efficiency" (Taylor 1911, 1).

Scientific management strives to use the fullest extent of the latest scientific knowledge (often described as the “best available science”) through disinterested experts. It should be made clear that this discussion concerning the scientific management paradigm is not a condemnation of science or scientists. Science has provided enormous value to society and it has the potential to contribute significantly to improving both the discourse and the actions that will be required to deal with social and ecosystem degradation (Pielke 2007). Scientific management, as a governance paradigm, insists that planning and decisions made concerning the use or preservation of natural resources are to be based on technology and efficiency. Further, scientific management routinely relies on a single, central authority for making optimal decisions on a national scale and implementing them through a bureaucratic chain of command (Hays 1959; Fischer 2000; Brunner, Steelman et al. 2005; Folke, Lowell Pritchard et al. 2007).

The paradigm of scientific management falls securely within the discourse that John Dryzek (2005) defined as administrative rationalism. A discourse is a shared way of looking at the world that allows for those who share the discourse to gather bits of information and make them into coherent stories or accounts. Discourses can help construct meanings and define relationships as well as shape interpretations of every day events. Although the way a particular discourse, or perspective, views the world is not always understood by others who do not share the discourse, seldom is there complete discontinuity across discourses. Discourses also generally bring with them some measure of political power and may exercise power in the manner that they condition the perceptions and values of those that adhere to them as some interests and values are pursued while others are suppressed (Dryzek 1997).

Dryzek's administrative rationalism, like scientific management, consists of a governance regime that governs largely through a bureaucracy with experts and managers as the heads of the bureaucracies. Activities are managed by experts using expert tools and theories like "cost benefit," "risk" analysis, environmental impact assessments, "expert advisory commissions" and other methods that experts can speak about but which shuts out the general public . As far as who's in charge:

...administrative rationalism implies hierarchy based on expertise, with both power and knowledge centralized at the apex. Those at the apex are assumed to know better than subordinate levels, so as to be able to assign tasks and coordinate operations. But problems of any complexity defy such centralization: nobody can possibly know enough about the various dimensions of an issue such as acid rain, global climate change, ozone depletion, or the interacting cocktail of urban air pollutants, not to mention the social and economic aspects of these issues, to sit with any confidence at the apex. (Dryzek 1997, 93).

Thus public or local knowledge is marginalized and relevant "expert" knowledge is too often so dispersed and fragmentary that the closed, hierarchical style of administrative rationalism simply cannot put the pieces together in a useful manner. If aggregation is tried with complex problems, the result is typically problem displacement rather than problem solving, e.g. air pollution getting turned into water pollution. As Dryzek (2005) notes, most anti-pollution agencies operate under single-medium statutes like clean air acts and clean water acts - thus increasing the likelihood of problem displacement across media (Dryzek 1997, 95).

Thus, whether it is called scientific management or administrative rationalism, the present paradigm of fragmented bureaucratic, expert-driven, regulation with efficiency-centered decision-making hierarchy has been developing and strengthening since the

early 1900s. The advent of the industrial era brought on increased need for expert control and management because only scientific and technical experts had the requisite knowledge and skills (Brunner, Steelman et al. 2005). Citizens, who once largely controlled the production of their own food, transportation, and other necessities, began to rely upon increasingly complex corporate and institutional interests for their needs. Individuals found themselves unable to easily determine their own interests and escalating complexity left citizen participation in governance largely in its wake. Control was turned over to technocrats and bureaucrats and public participation was left behind. So just at a time in when political influence of the public was being folded into an increasingly technical society "...it was undercut by the rise of bureaucratic organization and technical expertise" (Fischer 2000, 6).

The tension between participatory democracy and social and technical complexity continued to evolve in a special-interest laden version of "adaptive dance." Participants in the natural resources arena learned over time that local groups were not nearly as effective as national pressure groups. National pressure groups began to morph into national single-interest groups and often combined with administrative agencies and congressional committees that dealt with specialized subjects to marginalize more integrated approaches. "Iron Triangles," a term describing the process that involved the linkages formed between powerful special interest lobbying groups, government regulatory agencies, and congressional committees or sub-committees so as to write rules and regulations that harmonized their particular interests while preventing the more general interests of society to participate, emerged as the dominant structures in spite of the avowed goal of scientific management to rise above politics. The next logical step,

naturally, was for organized interests to hire their own experts to justify conflicting positions, ultimately leading to scientific analyses and economic assessments that fractured along traditional political fault lines and contributing to an overall erosion of public confidence in science (Brunner, Colburn et al. 2002, 212).

In this manner politics and policy have evolved to promote single or special interests over the common good. We have already seen that ecosystem surprise is often triggered by the targeting of a single commodity or focusing on output or yield of a desired ecosystem product or service. Economic regimes form around the extraction or use of desired commodity or product. To spell it out:

Economic dependence on a short list of products, linked via politicians in powerful legislative positions who are supported by economic interests, can reinforce the thinking in a bureaucracy managing a natural resource (Trosper 2003, 328)

Thus under the scientific management *status quo*, bureaucracies and special interests can feed off one another. In response, natural resource users and conservation groups have had little choice but to engage each other in issue-by-issue power-balancing politics. Politics, therefore, has rarely, if ever, been driven by the knowledge and input of impartial scientific experts. Politics evolved as the context and typically enabled a regulatory scheme that drafted and enforced rules dedicated to the controlled exploitation of natural resource sectors and components (Dryzek 1997; Brunner, Colburn et al. 2002; Fiorino 2006).

There is more to the story. Ever-changing and evolving societies utilize more than interactions that are based purely on economic or political forces to apportion values and access to democracy and capital markets. Ultimately the behavior of individuals is a

response to their environment in a way that is far more complex than can be delineated or captured by basic rules of economics and politics (Dryzek 1997; Gunderson and Holling 2002).

What we have learned, therefore, is that there are common patterns behind the failures of management of the human activities that impact an ecosystem's function. One pattern that is typical of resource exploitation scenarios involves the need for or identification of a target variable that is then successfully controlled. Social and economic systems initially flourish with increased economic opportunity centering on the controlled target variable. The efficiencies and limited, fragmented interests of the scientific management/administrative rationalism paradigm are unable to effectively control ecosystem variables and actually enhance exploitation. Initial success sets the stage for ultimate failure with the stabilization of target variables effectively causing meaningful changes in other ecological, social and economic components – leading ultimately to the collapse of the entire system (Gunderson, Holling et al. 1995; Dryzek 1997; Gunderson and Holling 2002; Berkes, Colding et al. 2003; Armitage, Berkes et al. 2007; Ascher, Steelman et al. 2010). In sum:

Although there is considerable variation in detail, there is remarkable consistency in the history of resource exploitation: resources are inevitably overexploited, often to the point of collapse or extinction. We suggest that such consistency is due to the following common features: (i) Wealth or the prospect of wealth generates political and social power that is used to promote unlimited exploitation of resources. (ii) Scientific understanding and consensus is hampered by the lack of controls and replicates, so that each new problem involves learning about a new system. (iii) The complexity of the underlying biological and physical systems precludes a reductionist approach to management. Optimum levels of exploitation must be determined by trial and error. (iv) Large levels of natural variability mask the effects of overexploitation. Initial overexploitation is

not detectable until it is severe and often irreversible (Ludwig, Hilborn et al. 1993, 17).

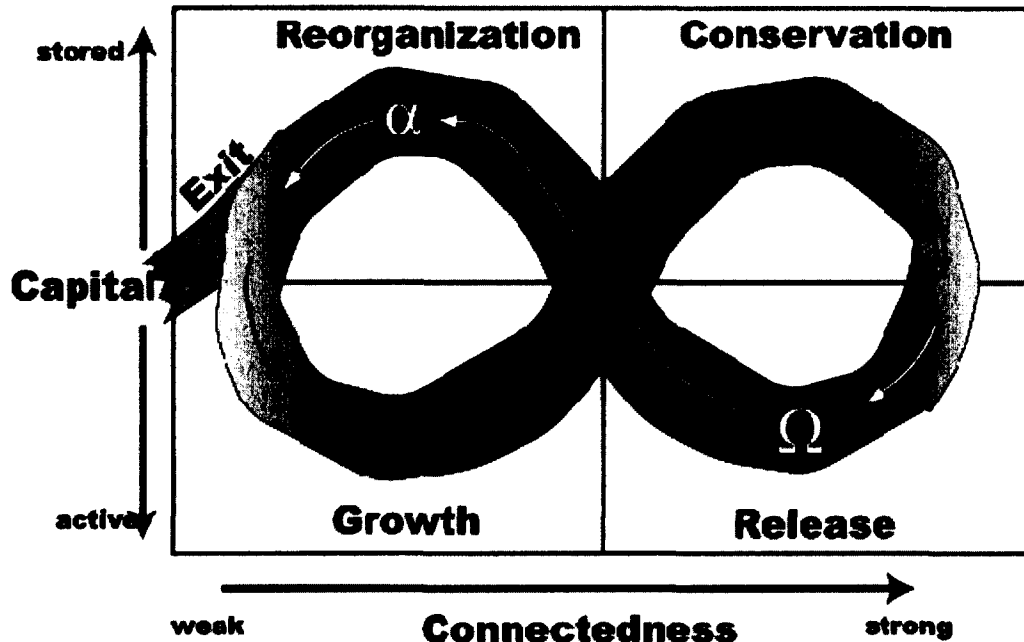
Clearly our current regulatory scheme is inextricably structured to permit the identification and efficient exploitation of targeted ecosystem components. As we will see below, this ability opens the door to ecosystem frailty and, ultimately, collapse.

### **Resilience and Adaptive Cycles**

The previous section stressed that ecosystems are dynamic, continually changing, and unpredictable. It also described the process whereby regulation that focuses on the control of a target variable can lead ultimately to the collapse of the entire system. The reason that most ecosystems don't collapse is that healthy ecological systems have the resilience to withstand wide change and still maintain the integrity of their functions. As was pointed out previously, *resilience*, or *ecosystem resilience* which "emphasizes conditions far from any equilibrium, where instabilities can flip a system into another regime of behavior – i.e., to another stability domain ... resilience is measured by the magnitude of disturbance that can be absorbed before the system changes its structure by changing the variables and processes that control behavior" (Gunderson and Holling 2002, 27-28 ).

It needs to be stressed, however, that ecosystem resilience involves humans. Humans all live within social-ecological systems. We depend on ecosystems for our existence. So when we talk about resilience and the capacity of a system to absorb disturbance and still retain its structure and function, we are not simply talking about "nature," but a totally linked social-ecological system of which we are all a part (Davidson-Hunt and Berkes 2003; Walker and Salt 2006).

In order to better understand change and resilience in complex systems, the



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metaphor of the adaptive cycle<sup>3</sup> is useful (Gunderson, Holling et al. 1995; Gunderson and Holling 2002). Its phases of exploitation, conservation, release, and reorganization

<sup>3</sup> The adaptive cycle provides a vehicle for the discussion of ecosystem succession. The traditional view of succession involved the incomplete “equilibrium” model discussed previously. That view assumed that equilibrium, or the attainment of a climax phase, was controlled by two functions: exploitation and conservation. Exploitation referred to the organizations and processes that enable the quick colonization of recently disturbed areas by species considered r-strategists. Conservation describes the slow accumulation and storage of energy and material by species described as K-strategists. The use of r and K to describe the strategies of species in the exploitation and conservation phases is directly related to the parameters of the logistics equation. The r types are therefore species that have extensive dispersal ability and rapid growth in disturbed areas or any area where the best ‘scrambler’ wins, while K-strategists generally have slower growth rates and flourish in areas where resources become divided. Holling, C. S. (1995). *What Barriers? What Bridges? Barriers and Bridges to the Renewal of Ecosystems and Institutions*. L. H. Gunderson, C. S. Holling and S. S. Light. New York, Columbia University Press: 3-34, Gunderson, L. H. and C. S. Holling, Eds. (2002). *Panarchy: Understanding Transformations in Human and Natural Systems*. Washington, D.C., Island Press.

To continue the metaphor, the adaptive cycle responds to subsequent ecological inputs and expands the traditional exploitation and conservation model by adding two additional functions. The first addition is the function that results from the tightly bound accumulation of



provides a strong framework that underpins the interpretation of ecosystem change and governance (See Figure 4).

The adaptive cycle metaphor attempts to demonstrate how three properties of ecosystems interact to focus and shape the future responses and trajectories of the ecosystem, agencies, and people. These three properties are:

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biomass and nutrients in the conservation of K phase. This addition, called the 'release' phase or, borrowing from economics, "creative destruction" Schumpeter, J. A. (1942). Capitalism, Socialism and Democracy. New York, Harper and Row., reflects the sudden collapse or release of the nutrients and biomass accumulated in the K phase. Resources are released from their bound and controlled state, connections are broken, feedback regulatory controls weaken, and destabilizing positive feedbacks develop. This is designated as the omega ( $\Omega$ ) phase (Figure 3) Gunderson, L. H. and C. S. Holling, Eds. (2002). Panarchy: Understanding Transformations in Human and Natural Systems. Washington, D.C., Island Press..

The second additional function is that of "reorganization" and is deemed the alpha ( $\alpha$ ) phase. In this phase, the remnants of the collapse of the K phase begin a slow, random process of reorganization. It is during the transition from  $\Omega$  to  $\alpha$  that there is an explosive increase in uncertainty where conditions might arise for chaotic behavior. During this phase the system is essentially unregulated, connections are weak and there is no organization *ibid.*. Thus it is the stage "most affected by probabilistic events that allow a diversity of entrained species, as well as exotic invaders, to become established...it is the stage most vulnerable to erosion and to the loss of accumulated capital... [And] it is the stage from which jumps to unexpectedly different and more productive systems are possible" Holling, C. S. (1995). What Barriers? What Bridges? Barriers and Bridges to the Renewal of Ecosystems and Institutions. L. H. Gunderson, C. S. Holling and S. S. Light. New York, Columbia University Press: 3-34..

The omega ( $\Omega$ ) and alpha ( $\alpha$ ) phases, shaded in figure 3, form the back loop of the adaptive cycle. The back loop phase, from  $\Omega$  to  $\alpha$ , is a rapid reorganization and leads to renewal. This can be contrasted with the front loop phase, r to K, which is the slow, incremental, phase of growth and accumulation. The front loop is predictable with higher degrees of certainty. The back loop, on the other hand, encompasses the outcomes following collapse and reorganization and is highly unpredictable Gunderson, L. H. and C. S. Holling, Eds. (2002). Panarchy: Understanding Transformations in Human and Natural Systems. Washington, D.C., Island Press.. Thus there are two phases in the adaptive cycle where ecosystems become briefly vulnerable to dramatic transformation. The back loop reorganization ( $\alpha$ ) phase and the conservation, or K, phase of the front loop. These are phases where slower and larger levels in ecosystems become vulnerable to small events and fast processes. The  $\alpha$  phase is vulnerable, as we have seen, due to the weak connections and lack of organization. At the other end of the spectrum, the K phase is vulnerable because a mature ecosystem can become overconnected in a variety of ways as well as brittle. Although the system may be at some version of equilibrium, there is a loss of resilience, particularly if target variables are attempted to be controlled, manipulated, or exploited, and the system becomes an accident waiting to happen Holling, C. S. (1995). What Barriers? What Bridges? Barriers and Bridges to the Renewal of Ecosystems and Institutions. L. H. Gunderson, C. S. Holling and S. S. Light. New York, Columbia University Press: 3-34..

- The potential [Capital] available for change, since that determines the range of options possible;
- The degree of connectedness between internal controlling variables and processes, a measure that reflects the degree of flexibility or rigidity of such controls – i.e., their sensitivity or not to external variation;
- The resilience of the systems, a measure of their vulnerability to unexpected or unpredictable shocks (Gunderson, Holling et al. 1995; Gunderson and Holling 2002, 32-33)

The adaptive cycle provides a helpful metaphor to demonstrate the dynamic, complex and difficult if not impossible to predict nature of ecosystems. It also helps depict the importance of resilience as a quality of ecosystem dynamics and function. Ecosystems that are resilient are better able to absorb disturbance without changing in structure and flipping to a new, and perhaps less desirable, equilibrium. One of the ways to impair resilience, as we have seen, is for governance or regulation to try to control or exploit targeted variables within the system.

Current governance, for the most part, is based on the legacy and processes of efficiency and scientific management which strives to efficiently control variables and to maximize value from natural resources using command and control bureaucracy and expert-driven technology. The adaptive cycle metaphor demonstrates that ecosystems are most vulnerable when the system is at seeming (and mythical) equilibrium but brittle with entanglements between numerous variables within the system, including human and institutional inputs. As ecosystems grow and mature, and variables are controlled or limited for the benefit of society or for economic gain, the system becomes more brittle and less resilient – the accident waiting to happen. The next section looks at whether there may be a better way to develop governance that permits more effective management of the human activities that impact the environment.

## **Changing Course: An Ecosystem-Based Approach to Adaptive Governance**

The study of the impact of governance on the human activities that impact the environment has been the poor step-child for researchers in the academic and scientific communities. Far more work, money, and effort has gone into the study of the natural components and processes underlying ecosystems, but research on socioeconomic and governance aspects of ecosystem dynamics has been limited despite the fact that progress in these areas is essential to achieving effective ecosystem-based approaches to management (Sutinen, Clay et al. 2000). There is a need to develop connections between the spatial and temporal scales of nested ecosystems and networked institutions capable of monitoring, assessing, and regulating at appropriate levels of regional, national, local, citizen and NGO involvement. It is axiomatic that the manner of organization of governance arrangements is critical to resource use and, by extension, ecosystem health (Costanza, Norton et al. 1992).

Current laws in the United States, Canada, and elsewhere reflect the traditional tendency of government agencies and departments charged with responsibilities for natural resources and coastal activities to be limited to some particular type of activity. Thus management focus has traditionally centered on legislatively-mandated jurisdictional sectors and is typically concerned with limiting some narrow activity or increasing production of desired commodities (VanderZwaag 1995; Juda 2003; Fiorino 2006; Brunner 2010a).

With respect to the governance and management of the human activities that impact the integrity and resilience of ecosystems, the notion that traditional scientific management approaches are failing, and may in fact be making the problems worse, has

been discussed. The institutional structure that has developed for decades around the low-hanging fruit of egregious smokestacks and end-of-pipe discharges are proving remarkably resistant to fundamental change and innovation (Skowronek 1982; Brunner, Steelman et al. 2005). Thus old regulation, evolving from a late 19<sup>th</sup> century obsession with efficiency, largely designed to respond to a 1970s view of environmental problems, and revolving around selective intervention by government based on a strategy of bureaucratic control, is no longer an effective response. It may even be largely irrelevant. We must move beyond simply controlling pollution to preventing it, reducing risk, promoting eco-efficiency, advancing stewardship, and achieving a sustainable economy and society over the long term (Fiorino 2006; Pielke 2007; NRC 2009).

As discussed in the Introduction to this paper, there have been repeated calls for a broader, more holistic ecosystem approach to environmental management of the coastal oceans has been the pronounced response to the perceived failure of traditional scientific sector-based management (Haskell 1992; F.A.O. 1995a; Constanza 1998; EPAP 1999; Juda 1999; Sherman and Duda 1999; Costanza, Low et al. 2001; Macpherson 2001; Sherman and Duda 2001; Link 2002; Policy 2002; Steelman 2010; Brunner 2010a; Brunner and Lynch 2010b). The implementation of a more ecosystem-based approach to regulations for the Bay of Fundy/Gulf of Maine region will require considerable thought, courageous experimentation, and the ability to monitor trends in order to learn from our mistakes. Management must shift its focus from the current emphasis on satisfying the needs of humans through output objectives to an emphasis on protecting the ecosystem functions that provide those goods and services. It bears repeating that sustainability requires ecosystems be viewed as non-linear complex systems with self-organizing

properties, resilience, and inherent uncertainty (Gunderson, Holling et al. 1995; Gunderson and Holling 2002; Berkes, Colding et al. 2003). Conventional natural resource models that assume some quantifiable equilibrium or “climax” phase of ecosystems must begin to recognize that nature is not equilibrium-driven and is inherently unpredictable (Regier and Baskerville 1986; Barron 2003; Berkes, Colding et al. 2003; Gunderson 2003).

It will certainly not be easy to overturn more than a century of developed government, NGO, and economic interests that seemingly perpetuate profound ideological separation. As laws and regulations became more complex society and special interests evolved to divide and fragment environmental issues. Potential regulatory change is frequently watered-down or blocked by galvanized and often piecemeal efforts by interest groups organized to block each other. (Brunner, Steelman et al. 2005). At a time when common or public interests should be front-and-center with respect to the decisions and policies considered by policy makers that have the effect of distributing values as well as resources, special interests, those interests that detract from the public good, are often in control of the decision and policy making. With respect to science having a role as a neutral, objective force:

Science in the service of common interests is threatened as scientists and policy-makers have come to see science mainly as a servant of interest group politics. That is to say, increasingly, science has come to be viewed as simply a resource for enhancing the ability of groups in society to bargain, negotiate, and compromise in pursuit of their special interests (Pielke 2007, 10)

Certainly, at a national level, and often at a state or provincial level, many believe that political institutions have broken down, so that the broad public no longer believes them credible:

The American economy increasingly serves only a narrow part of society, and America's national politics has failed to put the country back on track through honest, open, and transparent problem solving. Too many of America's elites – among the super-rich, the CEOs, and many of my colleagues in academia – have abandoned a commitment to social responsibility. They chase wealth and power, the rest of society be damned (Sachs 2011, 5).

Given the precarious position of the federal political regime, and the distractions provided by mindless power struggles, the division, fragmentation, and stalemate that remain stubborn legacies of the nation's governance structure at the national, provincial, and state levels may signal opportunities for the mitigation of these barriers at more local and regional levels (Prugh, Costanza et al. 2000; Brunner, Colburn et al. 2002; Cortese 2011). Indeed a goal of implementing an ecosystem-based approach to the management of the human activities that impact the environment may be a way of ushering in a more diverse and effective local and regional approach to governance. The move toward a more regional and local governance regime will be discussed later in this chapter.

Ultimately, however, there is no magic or mystery to the notion of an ecosystem-based approach to the management of human activities that impact ecosystems. The ecosystem approach integrates ecological protection and restoration with human needs to strengthen the essential connection between economic prosperity and environmental well-being. The process requires meaningful collaboration between federal,

state/provincial, local, and tribal and first nation governments, and an active and informed public, to achieve the ultimate goal of a resilient and sustainable environment.

Expanding upon the definition proffered by the Helsinki Commission (2003), an ecosystem-based approach to governance may be defined as:

A governance process that develops an integrated ecosystem approach to coastal management bounded by ecological, not political, boundaries, and uses collaborative, cooperative, and community actions as often as possible to implement a goal-driven community-supported process for the comprehensive integrated management of human activities. Policy development is based on the best available local and expert knowledge about the ecosystem and its dynamics in order to identify and collaboratively take action at all appropriate levels on influences which are critical to the health and resilience of coastal ecosystem, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity

Thus the approach is applied within a geographic framework determined primarily by ecological, not political, boundaries. The process must overcome the fragmentation inherent in both the sectoral management approach and the splits in jurisdiction among levels of government at the land-water interface. Included at every level is the need for significant stakeholder and resource user involvement, recognition of human dignity social justice, democracy, and intergenerational equity. Finally, scientific uncertainty must be countered with the use of precautionary decision making.

The important characteristics of an ecosystem approach to governance may be summarized as follows:

- Management for resilience. Governance must take the perspective that its task is to find common ground on policies that advance the *common interest* (Brunner 2002). The common interest of maintaining and supporting ecosystem integrity

should outweigh parochial interests in preserving bureaucratic turf or command and control hierarchy. The critical component of ecosystem-based governance is that management focuses on the relationship between people and the natural processes necessary to sustain ecosystem structure and function , the life support systems, while recognizing the need for human and institutional involvement at every level of the ecosystem (Sutinen, Clay et al. 2000).

- Significant, meaningful public participation. Any ecosystem management regime must provide the opportunity for meaningful participation and input of a broad representative segment of the population in decision making processes (Costanza, Norton et al. 1992; Pauly and Maclean 2003). Significant, meaningful public participation is required (Becker 1993; Cortner and Moote 1999; Jackson 2005). Participation must be open to almost any person or group with a significant interest in the issue (Brunner, Steelman et al. 2005). Citizen involvement and partnership must be sufficient to build “civic science” instead of the traditional public information programs designed to inform passively (Gunderson, Holling et al. 1995). Together we must “pay the price of civilization through multiple acts of good citizenship...” (Sachs 2011, 5)
- Integrated, collaborative government involvement. Regulatory agencies must participate in coordinated and integrated fashion and allow softer local and regional input into governance. The approach is applied within a geographic framework determined primarily by ecological, not political, boundaries. Thus the process must overcome the fragmentation inherent in both the sectoral management approach and the splits in jurisdiction among levels of government



(Regier and Baskerville 1986; Berkes, Colding et al. 2003; Folke, Lowell Pritchard et al. 2007). In an ideal system, government acts less *on* other actors and more *with* other actors in a collaborative and communicative way. There is, therefore, more frequent, collaborative contact (i.e. not just during crisis). Thus government would require less of the local, state, or federal governments exerting control over others in society and more of a partnership-like interaction among them (Fiorino 2006).

- **Governance is adaptive.** There must be a realization that stewardship cannot wait on science to achieve a full understanding of ecosystem structure and function. Thus an ecosystem based approach in any region must be prepared to cope with the uncertainty inherent in complex natural and institutional systems (Sutinen, Clay et al. 2000; Sherman, Kane et al. 2002). Adaptive governance is a mode of learning that allows for decision makers with a poor understanding of the connection between their actions and the consequences to learn by doing (Ludwig, Hilborn et al. 1993; Holling 1995; NRC 2009). Ecosystem surprises stemming from delay in feedback, and/or rapid feedback, are both normal ecosystem dynamics and require adaptable governance. It should be understood that it is not humanly possible to design a flawless governance process capable of coping with multiple, complex systems. All that can be done is to attempt to design a system that operates under rules that allow sufficient information to be generated over time to enable participants to learn from their mistakes and continually adapt and improve the institutional system to operate within natural limits (Costanza, Low et al. 2001). Under an adaptive governance regime, policy

choices and interventions are treated as experiments (NRC 2009), relying explicitly on monitoring, evaluating, and terminating failed policies instead of expert-driven planning that relies primarily on science-based technology rather than trial and error (Brunner, Steelman et al. 2005).

- Mobilizing local knowledge. Social and cultural memory and contemporary local knowledge must be mobilized by developing links between key persons and providing a direction for adaptive governance. This is a way of building social capacity for resilience in social-ecological systems (Holling 1995; Berkes, Colding et al. 2003; Steelman 2010).
- Overarching lead or joint institution. Governance must have a lead or joint institution able to adapt to new information and understanding (Christensen, Bartuska et al. 1996). They must, therefore, have the authority (formal or informal) and means to carry out systematic scientific research to understand system response and status, to track compliance with policy goals and objectives as well as to make changes when necessary. The obvious need is for transparency and fairness as perceived by the public and regulated community. More pertinent, however, may be the existence of informal or voluntary venues for dispute resolution that gives the public and stakeholders an opportunity to work together toward resolution of local or regional problems. This may be especially important where, as in this study area, the problems we are having with environmental degradation are the result of the cumulative impact of activities that are entirely (or mostly) legal under our existing laws and regulations (Brunner 2002; Fiorino 2006).

- A precautionary approach to uncertainty. A precautionary decision-making approach must be used in order to account for the great degree of uncertainty inherent in complex natural resource issues (Sherman 1994; Sutinen, Clay et al. 2000; Costanza, Low et al. 2001). Principle 15 of the Rio Declaration makes it clear that where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation (Sitarz 1994). There must be a realization that stewardship cannot wait on science to achieve a full understanding of ecosystem structure and function. Thus ecosystem management in the region must be prepared to cope with the uncertainty inherent in complex natural and institutional systems ((Sherman, Kane et al. 2002; Whiteside 2006), Clay et al. 2000; Sherman, Kane et al. 2002). Rapid feedback and appropriate decision-selection mechanisms must be in place to compensate for lack of knowledge by decision makers (Costanza, Low et al. 2001).

While the above attempts to cull some of the more obvious characteristics of ecosystem-based governance from the literature, the more important message is that *governance as usual is not an option*. As the National Research Council (2009) recently pointed out in no uncertain terms, government agencies, private organizations, and individuals are “...unprepared, both conceptually and practically...” to meet the environmental challenges, including climate change, that will affect our futures (2009, 1). Thus the time is right for concerned institutions, groups, and individuals in the region to seriously contemplate a transition from “business as usual” to a more holistic,

collaborative, and participatory governance regime for the Bay of Fundy/Gulf of Maine region.

Significant change, especially the kind of change and innovation required to achieve at least some of the characteristics set forth above, is exceedingly difficult. There have indeed been many examples of bold innovation on the part of government agencies and institutions aimed at fostering new approaches to remedy environmental harm and achieve sustainable resource use. In the last decade, no fewer than twenty federal agencies have adopted innovative ways to improve their efforts at achieving their environmental tasks and mission, including the National Oceanic and Atmospheric Administration (NOAA), the Environmental Protection Administration (EPA), the National Park Service (USNPS), the US Forest Service (USFS), and the US Fish and Wildlife Service (USFWS) (Steelman 2010). Desired outcomes, however, remain bewilderingly elusive. From an outside observer's standpoint, nothing seems to have changed.

One significant reason that new initiatives fail is that innovative change must occur within larger institutional processes that impact the effectiveness of innovations. There is inherent tension between innovation and institutions. Innovations are often adaptive and transitory. Institutions are not (Steelman 2010). Further, any attempt to implement change and innovation in the regulation of the use and exploitation of natural resources in the Bay of Fundy/Gulf of Maine watershed must recognize that the institutions and entities that comprise the governance regime of the region are embedded in existing and enduring social and decision processes. There are economic, cultural, and social systems in place now that determine how values are distributed (Lasswell 1971;

Brunner, Steelman et al. 2005). Industry, governments, and NGOs often have strong vested interest in maintaining the *status quo* as change in governance can mean a redistribution of values like wealth and power.

The next section attempts to distill the existing literature, including case studies and academic treatises, to construct an “ideal” compilation of characteristics that I suggest would be reflective of an ecosystem-based approach to governance within the framework of the policy sciences. In chapters 4 and 5 the governance regimes of the Great Lakes Watershed Basin during the 1970s and 1980s and the regime extant in the Bay of Fundy/Gulf of Maine watershed will be compared to the criteria and characteristics set forth in the “ideal” framework. In this manner, using the framework, it is hoped that gaps between the governance that “is” and the governance that “should be” will be revealed and can lay the groundwork for the recommendations and conclusions set forth in chapter 6.

### **The Ecosystem-based Approach and the Policy Sciences Analytical Framework**

The decision to use the policy sciences analytical framework approach to the analysis of the ecosystem-based approach to governance is an attempt to organize the various indicators or characteristics of ecosystem-based governance and put them into context. The characteristics of ecosystem-based governance are not distilled from thin air. Context is critical for the analysis of complex problems like those underpinning many if not most environmental issues and assessments. The principle of context, that all things are interconnected and that the meaning of anything depends upon those connections, is at work in this investigation. Moreover, the related notion that the properties of the parts

cannot be understood except in the context of the whole is consistent with our discussion of the dynamic nature of environmental and social systems (Clark 1997). Holling (1995) notes the importance of a “systems view” necessary for addressing complex ecosystem issues. In the language of the policy sciences, a “systems view” is synonymous with a “policy-oriented” perspective (Clark 2002, 30). The sobering reality, however, is that:

...the system we deal with is always incomplete. Surprise is inevitable. Not only is the science incomplete, but the system itself is a moving target, evolving because of the impact of management and the progressive expansion of the scale of human influences on the planet (Gunderson, Holling et al. 1995, 13).

Thus reality and our less-than-satisfactory experience with fragmented, expert-driven, piecemeal restoration plans are forcing researchers, scientists, and policy-makers to veer off the linear path into the decidedly non-linear woods where complexity, contextuality, and uncertainty abound.

As has been discussed, an analysis of the policy process as fostered by the framework provided by Lasswell and the policy sciences permits an examination of the policy process through multiple stages. Lasswell’s approach demands a greater attention to context and to some degree enables scholarly attention to shift focus to institutional and other aspects of the policy process that has long been dominated by a fascination with congressional policy making (Keller 2009). Importantly, the research approach suggested by the policy sciences framework acknowledges that the stages of the policy process do not operate in linear fashion but instead may occur in parallel or iterative cycles (Lasswell 1971; Clark 2002; Keller 2009).

## **Problem Orientation**

The problem orientation phase of the policy sciences analytical framework acts rather like flexible bookends to guide and assess the entire framework. It helps frame the mapping and context of the social and decision process in an effort to strike at the heart at the primary concern of all analytical methods: how to bring appropriate knowledge to bear in policy decisions (Clark 2002, 128). Problem orientation is geared toward forcing investigators to switch from being “solution minded” and to approach policy from a “problem minded” perspective. In essence, problem orientation serves as a guide to the learning process fostered by the decision and social process inquiries. As such the five tasks within problem orientation serve as an overall “strategy to address problems and invent solutions (Lasswell 1971; Clark and Willard 2000, 9). Thus:

In problem orientation, the problems at hand must first be specified in relation to the goals that people seek, thus permitting a clearer definition of the problems than is otherwise possible. Historic trends must then be described to see if events and decision making are moving toward or away from the specified goals. Next, factors or conditions that have influenced or caused these trends must be determined. When past trends and conditions are adequately known, projections of future trends are possible. Finally, after these four tasks have been completed and the necessary information assembled, alternative courses of action for achieving the stated goals can be invented; evaluated according to their effectiveness, efficiency, and equitability in solving the problem (Clark 2008, 57).

Certainly problem orientation is ongoing and iterative. To begin the examination using the framework approach we will look at the characteristics of goal clarification under our “ideal” ecosystem-based approach to governance.

Goal Clarification. Clark tells us that clarifying the goals of the participants is our first task. “People involved in a resource management issue must specify what they hope

to achieve (a content matter) and also how they expect to achieve it (a procedural matter (2002, 87). “The goal-clarifying task is indicated by the blunt question: ‘What ought I to prefer?’” (Lasswell 1971, 40).

Goals are preferred outcomes within a specific context and are typically expressed in terms of the distribution of values and practices. Clarifying goals means finding the answers to the question: What value outcomes should we seek in an ecosystem-based approach to governance? Under the traditional governance model, goals are often established by a government with the supposed cognitive capacity to determine society’s environmental goals and, in some detail, how those goals should be achieved (Fiorino 2006). Goals are single targets to be realized efficiently; they are fixed, given, or assumed to separate science from non-science, and progress is measurable (Brunner, Steelman et al. 2005). Goals of government agencies are fragmented, however, and paradoxes abound. Different agencies operate independently striving to achieve separate and often-unrelated or competing objectives. Furthermore, some agencies are charged by statutory prescription with the responsibility to limit the taking of a commodity while simultaneously promoting the same commodity for harvest (Cortner and Moote 1999). In 1976, for instance, the National Forest Management Act charged the Forest Service with the responsibility to both protect forested lands and to proscribe rules for the harvest of timber lands (Troster 2003). Similarly, the Sustainable Fisheries Act (1996) requires the National Marine Fisheries Service to rebuild overfished stocks of fish on a species-by-species basis within certain time requirements, and at the same time determine optimum yield catch limits while being pressured by some members of Congress and other special



interests to extend deadlines and allow increased harvests (Safina, Rosenberg et al. 2005; MSFCMA 1996).

Goal choices should, initially, be fairly broad and widely accepted. Clark cites Lasswell and MacDougal (1992, 737-58) for the idea that the overriding goals should be human dignity, ecosystem health, and democracy. Indeed, the emphasis on the protection and advancement of human dignity has historically been a fundamental quest of the policy sciences approach (deLeon 1988). When we consider that we are examining the effects of human decisions on human lives, which require a healthy, resilient environment capable of sustaining human life, commencing any investigation with a goal of human dignity begins to make sense. As to the goal of democracy, it is “well-rooted in many cultural traditions throughout history...for all people to have full opportunity to shape and share power, wealth, enlightenment, well-being, skill, affection, rectitude, and respect” (Lasswell and MacDougal 1992; Clark 2002, 89). Further it should be clarified that the policy sciences strives to achieve an overriding goal of the realization of human dignity for the many, not the dignity of the few at a cost of indignity for the many. Since the goal is democracy and dignity for the many, decision outcomes must aim at achieving equal opportunity for participation in power, wealth, well-being, and the other important values (Lasswell 1971).

While there can be little serious question as to the virtues of having the goals of human dignity and democracy at the heart of any policy process, there needs to be more detail for the goal process and content in an assessment of ecosystem conflicts and issues. Some detail may be found in the terms of the Universal Declaration of Human Rights. In the universal agreement all nations agreed to recognize that the inherent dignity and the

equal and inalienable rights of all members of the human family is the foundation of freedom, justice and peace in the world (UN 1948). This sentiment ultimately expanded into a carefully worded statement of world community intent that declared that “human beings are at the center of the of concerns for sustainable development” and are entitled to good health and economic well-being (UNCED 1992, Principles 1, 3, 5, 6, 7, 8, 10, 13,14, 15, 17, 18, 19, 23, 23, 24, , 25, 26).

The symptoms that governance and society in the United States are not living up to the ideals of human dignity and democracy are numerous:

- In the last seventy years, barely half of eligible voters in the United States actually voted in a presidential election (Norris 2002). Voter turnout in the U.S. is roughly 63% of that in Western Europe. Further, U.S. elections fail to meet internationally recognized fairness standards (Lappe 2006).
- America is dividing. During the 1980s and 90s the United States underwent the largest wealth transfer in its history as the net worth of the top 1 percent rose by 63% while the net worth of those in the bottom 40% dropped by 44%. At the start of the 1970s, the corporate Chief Executive Officers (CEOs) earned an average pay that was approximately 40 times the pay of an average worker. By the year 2000 it had reach 1,000 times the average worker’s pay. Shockingly, the U.S. census bureau records reveal that the median earnings of male full-time workers actually peaked in 1973. Further, while earnings have declined, Conference Board data indicate that job satisfaction has been on the wane for the last 25 years (Sachs 2011).

- In 1964 three-quarters of the American public trusted government. By the late 1990s that number had shrunk to one quarter – while the number of Americans who believe that “the government is run by a few big interests looking out only for themselves” more than doubled between the mid-1960s and the mid-90s, reaching 76% (Orren 1997, 80-81). The number of lobbyists in Washington has tripled since 1996, outnumbering members of Congress by fifth-six to one (Lappe 2006).
- Poverty is real and expanding. Thirty-five million Americans – a number equal to the entire population of Canada – live in households that are so poor that they are not sure from where their next meal is coming. Further, the Institute of Medicine estimates that eighteen thousand Americans die unnecessarily each year because they lack health care (Lappe 2006). In addition, the United States ranks forty-second in infant survival (CIA 2005).

This list is, of course, not exhaustive. The point is simply that current governance in America does not appear to be overly concerned with human dignity, fairness, or democracy. “Moreover, we’re made to believe that we like it this way – that we *prefer* to leave our futures to others. Only a few oddballs care about contributing to something bigger than themselves. You know, those *activists*” (Lappe 2006, 6).

With the goal of human dignity and democracy in mind, there must be some focus on how we best begin to change the trends and make headway toward a society that advances these goals. It is noteworthy that a popular assessment of the cause of the deteriorating social and economic equalities in this country is the notion that government is the cause of society’s ills. As I write these words, we are about a week from the 2012

New Hampshire presidential primary election. There is a theme to the political rhetoric, a *mantra* if you will that the ills of modern society are the fault of government regulation.

Certainly a discussion of the history of government and its relationship to human dignity is beyond the scope of this research. To some degree, however, the notion that governance should somehow back off and leave regulation, including rules relating to human impacts on ecosystem health and resilience, entirely to supply and demand and free market capitalism deserves brief comment.

There is little dispute that for some three decades, from the new Deal of the mid-1930s through the civil rights legislative battles of the 1960s the federal government steered the national economy and drove equitable policy as a trusted instrument of democratic power. National highways were built, a national power grid was created, and government teamed with private enterprise to launch satellites and create the Internet. School systems became integrated and social programs, including Medicare, social security, food stamps, and other programs supportive of the less-fortunate and elderly came to fruition. As Franklin Roosevelt put it as he ushered in a new era of government intervention in the economy:

[G]overnment [is] the instrument of our united purpose to solve for the individual the ever-rising problems of a complex civilization. Repeated attempts at their solution without the aid of government had left us baffled and bewildered.<sup>4</sup>

Yet those sentiments are hardly recognizable today. After Viet Nam, Richard Nixon, and the oil crisis and higher interest rates of the 1970s, Ronald Reagan proclaimed:

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<sup>4</sup> Franklin D. Roosevelt, Second Inaugural Address, January 20, 1937

In this present crisis, government is not the solution to our problem; government is the problem....It is my intention to curb the size and influence of the Federal establishment<sup>5</sup>

The rhetoric, through the popular and business media, is insisting that free market capitalism remains the only way to a prosperous economy. The conservative right often expands upon the “invisible hand” metaphor first used first by Adam Smith (2003)<sup>6</sup> for the proposition that the U.S. economy requires that entrepreneurs must have a free hand, unfettered by government regulation, to create wealth and jobs for those that have thus far been harmed by our *status quo* economic and regulatory scheme. So the challenge is relatively clear. Can governance be restored to the point that citizens believe that it can actually foster the public good? Is there any way that people can be convinced to pay the price and participate with their interest, time, and commitment in a participatory democracy that reflects the will of the populace?

As we know, governance is active at several levels. Public dignity and democracy operate at local, state/provincial, and federal levels. Clearly the *status quo* is a disappointment. The federal level of governance, however, may be losing credibility while involvement and participation at local and regional levels could be fostered. Surely every situation is different and context changes from community to community. Thus it may be more productive to approach goal clarification as an inquiry into what the

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<sup>5</sup> Ronald Reagan, First Inaugural Address, January 20, 1981

<sup>6</sup> Interestingly, a review of Adam Smith’s work shows that the term “invisible hand” was used but once in his 1200+ page The Wealth of Nations and it was used with numerous caveats and conditions that involved an overall notion of fairness and justice. It would likely come as a surprise to the current crop of Republican candidates canvassing our state that Smith also concluded that workers were often oppressed and that legislation pertaining to workers typically was harmful to workers (p. 195). Smith also wrote that workers should be “...well fed, clothed, and lodged” (p. 110-111). Finally, modern day political rhetoric seems to ignore the fact that Adam Smith believed that taxing the wealthy was appropriate, opining that subjects “...ought to contribute toward the support of the government, as nearly as possible, in proportion to their respective abilities” (p. 1043). Smith, A. (2003). The Wealth of Nations. New York, Bantam Dell.

community wants. What values does the community prize over others? Again it is better to start with broader goals. In theory all communities should want fishable, swimmable water and the ability to harvest food from land and water from lakes and rivers that is safe to consume.

In our ideal ecosystem-based approach to governance, goals would be determined with a great deal of input from community. Strong public outreach and education efforts should provide incentive for community members to establish goals consistent with the overriding goals of human dignity and democracy (e.g. the “common good”). Resources should be available to assist communities in clarifying their common interests and, if necessary, stepping back from their individual demands, claims, and special interests to find common ground in more general and widely shared values (Clark 2002). New and measurable goals can be part of facilitated efforts by agencies with roles that evolve from rigid enforcement toward collaborative efforts integrated across all media and encouraging local and regional civic environmentalism (Fiorino 2006). Multiple goals are to be integrated if possible or traded off if necessary; they depend on judgments in the particular context and are subject to change (Brunner, Steelman et al. 2005). Goals should place the integrity and resilience of the ecosystem functions over human use because human demands for ecosystem goods and services cannot otherwise be sustainably met. Common interests should prevail over special interests. There should be methods for individuals and groups to find common interests.

Table 7 Goal Clarification

Traditional	Ecosystem-based Approach
Goals established by government agencies with assumed expertise to determine society's environmental goals and how they should be achieved. Agency goals trump community acceptance.	Meaningful public and/or community participation and input in the goal clarification process. National goals may provide guidance but community has broad input into how to achieve goals. Goal choices have broad community acceptance
Public participation generally limited to after-the-fact public comments on plans developed by government agencies and experts.	Strong public outreach and education provide ability to establish community goals inclusive of human dignity and democracy and provide basis for clarifying common interests. Human dignity includes economic fairness and sustainability.
Goals are traditionally single targets to be realized efficiently; they are fixed, given, or assumed to separate science from non-science, and progress is measurable	Multiple goals may be integrated that embrace human dignity, economic fairness for the many, and equal access to governance with a focus on maintenance and preservation of the integrity and resilience of ecosystem functions.

In sum, the key goal clarification characteristics of an ecosystem-based approach to governance are:

- 1) Meaningful community participation in the goal clarification process;
- 2) Strong public outreach and education efforts devoted to governance options and ecosystem issues, and
- 3) Multiple goals that are long-term and enduring and overall embrace human dignity, economic fairness, and equal access to governance with a premium placed on maintenance of the integrity and resilience of ecosystem functions (Table 7).

Describing Trends. The second task in problem orientation is the description of past trends. Trend description serves in important function in ecosystem-based examination and decision-making because reliable, objective trend analysis tells us what progress, if any, we are making toward short, medium, and long-term goals. When

examining ecosystem issues, our ideal ecosystem-based governance regime requires that the status of environmental as well as social and economic variables be assessed, i.e. are the eight values set forth in the social process becoming more abundant and available in the community and are institutional practices beginning to reflect the goals of human dignity, democracy, and ecosystem resilience rather than those of tyranny and deprivation (Clark 2002; Brunner and Lynch 2010b).

Thus in our ideal ecosystem-based governance the trends should be toward a greater sharing of wealth, knowledge, education, power, health, respect, skill and rectitude throughout the community. Ecosystem function should be trending toward greater resilience and community demands on ecosystem services should be moving toward a closer alignment with its capacity. Given that the pressures of global population trends, and the increasing demands being placed on the resources at the coastal margins of our continents, the earth's role as a provider of renewable and nonrenewable resources is becoming strained (Table 8). This means that fewer resources must be spread further. Trends, therefore, will reflect the value demands that will be rubbed raw in the years and decades to come. As society takes steps to determine how the attainment of human dignity will play out, the demands for wealth, knowledge, education, well-being, power, rectitude, skill, and health will only grow. The sustainable management natural resources will not be possible without the achievement of basic human rights for all (Clark 2002).

Trends in our ideal system should be determined and characterized factually, based on reliable and verifiable knowledge. Knowledge plays a critical role in trend analysis but needs to take a broader form than under traditional scientific management. Traditional science is an important subset of knowledge and must play a critical role in



determining trends and clarifying and attempting to expand the choices available to policy makers (Pielke 2007; Ascher, Steelman et al. 2010). Other kinds of knowledge are important to making good policy, however. *Local knowledge* can materially assist policy makers by providing context and place-based experience (Berkes, Colding et al. 2003; Ascher, Steelman et al. 2010).

Table 8 Describing Trends

Traditional	Ecosystem-based Approach
<p>“Best available science” mandates the development of indicators by scientists and academics to determine whether ecological variables are reaching targets established by government. Public input into the development or relevance of indicators limited. Data gathered by scientists or academics.</p>	<p>The use of reliable methods to measure whether a suite of socioecological variables are moving closer to, not away from, goals established with significant input from community. Use of local residents, NGOs, and community, municipal, and regional participants to gather trend data in collaboration with scientists and academics.</p>
<p>Trend analysis performed by scientists/academics and published mainly through peer-reviewed literature and professional/scientific conferences.</p>	<p>Open and transparent communication of the progress and trend data to policy makers and to an informed public through frequent meetings, accessible media, and other techniques.</p>
<p>Trend data and analysis performed by scientific and/or academic community with very little public input. Data may be presented at public meetings or in newsletters, sometimes using “science translators,” but public not meaningfully involved in report development or educated to understand importance of data.</p>	<p>Significant opportunities for community members and the public to be involved with scientists in the assessment of trend data using local knowledge and local preferences. Public participation in the development of reports and presentations. Public outreach used to educate public on the importance and significance of data in advance of regular meetings in a variety of forums.</p>

Another form of knowledge has been called *public preferences* and involves knowledge that is revealed through political behavior. It entails insights into the support or opposition of individuals and groups in the community and the strength or intensity of the public preferences (Ascher, Steelman et al. 2010). Using local preferences can greatly

assist policy makers who need to know how well past decisions and actions have achieved the goals of the community, how well they have served the common interest, what the perceived consequences (outcomes and effects) have been, and what groups, institutions or segments of the community have benefitted as well as who has been relegated to the background (Clark 2002).

Analyzing Conditions. Condition analysis is a task that encompasses the analysis of the conditions that impacted or affected past events and decisions. For each trend identified in a particular policy or natural resources problem and his socioeconomic context, there are conditions both historical and current that influence those trends. It is also an opportunity to determine how participants have performed against goals (Clark, Willard et al. 2000). Once again knowledge, especially a collaborative scientific approach encompassing a variety of disciplines, is necessary. Local knowledge also must play an important role in the analysis of conditions (Becker 1993; Berkes and Folke 1998; Brunner, Colburn et al. 2002).

Buried within conditions analysis is the presumption by stakeholders and the relevant community that there is an underlying ecological and socioeconomic equilibrium that buttresses a *status quo* view of the current situation. Any analysis of conditions, therefore, must pay particular attention to a search for factors that move a system toward or away from that equilibrium. This includes social, institutional, and economic factors, as well as problems in the natural ecosystem. The treatment of class may need to receive careful attention as the upper classes in society have long enjoyed the most in terms of values while lower classes the least. A broad understanding of the social, economic and environmental factors should help explain individual and collective behavior – an

explanation that lies within the social process, defined as *humans pursuing values through institutions using resources* (Clark 2002). Indeed, thorough conditions analysis needs to take into account the tension between democracy and capitalism in the community and region. The root of this tension lies in the fact that democracy is based on the ideal of political equality where every citizen has the same potential to influence what government does – whether or not each citizen chooses to use the opportunity or chooses to use their powers poorly. As “all are created equal,” therefore, money should not matter in this governance regime. Contrast this with capitalism and the marketplace, where money matters a great deal. Markets often respond to preferences backed by powerful financial interests. Thus the rich and poor, though equal politically, are seldom equal in an economic sense. Conditions analysis can reveal where the contrasting features of democracy and the free market come into play. All too routinely, economic markets fail to produce “public goods” that are shared in common, like clean water, unpolluted air, safe streets, and a system of justice. Similarly, corporate balance sheets seldom account for negative externalities – the benefits, costs, or consequences that accrue to those outside a market transaction (e.g. toxic waste disposal). Finally, other values can get trampled by economic markets, including the fair treatment of workers, neighbors, and even the fair distribution of wealth or economic rewards (Visser 2004).

In an ideal system, condition analysis should be part of an iterative effort by scientists and community members to determine the causes or other factors influencing trends. Resources should be available to permit scientists and others to sort out the

Table 9 Conditions Analysis

Traditional	Ecosystem-based Approach
Conditions analysis is a function of scientific and academic communities with results published in technical peer reviewed publications and infrequently shared with or accessible by public.	Conditions analysis is iterative with collaborative efforts by scientists and community to gain and share knowledge necessary to determine the conditions that are factors in any negative trends.
Current iterations of democracy and free markets can marginalize the public well-being and common interests by enabling powerful financial interests to the detriment of a fair distribution of wealth, health, education, and well-being.	Conditions analysis explores more than ecosystem factors and examines social and economic factors in order to understand whether economic or other special interests are overriding common interests and the public good

various environmental signals and determine what conditions are factors in any negative ecosystem trends. The inquiry, however, should not be limited to ecosystem factors. Trends can be affected by the individual and institutional effects of economic activity. Democracy, if waning, will be effectively unable to counter economic market pressures and compel government and regulatory authorities to step in and correct environmental abuses. Environmental and ecosystem measurements should be transparent and involve the community in a significant manner. Education and outreach should be an integral part of the ideal governance in order to keep citizens informed and aware of the importance and context of conditions (Table 9).

Projecting Developments. This task is all about determining how likely it is that the community will realize its goals. Policy decisions must look to the future, so past trends and conditions must be projected forward. Problem solving here relies on the

ability to estimate whether the important features of social context, conditions, and problems will persist unchanged or in what manner they may change in the future given a range of choices. If the future is unacceptable, action must be taken (Clark, Willard et al. 2000; Clark 2002).

Projecting developments depends upon reliable knowledge about trends and conditions. Another factor creeps in here. History tells us that often policy makers are knowledgeable about trends and conditions, yet are either unwilling to buck political hazards or are blocked by special interest opposition (Clark 2002).

In our ideal system (Table 10), reliable knowledge will underpin the projection of developments. If trends and conditions are such that projected developments appear to take a community away from its goals, away from progress toward human dignity, and toward a weakened, less resilient ecosystem, there needs to be a system that will reward those who bring these issues to the attention of policy makers.

Table 10 Projecting Developments

Traditional	Ecosystem-based Approach
The task of projecting developments and problem solving is responsibility of government and academic institutions and policy makers using best available science.	Through regular public education and outreach, an involved public collaborates with academic institutions, scientists, and policy makers to understand reliable data and project developments.
Policy makers and regulatory authorities depend on reliable knowledge about trends and conditions, but may be unable to project unpopular potential developments because they are either unwilling to buck political hazards or are blocked by special interest opposition.	With the input of knowledgeable public, scientists and policy makers can acknowledge mistakes or policy failures, learn from them, and make adaptive changes, to reverse negative trends without fear of retribution from the governance system.

There also must be a way for policy makers to make adaptive changes in an attempt to reverse negative trends without fear of retribution from a system more concerned with wealth than long-term environmental viability.

Inventing, Evaluating, and Selecting Alternatives. In our ideal system, an integral part of governance is that there is a learning approach that focuses on improving policy and practice in the face of uncertainty. Governance and management strategies are considered experiments. Learning in our ideal world is promoted through both structural experimentation and management flexibility (Armitage, Berkes et al. 2007). Governance, and the ability to invent, evaluate, and select alternatives, must be adaptive (Regier and Baskerville 1986; Francis and Regier 1995; Straussfogel and Becker 1996; Costanza, Low et al. 2001; Brunner, Steelman et al. 2005; Armitage, Berkes et al. 2007; Brunner 2010a; Brunner and Lynch 2010b). Under an adaptive governance regime, policy choices and interventions are treated as experiments (NRC 2009), relying explicitly on monitoring, evaluating, and terminating failed policies instead of expert-driven planning that relies primarily on science-based technology rather than trial and error (Brunner, Steelman et al. 2005).

Thus alternative experimentation in our ideal system will employ social and decision making processes that make use of *inter alia* of broad participation, rapid feedback, reliable intelligence, transparent promotion, and appropriate value trade-offs to create a process capable of coping with multiple, complex systems (Table 11). No particular set of practices or governance tools can regulate human impacts so as to guarantee a resilient and productive ecosystem. All that we can do is attempt to design a system that operates under rules that allow sufficient information to be generated over

time to enable participants to learn from their mistakes and continually adapt and improve the institutional system to operate within natural limits (Francis 1993; Costanza, Low et al. 2001; Holling, Gunderson et al. 2002; Folke, Lowell Pritchard et al. 2007; Steelman 2010; Brunner 2010a). These characteristics are many and varied, and are largely discussed in the next two sections involving the social and decision-making portions of our ideal system.

Table 11 Inventing, Selecting and Evaluating Alternatives

Traditional	Ecosystem-based Approach
Existing governance is centered on legislatively-mandated jurisdictional sectors typically concerned with one aspect of the environment spectrum and collaborative projection and problem solving are typically beyond the scope of fragmented jurisdictional limits.	Government, policy makers, and an informed public work together to create, invent, evaluate, and select alternatives in order to solve problems. Agency jurisdictional lines do not impede collaboration and focus is on problem-solving. Policy choices are treated as experiments and failures provide a chance to learn and adapt.
Industry, governance, and NGOs develop increasing entanglements and strong vested interests in maintaining the <i>status quo</i> thus change is made more difficult when there can be a redistribution of wealth and power away from existing institutions.	Broad participation, rapid feedback, reliable intelligence, transparent promotion, and appropriate value negotiation contribute to a process capable of adaptation to cope with multiple complex systems.

**Social Process**

Few would argue with the fact that humans are involved in ecosystem health and resilience. Individual behavior expressed singly or through groups and institutions defines how natural resources are used, misused, exploited, controlled, conserved or restored. Social process gives us a way to map, often roughly, the interaction of people

and institutions as they influence the actions, plans, or policies of others, even if there is no awareness of the existence of one another:

The interaction of every individual and organized interest in society – in other words, the social process – constitutes the context of every resource problem, and neither the problems nor the decision-making processes necessary to solve them can be understood unless their context is known (Clark 2002, 32)

Thus this study attempts to map the basics of the social process participants and factors at work in each of the case studies. In addition we need to be cognizant that every participant in the use of resource services and every player with a potential say in the governance of the human activities that impact the ecosystem employs strategies in order to pursue particular values and/or outcomes. Typically, as people seek to improve their well-being by acting in ways that they perceive will leave them better off than if they had acted otherwise, they are engaged in an interplay of human value trade-offs. Generally no amount of “cold, hard facts” collected by “neutral objective” scientists, no amount of “education,” or “transparency” can completely neutralize basic inherent value differences or perceptions among people. Certainly, however, this realization should not take away from the fact that there are common interests and the need to attempt to clarify and secure them (Lasswell 1971; Clark, Willard et al. 2000; Clark 2002).

In order to examine the social process components in our ideal system, we will use the elements set forth by the policy sciences framework described in Chapter II as a guide. We will, therefore, examine the social process of our ideal system by asking the questions: Who should be participating? With what perspectives? In which situations?



Using what strategies? With what outcomes? And with what effects (Clark, Willard et al. 2000; Clark 2002)?

Participants. In the traditional governance scenario, a key aspiration for proponents of efficiency and scientific management is to use the latest scientific knowledge and expert, disinterested personnel. As we have seen, the key participants in traditional resource management are experts and scientists, with government relying upon their divination and implementation of the best available science (Berkes, Colding et al. 2003; Brunner, Steelman et al. 2005; Fiorino 2006) Further, pressure groups concerned with single interests, i.e. navigation, fishing, irrigation, join with administrative agencies in charge of individual programs as well as congressional committees to defeat any attempt at an integrated approach. Conservation and environmental groups also join in the policy process often belatedly and usually in a single-interest context (Brunner, Steelman et al. 2005) Courts are participants in traditional natural resource management to resolve conflicts (Fiorino 2006). Thus top-down, command-oriented, fragmented natural resource and environmental policy management are the rule in traditional governance (Weber 2003).

In any ideal ecosystem management regime (Table 10) there must be an expectation or at least the opportunity for meaningful participation and input of a broad segment of the regulated population in decision making processes (Costanza, Norton et al. 1992; Pauly and Maclean 2003). Significant, meaningful public participation is required (Becker 1993; Cortner and Moote 1999; Jackson 2005). Participation must be open to almost any person or group with a significant interest in the issue (Brunner, Steelman et al. 2005). Regulatory agencies must participate in coordinated and integrated

fashion and allow softer local and regional input into governance (Regier and Baskerville 1986; Berkes, Colding et al. 2003; Folke, Lowell Pritchard et al. 2007). Citizen involvement and partnership designed to build “civic science” is needed, not public information programs to inform passively (Gunderson, Holling et al. 1995). Better governance and enhanced accountability can come through grass roots ecosystem management i.e. the ongoing, collaborative governance arrangement in which inclusive coalitions of the unlike (citizens, government regulators, small businesses, environmentalists, commodity interests, and others) come together to resolve policy problems affecting the environment, economy, and communities of a particular place (Weber 2003) (See Table 12).

Table 12 Participants

Traditional	Ecosystem-based Approach
<p>Governance relies chiefly on “impartial” scientists and experts to determine the best available science to address (or develop plans) concerning natural resource use. Pressure groups participate typically on single issues of importance to their specific values and strive to defeat integrated approaches. Public informed, if at all, through passive public information programs.</p>	<p>Significant, meaningful public participation is required. The expectation is for significant meaningful participation and input of a broad segment of the affected population in decision making processes. Participation must be open to almost any person or group with a significant interest in the issue. Active outreach to develop citizen involvement and partnerships and build “civic science” base</p>
<p>Top-down bureaucracies are the chief means of enforcement of uniform rules and regulations</p>	<p>Regulatory agencies must participate in coordinated and integrated fashion and allow softer local and regional input into governance.</p>

Perspectives. Since each participant in a policy process will have a different way of viewing any policy issue it is important to try to understand the perspectives of participants in order to help understand the differences and similarities in the quest to

clarify and secure common interests. Perspectives are manifested through identity, expectations and demands (Clark, Willard et al. 2000; Clark 2002).

Identity, frequently shaped by myth, is at the center of a participant's perspective. "Conservationist" or "libertarian" are expressions of identity and overall can represent a rather stubborn pattern of behavior which can be studied and anticipated when common interests are sought. Parochialism, or a narrow, close-to-home outlook on the world, has diminished a bit over time and now is basically seen as a barrier to the development of cooperative solutions to problems. Parochialism may be contrasted with universalism, which encompasses a broader, more encompassing view that takes into account the experiences of all humanity (Clark 2002).

John Dryzek (2005) helped to shine some light on perspective in the context of complex environmental issues when he developed and defined a series of discourses which attempt to characterize the perspectives that people and organizations view the environment. A discourse is essentially a shared way of looking at the world. It enables those who prescribe to a particular discourse to convert information into a form understandable to them. Each discourse has its own philosophy, and proponents share assumptions, judgments and positions, creating their own version of reality after filtering information through the filter of their discourse. A discourse may further be classified with respect to its positions on economic growth and development (or industrialism), the nature and manner of environmental problem solving, the motivation and identity of the chief decision makers in the discourse, and the metaphors the discourse uses to convince others of the correctness of their positions (Dryzek 1997). Dryzek labels the various discourses. For example, the Promethean discourse views natural resources as

inexhaustible. Those that adhere to this discourse believe that humans have the ability to develop technology to solve any problem presented to them, including environmental problems. In fisheries management issues, for instance, I would expect a Promethean to believe that the ocean would supply an inexhaustible supply of fish for the world. Should facts indicate otherwise, Prometheans might then offer that aquaculture could raise the necessary fish while oceans systems recover to be fished another day (Dryzek 1997).

Another one of Dryzek's discourses pertinent to this study is Administrative Rationalism, or as it has been called, the "Leave it to the Experts" discourse (Dryzek 1997, 75). This description is apt. Administrative rationalists believe that environmental problems, and other societal ills and issues, should be left to experts: scientists, experienced policy managers and others of a similar stature to manage. The repertoire of administrative rationalism includes the professional resource-management bureaucracy that makes decisions and implements "natural resource management" responsible for the oversight, use and coordination of natural resources (Dryzek 1997, 76). Natural resource management does not take place in a vacuum in an administrative rationalism discourse, and politics can worm its way into scientific or technical management, "especially the influence of extractive industry," but administrative rationalism provides a public justification for its positions regardless of the accuracy of the avowed justification (Dryzek 1997, 77). Pollution control bureaucracies (generally media specific) are an indicator of administrative rationalism.

In Dryzek's (2005) view, when classifying an entity as administrative rationalism it is likely that there will be a government more concerned with rational management in the service of a clearly defined public interest using the best available expertise than it is

with democracy. Scientists and other experts will solve the problems. Thus technical experts and managers have a greater say in government decisions than anyone else. The motivation of the experts is generally assumed to be one of public interest.

As was discussed in chapter 2, administrative rationalism folds the scientific management paradigm into a discourse or shared way of looking at the world: Scientists and experts from many different fields working to solve a problem for the benefit of the ecosystem and those who rely upon its products and services. Dryzak (1997) notes that the only thing that spoils ecosystem management by experts is politics. Politicians, to an administrative rationalist, are not to be trusted with issues on an ecosystem scale, for politicians have a short term horizon (the next election), lack the patience to learn, and do not have the willingness to tolerate failure for the sake of learning (what we would call adaptive management) (Dryzek 1997).

While administrative rationalism parallels the model of scientific administration by marginalizing public input and delegating decisions concerning ecosystem issues and conflicts to experts, bureaucracy, and scientists, Dryzek (1997) suggests another discourse that more closely resembles our general understanding of a more holistic, ecosystem-based perspective to governance.

Democratic pragmatism, or “Leave it to the People,” is a discourse that is “...characterized in terms of interactive problem solving within the basic institutional structure of liberal capitalist democracy” (Dryzek 1997, 99). The term “democratic” is used in the title of the discourse to refer to a way of approaching problems in a broad-based problem-solving manner. “Pragmatism” has two intended connotations. The first signifies a practical view of the world. The second refers to the pragmatist philosophies

of William James, John Dewey and others who believed that solving complex problems in an uncertain world required a rational approach; more specifically, problem solving in life as in science – through experimentation.

Thus democratic pragmatism, like our ideal ecosystem-based approach to governance, relies upon expanded use of local knowledge since knowledge that is centralized in the hands of any individual or centralized administrative structure is typically incapable of solving environmental problems with significant complexity. Problem solving therefore becomes a flexible process involving a broad array of participants and cooperation across a variety of perspectives, creating an “...essential congruence between the demands of rationality in social problem solving and democratic values” (Dryzek 1997, 100).

The discourses described by Dryzek (2005) represent more than an intellectual exercise. They represent positions, beliefs, and actions that help define and delineate the views that people hold that are pertinent to the manner in which policy decisions impacting human activities that affect the environment are made. The discourses also provide a list of possible indicators that help us to understand whether an existing governance system is moving toward democratic pragmatism, or an ecosystem-based approach to governance, or whether indicators are telling us that we are stuck in the traditional scientific management paradigm represented by the administrative rationalism discourse.

In sum, the traditional paradigm, that we can somehow continue to optimize components of a system in isolation of the rest of the system, is proving inadequate to deal with the real world’s dynamic complexity. The more those elements of an

ecosystem are optimized for some specific goal, the more that resilience is diminished. Thus the drive for efficiency, or business as usual, effectively makes the total system more vulnerable to shocks and disturbances (Gunderson and Holling 2002; Walker and Salt 2006). Reliance on the remnants of scientific management results in reliance upon science, or even the “best available science.” The traditional quest for scientific justification is emblematic of perspectives that are driven by opposing views that proffer tailored “science” that support their policy views (Brunner, Steelman et al. 2005; Fiorino 2006). The role of science is viewed as the provider of data needed for litigation (Gunderson, Holling et al. 1995).

Perspectives under an ideal ecosystem-based approach to governance requires a governance structure that looks to find common ground on policies that advance common interests (Brunner 2002). One common interest in ecosystem-based governance is to enable management to focus on the natural processes necessary to sustain ecosystem structure and function while recognizing the need for human and institutional involvement at every level of the ecosystem (Sutinen, Clay et al. 2000). The common interest of maintaining and supporting ecosystem integrity should outweigh parochial interests in preserving bureaucratic turf or command and control hierarchy. In addition, the perspective necessary for ecosystem-based governance should be more universal and open to new ideas and experimental approaches rather than parochial and institutionally resistant to innovation. Problem solving should be viewed as a flexible process with broad participation and a variety of perspectives and should be cognizant that environmental, social, and economic systems are related with problems that overlap and need to be approached with a concern for human dignity and a respect for democratic

values (Dryzek 1997). Finally, perspective involves more than governance but extends to the expectations and demands of people (See Table 13). In an ideal world, citizens would have the knowledge necessary to adopt collective, community-oriented values instead of the selfish materialism of consumer values (Dryzek 1997; Clark 2002).

Table 13 Perspectives

Traditional	Ecosystem-based Approach
Traditional perspective loses sight of the common interest as politics and policy have evolved to favor the special or single interests over the common good.	Perspective requires a governance structure that looks to find common ground on policies that advance common interests. In addition, the perspective necessary for ecosystem-based governance should be more universal and open to new ideas and experimental approaches rather than parochial and institutionally resistant to innovation.
Scientists and other experts will solve the problems. Technical experts and managers have a greater say in government decisions than anyone else.	Problem solving should be viewed as a flexible process with broad participation and a variety of perspectives and should be cognizant that environmental, social, and economic systems are related with problems that overlap and need to be approached with a concern for human dignity and a respect for democratic access.
Legislative and regulatory perspective promotes policies and enforces rules dedicated to the controlled exploitation of natural resource sectors and components for human consumption or use even at the risk of permanent harm to the natural processes of the ecosystem that produce the desired resources.	Common interest in ecosystem-based governance is to enable management to focus on the natural processes necessary to sustain ecosystem structure and function while recognizing the need for human and institutional involvement at every level of the ecosystem. The common interest of maintaining and supporting ecosystem integrity should outweigh parochial interests in preserving bureaucratic turf or command and control hierarchy.

Situations. Inquiry into this task helps to tell us about the situations in which participants – armed with their perspectives – make value demands on each other which affect ecosystem functions and services. Participants in an ecosystem governance



process may interact in formal or informal settings, on a number of levels, and regularly or only during crises. Thus the examination of the situations in which participants interact may temper elements depending upon how often the participants interact. It may also have spatial issues determined by the geographic boundaries represented by the participants. There may be institutional issues that depend upon the degree that power is centralized or decentralized in the region and whether regimentation is increasing or decreasing. Finally the issue is whether it takes a crisis for participants to mobilize participants to alter their perspectives and discourse-related practices in order to resolve the crises (Clark 2002).

In terms of actions between government and stakeholders or participants, traditionally participants interact in situations where there is an adversary relationship – government acting to stop or limit economic or social activity because of environmental issues (Fiorino 2006). As we have seen, crisis in the form of collapse or surprise is generally the driving force behind interaction. Traditionally, success controlling an ecological variable that normally fluctuates leads to reduced resilience. Surprise is the result. Crisis, conflict and gridlock emerge when:

- There is a single target and piecemeal policy
- A single scale of focus, typically short term and local
- No realization that all policies are experimental
- Rigid management with no priority to design interventions as ways to test cause and effect assumptions
- Pathology increases when reaction to conflict is to demand more data or more precision in data along with more certainty and more

control of information and individuals (Gunderson, Holling et al. 1995).

In an ideal system, on the other hand, government acts less *on* other actors and more *with* other actors in a collaborative and communicative way to understand and address problems. There is more frequent, collaborative contact. Thus government would require less of the state exerting control over others in society and more of an interaction among them (Fiorino 2006). Decision-making and other collaborative processes are iterative and ongoing, not simply single-play problem-solving efforts (Weber 2003).

The pathology of the *status quo* is broken when the issue is seen as a strategic one of adaptive policy management, of science at appropriate scales, and of understanding human behavior, not a procedural one of institutional control. It requires:

- Integrated policies, not piecemeal
- Flexible, adaptive policies, not rigid, locked in ones
- Planning and management for learning, not simply for economic or social product
- Monitoring designed as a part of active interventions to achieve understanding and to identify remedial response, not monitoring for the sake of monitoring or purely for enforcement purposes
- Investments in “eclectic” science, or science on a broad-range of topics, not just focused, controlled science
- Citizen involvement and partnership, not public information programs to inform passively (Gunderson, Holling et al. 1995).

In our ideal system, the situations in which participants would interact would in order to avoid collapse, surprise, or gridlock, might have the following characteristics in common:

- Frequent collaborative interaction between government and more local resource users and the general public.
- Interactions between government and participants at local and regional levels.
- Situations should be informal and formal, with agencies willing to be used as resources for local involvement (Table 14).

Table 14 Situations

Traditional	Ecosystem-based Approach
<p>Interactions typically occur in adversarial situations when government acts to stop or limit economic or social activity because of environmental issues. Inspections, citations, enforcement and litigation typify the contentious situations.</p>	<p>Collaboration, communication and cooperation between government, stakeholders, and the public allow for governance that works more <i>with</i> participants than <i>on</i> them. This means more frequent collaborative interaction between government and participants at all levels. Further, agencies need to be less geared toward enforcement and more willing to be used as resources for local involvement and for solving problems where they arise.</p>
<p>Other interactions limited to situations called for by legislation or regulation that requires public hearings in order to passively inform the public and/or solicit public comments on plans that have largely been drafted by or left to the discretion of government scientists and experts.</p>	<p>Decision-making and other collaborative processes are iterative and ongoing, not simply single-play problem-solving efforts. The need for passive formal public and adversarial public hearings can be reduced through citizen involvement and partnership, not just public information programs to inform passively.</p>

**Base Values.** The concept of values is key to an understanding of how people interact. Values are the medium of exchange which people strive to gain while they use values or expend assets to gain them. Thus interactions between people, institutions, agencies, and others involve the gain and loss of values. It is this interpersonal and/or transactional tug-of-war of values that anyone interested in solving policy problems need

to take into account (Brewer and deLeon 1983; deLeon 1988; Clark 2008). Indeed environmental policy disputes are almost always "contests over values" despite the fact that they are often masked in economic or environmental jargon or appear to revolve around technical issues (Layzer 2006).

What assets or resources do participants use in their efforts to achieve their goals? What do they bring to the table? All values, including authority, can be used as bases of power. What assets or resources should participants use to achieve their goals? The Policy Sciences Framework suggests these include:

*Power* is to make and carry out decisions

*Enlightenment* is to have knowledge

*Wealth* is to have money or its equivalent

*Well-being* is to have health, physical and psychological

*Skill* is to have special abilities.

*Affection* is to have family, friends, and warm community relationships

*Respect* is to show and receive deference

*Rectitude* is to have ethical standards

Choices on ecosystem uses and stresses will turn on values. Whose values? The answer is probably very different depending upon whether one is looking at the current governance regime vs. our ideal system.

Traditional regulation was frequently based on a zero sum mentality – i.e. that the interests of private economic interests in the business community inevitably conflict with the broader economic interests of society. Business firms are often viewed as “amoral calculators” with a commitment to economic gain above all over values. Thus the old

approach was that regulation had to use a blunt hand consisting of legalistic and deterrence-based regulation in order to effectively change industry behavior (Fiorino 2006).

The behavior of US federal and state agencies is often strongly influenced by industrial interests and a desire to minimize or avoid loss of values such as power, wealth (i.e. funding), and respect. In decisions involving potential adverse effects on important industries (e.g. fishing in New England), agency value losses include decreased budget allocations from unsympathetic legislatures so the costs of making decisions that adversely affect various industries are often perceived as too great to risk. Agencies rely on the support of elected officials and support is often tied to the satisfaction of those officials with the agency's contributions to or lack of interference with local or regional gains. Backlash against strong conservation methods that may impact economic productivity can be severe even at a local level (Wallace 2003). As Wallace (2003) found when he reviewed the efficacy of efforts to preserve marine mammals under the Marine Mammal Protection Act in the United States (MMPA 1972), values have a strong impact on interrelated social factors impeding the cultures of participating organizations from adopting measures that would protect marine mammals in a meaningful fashion:

The role of values in the behavior and interactions of program participants, the quality of agency leadership, and communication skills and strategies influence decision-making in every stage of the policy process. Even where biophysical data strongly influence decision-making, the case studies indicate that leadership, communication strategies, and values had a profound effect on decision-making (Wallace 2003, 112).

In contrast to the traditional model of resource management which reduces agency and institutional (public institutions and private business interests) behavior into a

constant quest for power and wealth as capital for the purchase of other values, the policy sciences approach has consistently been focused on the intelligence relevant to an integration of values derived from interpersonal relations which prizes not the glory of a depersonalized state or the efficiency of a social mechanism, but human dignity and the realization of human capacities” (deLeon 1988, 37 - 38) Thus in an ideal society:

...citizens enjoy a full range of values, a state that has also been called ‘a commonwealth of human dignity.’ A healthy society is possible only when citizens enjoy a level of all eight values satisfactory to their needs (Clark 2008, 45).

In order to begin to achieve the kind of society described above, governance must move away from its administrative rationalist underpinnings. Speaking broadly, the values of power and wealth should be utilized to press demands for common interests of human dignity, ecosystem integrity and resilience (Holling 1995; Holling and Gunderson 2002a; Berkes, Colding et al. 2003). Knowledge (enlightenment) should be a goal that, as we have seen, is ideally gained from a variety of sources through a process of trial and error as much as through traditional experimental science (Brunner and Steelman 2005). The bottom line is that we need to move beyond the traditional approach that values power and wealth as interrelated ends in themselves:

Rosa Parks’ refusal to move to the back of the Birmingham bus released the flood gates of the civil rights movement, not because she was powerful, but because her act symbolized and tapped the deprivation of respect felt by millions of others like her. Many other sympathetic values were certainly involved, and later decisions sought to allocate them more equitably than before. Power and wealth were not sought as ends nearly so much as they were used as means to acquire access to other values: respect (non-discrimination in jobs and housing), skill (job training and educational opportunities), well-being (nutrition and health programs), and

rectitude (realization of long-denied constitutional guarantees and simple recognition as fellow human beings) (Brewer and deLeon 1983, 16).

While transitioning to a broader and more collaborative governance process is different from the genesis of the civil rights movement, there are similarities given how society must adjust the priorities of our personal and institutional values. The characteristics of an ideal ecosystem approach to governance demand a heavy reliance on significant public participation, collaboration, resilience, and learning through trial and error. The values necessary for the implementation of an ecosystem-based approach must move away from the traditional goals of power and wealth as ends in themselves. In order for implementation of an ecosystem-based approach to governance to have a chance there needs to be much more emphasis on utilizing power and wealth to obtain stronger inputs from the values of knowledge, rectitude, well-being, and respect. A trial-and-error approach to management solutions, for example, requires a strong commitment to the gathering and sharing of knowledge together with an ability to acknowledge failures without the fear that funding will be lost. In addition, collaboration and significant public participation will require a focus on the values of respect, affection, rectitude and well-being. There is simply no way to gain the trust, credibility, and respect necessary for problem-solving and planning collaboration and public and broad-based community support without a shift more in the direction of these important values.

Thus our ideal system (Table 15) must be characterized by resource sharing and collaborative efforts designed to bring a broad base of the public and regulated interests together with regulators to share ideas, develop knowledge, and gain mutual respect to

identify goals, threats to those goals, and possible actions to take in order to preserve and restore ecosystem resilience.

Table 15 Base Values

Traditional	Ecosystem-based Approach
<p>Traditional approach values power and wealth as interrelated ends in themselves.</p>	<p>The values of power and wealth should be utilized to press demands for common interests prioritizing human dignity, ecosystem integrity and resilience. Knowledge (enlightenment) should be a goal that is ideally gained from a variety of sources through a process of trial and error as much as through traditional experimental science.</p>
<p>Agency and institutional (public institutions and private business interests) behavior is essentially a constant quest for power and wealth as capital for the purchase of other values or the preservation of existing power and wealth, e.g. Agency turf or budget, private corporate profits, non-profit organizations donations and prestige. Other values are too often secondary.</p>	<p>In order for implementation of an ecosystem-based approach to governance to have a chance there needs to be much more emphasis on utilizing power and wealth to obtain stronger inputs from the values of knowledge, rectitude, well-being, and respect</p>

Strategies. There are various strategies that people and institutions may employ in order to pursue their values. The four basic strategies that will be included in this study are:

- *Diplomatic strategies* which use communication among and between the leaders of any group or agency to foster collaborative opportunities to problem solving which engage the multiple interests concerned;



- *Ideological strategies* that involve communications to a public that is wider than just leaders or heads of agencies and include public talks, newspaper and other mass media appeals and, in the extreme, propaganda;
- *Economic strategies* that consist of practices that rely on the production and distribution of goods and services. Boycotts and labor actions are included in economic strategies (Clark 2002), and
- *Litigation* which in this study is defined as disputes that are submitted for binding resolution by a third party<sup>7</sup> (e.g. lawsuits and other legal action; mediated or negotiated proceedings, etc.).

In the traditional governance scheme, strategies typically are built upon a regulatory format and therefore rely upon regulation using economic or social intervention to force compliance with uniform rules. Where this intervention fails, litigation provides the remedy (Fiorino 2006). Thus *status quo* strategies use litigation as a principle weapon in the management arsenal (Steneck, Vavrinec et al. 2004; Walker and Salt 2006). Indeed it has been noted that the United States more often relies on lawyers, legal threats, and legal maneuvering in implementing public policies and attempting to hold governmental officials accountable, not to mention other civil and criminal proceedings (Buhi and Feng 2009).

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<sup>7</sup> Most of the Policy Sciences literature sets forth four strategies, to wit: diplomatic, ideological, economic, and military deLeon, P. (1988). Advice and Consent: The Development of the Policy Sciences. New York, Russel Sage Foundation, Clark, T. W., A. R. Willard, et al., Eds. (2000). Foundations of Natural Resources Policy and Management. New Haven, Yale University Press, Clark, T. W. (2002). The Policy Process: A Practical Guide for Natural Resource Professionals. New Haven, Yale University Press.. As the military option is not typically a realistic strategy in the negotiation and resolution of environmental issues, I have eliminated military as a strategy option and added litigation which, in my experience, is a strategy of last resort employed relatively often in environmental disputes.

From the time of the nation's formation commentators like Alexis de Toqueville (2005) couldn't help but note that the American governance scheme "...entrusted huge political power to their courts..." (Gross and Dodge 2005, 120). A strong, death-grip-like reliance upon lawyers, judges, and the rule of law most likely stems from two different and powerful elements: "first, a *political culture* (or set of political attitudes) that expects and demands comprehensive governmental protections from serious harm, injustice, and environmental dangers – and hence a powerful, activist government – and second, a set of *governmental structures* that reflect mistrust of concentrated power and hence that limit and fragment political and governmental authority" [emphasis original] (Buhi and Feng 2009, 15).

America's obsession with litigation as a first-line strategy, however, does not stem from any unique genetic or social/culture predisposition to "litigiousness:"

Rather, American adversarial legalism arises from political traditions and legal arrangements that provide incentives to resort to adversarial legal weapons. Such weapons are used far less frequently in parliamentary democracies with different institutional mechanisms for addressing social problems. Put another way, American adversarial legalism arises from the relative *absence* of institutions that effectively channel contending parties and groups into less expensive and more efficient ways of resolving disputes, ensuring accountability, regulating business, and compensating victims of injury or economic misfortune [emphasis original] (Buhi and Feng 2009, 34).

It would appear, therefore, that the general proclivity for Americans to use adversarial confrontation or litigation as a strategy for redressing perceived wrongs and for stopping or stalling regulatory efforts to implement, or not, environmental limitations or regulations (Rosenbaum 2008), does not have to be the primary strategy. Different

approaches and some institutional change, including greater use of mediation, facilitation and other alternative dispute mechanisms can be developed and mandated.

An ecosystem-based approach, therefore, would require movement away from regulatory enforcement efforts geared toward targeted interventions at point sources and problem areas in the form of commands to different classes of firms mandating change in existing technologies or behavior (Table 14). Instead there should be a movement toward cooperation and collaboration in decisions about processes and raw materials, sustainability planning integrating environmental goals with other social and economic goals using diplomatic and ideological strategies. Certainly there will always be a need for basic rules backed by the coercive power of the state in order to keep firms in line and not give unfair competitive advantage to environmentally noncompliant firms (Harrison 1995). The point is that ecosystem-based approach governance would seek to work with the regulated public to a greater degree. This might mean that technical violations that cause no harm and are no threat can be overlooked. It might also mean that plants or industries with excellent environmental histories receive less attention than those with a history of problems. These decisions, of course, would need to be made by field inspectors and front line regulators that are well-trained and capable of exercising the discretion necessary to implement a more flexible regulatory approach.

The presence of a *bridging organization* that connects and navigates the interests of different stakeholders as well as across organizational levels should also be integral part of adaptive governance of social-ecological systems. Bridging organizations have become increasingly necessary as realization grows that conventional science is no longer adequate to deal with the nonlinearity and complexities inherent in the management of

activities that impact the environment (Ludwig, Hilborn et al. 1993; Reid, Berkes et al. 2006). The Quincy Library Group, Henry's Fork, and the Applegate Partnerships, discussed elsewhere, are examples of the creation of multiple interest bridging organizations created to fill contentious management gaps existing in traditional management laws and practices (Berkes, Colding et al. 2003; Reid, Berkes et al. 2006; Folke, Lowell Pritchard et al. 2007; Armitage and Plummer 2010; Brunner 2010a). Farther to the north, a diverse group of interested parties came together to form the Arctic Borderlands Ecological Knowledge Co-op in order to buttress traditional science with local knowledge and to monitor and assess ecosystem changes in the traditional range of the Porcupine Caribou herd – a range that transcends the political border between the Canadian Yukon Territories and the U.S. state of Alaska (Arctic\_Borderlands 2012). The bottom line is that it is increasingly evident that knowledge is contextual and that there has been space created for considering other systems of knowledge in scientific assessments, including political inputs, values, worldviews, and other options that need to be recognized, negotiated and resolved (Reid, Berkes et al. 2006).

Such organizations provide social incentives by rewarding and creating space for collaboration, value formation, and innovation. The collaboration that bridging organizations initiate is *strategic*; conditional on the goals to enhance the values from the ecosystems (Hahn, Schultz et al. 2008).

In the final analysis (Table 16), strategies in an ecosystem-based approach should be more goal-oriented and should have institutions and processes that enable and

incentivize more diplomatic and ideological strategies and discourage the use of more adversarial and/or litigious strategies.

Table 16 Strategies

Traditional	Ecosystem-based Approach
Strategies typically are built upon a regulatory format and therefore rely upon bureaucratic regulation and enforcement using economic or social/punitive intervention to force compliance with uniform rules.	Strategies are more directed toward ideological and diplomatic practices. An ecosystem-based approach would rely more on ideological and diplomatic strategies, moving away from regulatory enforcement efforts geared toward targeted interventions at point sources and problem areas which take the form of commands to different classes of firms mandating change in existing technologies or behavior. Instead there would be cooperation and collaboration in decisions about processes and raw materials, sustainability planning integrating environmental goals with other social and economic goals.
Thus <i>status quo</i> strategies use litigation or the threat of litigation as the principle weapon in the management arsenal	Litigation will play a role as there is a need for basic rules to be backed by the coercive power of the state in order to keep firms in line and not give unfair competitive advantage to environmentally noncompliant firms. Litigation would, however, rely more upon alternative dispute mechanisms, including facilitation and mediation.
Citations and enforcement are fragmented under an array of bureaucracies at various levels (local, state, provincial, and federal). Compliance can be confusing and costly and may not be consistent with overall goals.	The existence of a <i>bridging organization</i> that connects and navigates the interests of different stakeholders across organizational levels should be integral part of adaptive governance of social-ecological systems. Such organizations provide social incentives by rewarding and creating space for collaboration, value formation, and innovation. The collaboration that bridging organizations initiate is <i>strategic</i> ; conditional on the goals to enhance the values from the ecosystems

Outcomes. Outcomes, generally short-term but may be medium or long-term as well, are the culminating events measured in terms of values that may be seen as indicative of progress, or not, depending on the perspective of the participants. Outcomes

may take the form of changes in process, or institutions, which, at least in terms of a transition to ecosystem-based governance, indicate movement toward the creation and implementation of the perspectives and institutional structures that are conducive to innovation and/or sustained attention to the situation of concern.

In terms of our ideal system, progress would be indicated by efforts to share power with and distribute more values to a greater portion of the public. If analysis of the values set forth in our social process reveals that more power and wealth is being accumulated by fewer entities, which would reflect a negative trend to those who seek to move in the direction of a more ecosystem-based approach to governance. If, on the other hand, there are tangible efforts toward creating governance processes and structures that encourage public participation, collaboration, the mobilization of local knowledge, and more adaptable, accountable, and flexible management, then outcomes are headed in a direction consistent with ecosystem-based governance.

Thus in our ideal system (Table 17) we would simply be looking for progress on the goals of the participants. Indicators of progress might include continuous or routine conversation and sharing of intelligence through a process that can determine progress on goals. In addition, there should be a movement toward structures and processes that provide more accountability to the public and stakeholders. Another positive indicator would be signs that regulatory activities reveal that institutions are more collaborative, cooperative, and integrated as opposed to adversarial and litigious. Institutions and governance should show signs of being able to innovate and learn from their experiences with successes being scaled up to other regions and contexts.

Table 17 Outcomes

Traditional	Ecosystem-based Approach
If analysis reveals that more power and wealth is being accumulated by fewer entities it would reflect a negative trend to those who seek to move in the direction of a more ecosystem-based approach to governance.	Indicators of progress include continuous or routine conversation and sharing of intelligence through a process that can determine progress on goals. Progress also indicated by a movement toward structures and processes that provide more accountability to the public and stakeholders. Another positive indicator would be signs that regulatory activities are more collaborative, cooperative, and integrated as opposed to adversarial and litigious.
Stubborn adherence to uniform top-down bureaucratic regulation with continued adversarial strategies would be indicative of a lack of progress of transition toward ecosystem-based governance.	Institutions and governance should show signs of being able to innovate and learn from their experiences with successes being scaled up to other regions and contexts.

**Effects.** Effects represent true change. They are the long-term outcomes in terms of values, processes, and institutional innovation (Clark 2002). The characteristics of ecosystem-based approaches to governance are set forth earlier in this chapter and provide us with a shopping list of goals at which to aim. Outcomes would be changes in governance that help to develop and implement those characteristics.

In essence, *effects* developed for our ideal system would include innovative measures that would transforming current governance entities and create new or modified value institutions that get beyond scientific management and strict command and control hierarchy of bureaucracy using local input and collaborative processes (Brunner and Steelman 2005; Coe-Juell 2005; Fiorino 2006; Folke, Lowell Pritchard et al. 2007). It would allow for softer and more voluntary local or regional regulation of activities that impact the ecosystem consistent with community goals and national standards. Indicators

of effects that would evidence a change for the better in terms of a broader, more accountable and adaptable ecosystem-based approach we expect to effects that would foster greater respect and cooperation between regulators and regulated public and increased knowledge among public to understand that their actions impact the environment. There should also be evidence of a greater acceptance by regulators of public and community input and decision-making (Table 18).

Table 18 Effects

Traditional	Ecosystem-based Approach
Continuation of <i>status quo</i> governance with no or insignificant change. Existing institutions preserve values of power and wealth and there is continuation of failed policies and processes of the past – although sometimes under new names.	Transition toward a more adaptive ecosystem-based approach to governance. Innovative measures are tried that transform current governance entities and create new or modified value institutions that get beyond scientific management and strict command and control hierarchy of bureaucracy using local input and collaborative processes

The social process, and more specifically the outcomes and effects analyzed within the social function, are necessarily dependent upon the problem orientation and decision process functions. An examination of the effects element of the framework assures that we do not neglect to look at the overall changes and cumulative impacts of many changes implemented on a number of scales. With that acknowledgement of the need to assess the larger picture, we can now turn to an examination of the decision process and the characteristics that might be grounded therein in order to effectively create much-needed change and innovation designed to improve existing governance.



## **Decision Process**

It bears repeating at this juncture that the purpose of this dissertation research is to examine the governance processes in place in the Bay of Fundy/Gulf of Maine region to determine whether existing governance has the capacity adopt a more ecosystem-based approach to the management of the human activities that impact the ecosystem. This chapter has reviewed the literature that provides a compelling basis for the conclusion that our current scientific management approaches are unable to effectively contain many of the forces that are leading to an overall degradation of the ecosystem. The comparison of the social process and problem orientation functions under traditional vs. ecosystem-based governance in the above analysis shows us that newer governance trends require the significant involvement of an educated public in governance structures that rely less on the institutional top-down enforcement of regulatory laws and more on softer and more local community efforts involving the collaboration of a broad spectrum of affected parties and other participants.

The problem orientation and social processes of the current management processes have been reviewed using the framework provided by the policy sciences (See Chapter II). In addition the framework has been used to present governance process and content alternatives in terms of the problem orientation and the social processes that society should be moving toward. In this manner a new governance regime is being proposed component-by-component. We now turn our attention to the Decision Process.

No meaningful progress can be made toward environmental sustainability may occur without an active and fully engaged public able to utilize a responsive, attentive

governance system. “[W]hether society can move toward ecological sustainability will depend on the health of our governance process” (Cortner and Moote 1999, xi) Thus notions of human dignity and a fair distribution of values are integral to the ability and willingness of a community to pitch in and become an active part of the effort to clarify and secure common interests that can lead to the restoration of our ecosystems to healthy, functional, and resilient systems that are able to sustainably supply the ecosystem services upon which humans depend for their continued survival.

Natural resource policy and management are mostly often thought of as a process of decision making. An examination of the decision process practiced in a given ecosystem governance regime requires mapping the six interlinked functions of intelligence, promotion, prescription, implementation<sup>8</sup>, termination, and appraisal. This systematic analysis can turn up flaws in the decision process that cause restoration plans to fail. Knowing how a decision process works, or doesn't work, participants can maintain good practices or correct a poorly functioning one. A decision process can be a way of reconciling or at least productively managing competing interests and policies through politics. Politics will always be with us because people seek different policies that reflect their particular, or “special”, interests. In many cases, however, as in sustainability management, people must reconcile interest differences to clarify and secure their common interests. Investigation should reveal who establishes what the common interests are or should be. In terms of ecosystem-based governance, trends can

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<sup>8</sup> The policy sciences analytical framework generally includes an examination of seven interlinked functions. For purposes of this study, I have combined the functions of invocation and application into one function: implementation. In this manner enforcement and adjudicatory functions may be analyzed together in a more meaningful and less redundant manner. This has been done in the examination of other environmental conflicts using the analytical framework. See, e.g. Clark, S. G. (2008). Ensuring Greater Yellowstone's Future. New Haven, Yale University Press.

be determined that might indicate whether intelligence (see below) data is reliable and linked to the appropriate scales within an ecosystem, whether such intelligence is being communicated to policy makers in a meaningful manner and, ultimately, whether a structure exists that allows for decision makers to react to intelligence in an adaptive fashion. Note that ecosystem-based governance requires a decision process that is open and transparent, not slanted toward special interests and power (Clark 2002). In terms of ecosystem-based governance, trends can be determined that might indicate whether intelligence data is reliable and linked to the appropriate scales within an ecosystem, whether such intelligence is being communicated to policy makers in a meaningful manner and, ultimately, whether a structure exists that allows for decision makers to react to intelligence in an adaptive fashion, and whether there is impartial third-party appraisal of existing policies that will permit participants to adapt or even terminate programs. Note that ecosystem-based governance requires a decision process that is open and transparent, not slanted toward special interests and power (Clark 2002).

Intelligence. Intelligence is the process of obtaining and processing information and making it available to decision makers, stakeholders, members of the public, and others (Clark 2002). It involves the generation of knowledge, the transmission of knowledge, the use of knowledge, and the effects of knowledge on the policy process. Knowledge relevant to environmental decision making may be generated by scientists as well as local knowledge. It may also come in the form of public preferences, i.e. beliefs and priorities that give clues to the support of or opposition to given choices or outcomes and the intensity of those positions. In other words, what groups are for or against a

proposed policy and how much power do they have to influence the outcome (Ascher, Steelman et al. 2010).

Earlier in this chapter there was discussion centered on the idea that our current *status quo* of limiting the process of gathering of intelligence largely to scientists and other experts who then confine transmission of research and data to members of their own discipline needs some improvement. Knowledge disseminated through peer-review processes may help to ensure some measure of reliability and assurance of rigor, but there are also distributional consequences that have the effect of screening out knowledge that policymakers should take into account (Ascher, Steelman et al. 2010).

As opposed to the traditional way of dealing with the gathering, transmission, and processing of intelligence, new more participatory and transparent approaches may be more effective in making a difference and improving our environmental practices. Intelligence, for instance, should be comprehensive and gathered at appropriate scales in order to detect trends and changes in ecosystem resilience and function (Lasswell 1971; Gunderson and Holling 2002; Gunderson 2003; Reid, Berkes et al. 2006). Intelligence and information must then be made available to researchers, scientists and the public. In order for the public to be interested and be able to understand the data and other intelligence, significant public outreach and capacity building is required (Becker 1993). Social capacity is also characterized in terms of capital, especially social capital (trust, skills in collaboration, and conflict resolution), human capital (advancement in different knowledge systems), and cultural capital (beliefs about how people, nature, and society are related) (Fiorino 2006). Bridging organizations help bring these out, as well as help to foster collaboration between social capacity and institutional capacity (Hahn, Schultz

et al. 2008). Local groups able to inventory and sample the natural resources with results communicated to a variety of actors, including the general public, using a wide range of methods, are preferable to the kind of closed process we have now that collects and transfers knowledge only amongst a select group of peer review journal aficionados. Information, collected by a range of volunteers under the guidance of a blend of scientific and local knowledge and transferred freely provides the basis for feedback loops required for the holistic and sustainable management of complex systems (Walker and Salt 2006). Monitoring systems designed to detect the responses of both natural and social systems to intervention are critical elements of such an intelligence system.

Broader public and community involvement in the gathering and transmission of data is no longer a novel idea. There are numerous examples of collaborative groups of scientists, government agency representatives, stakeholders and the public joining forces to develop indicators, monitor conditions, and assess trends. In the McKenzie River watershed straddling northern Alaska and the Yukon, the Arctic Borderlands Ecological Knowledge Co-op, comprised of government scientists, local resource users (hunters and fishers), state and territorial government representatives, and open to participation to anyone who wishes to maintain and improve the program, has been operating since 1996. It began when a rift developed between government scientists and community representatives concerning the accuracy and value of different types of information. In the past, the same situation would be handled at meetings run by government representatives respectfully acknowledging the differences and then proceeding to strengthen the science-based approach. At a meeting in the mid-1990's the community decided to tackle the issue and developed a monitoring plan that sought to improve the

collective understanding of conditions and trends by using local observations, traditional ecological knowledge, science-based research and monitoring, as well as government records. The 1996 meeting morphed into an annual gathering with members reporting on a list of some seventy indicators. Led, but not owned, by Environment Canada, residents and scientists meet to trade information and discuss trends and conditions and make decisions by consensus on the Co-op's plans (Reid, Berkes et al. 2006).

Similarly, residents of the Applegate Valley watershed in southern Oregon lived in crisis mode for most of the 1980s due to the polarization and conflict between loggers and conservationists as a result of the spotted owl controversy. In the early 1990s, however, two unlikely collaborators in the form of a life-long logger and a staunch environmentalist began talking to one another. Their discussions planted the seed for what ultimately became known as the Applegate Partnership. This community-based partnership was comprised of representatives from industry, conservation groups, natural resource agencies, and residents whose goal was to move away from the frustrating “my opinion against yours; my expert against yours; my laws against your guidelines” dynamic that had marked historic interactions. The partnership was able to rid themselves of the “us” versus “them” mentality. Goals and a mission statement developed with the assistance and input of the public drive the partnership. Local knowledge is critically important. The partnership elected a board of directors whose nominations were based not on affiliations but on their desire to work toward solutions and put ecosystem health in front of private agendas. Their decisions and deliberations involve significant public participation, formal and informal transparency, and successfully focus on creating trust and working together to solve to solve problems and

ease conflict (Wondolleck and Yaffee 2000, 140 - 141). Admittedly the ultimate decisions on timber sales and fire suppression methods remain within the mandate of national and state laws and agencies, but the information and input from the Applegate Partnership has provided creative new ideas and methods of implementation that have provided traditional management with effective “outside the box...prescriptions” and have produced better information that “increases the legitimacy of agency decision making” (Weber 2003,115).

Many more examples exist of community partnerships that have resulted in effective and accountable governance and management with shared research and fact-finding as a pivotal element in their success. In central Michigan public monitoring is critical to efforts to save the Kirtland Warbler populations. The Eel River Delta Sustainable Agriculture Committee in Humboldt County, California, receives funding from state and federal agencies to test water quality throughout the delta in order to determine the impacts of land use to the water quality in the region. The bottom line is that by using the public and stakeholders to assist with the gathering and sharing of information, uncertainty is reduced and personal relationships among participants are strengthened while trust is created (Wondolleck and Yaffee 2000).

In sum, in an ideal system that uses an ecosystem-based approach to governance, there are common elements that we would expect to find in terms of the use of knowledge and the gathering of data and information relevant to ecosystem and socioeconomic conditions (Table 19). In the first place we would expect to find that intelligence relevant to the goals of the community is being collected for all relevant components of the ecosystem and from all affected people regardless of political borders.

Intelligence must come from a broad array of participants that includes information from scientists, academics, the regulated public, and the public at large. Intelligence must then be communicated to appropriate institutions for analysis and coordinated action. There is reliable monitoring and intelligence matched in scale to the multiple scales of the ecosystem. Intelligence is communicated to an accountable entity, i.e. a person, partnership, or other entity that has an obligation or responsibility to an authority, group, standard, mandate or behavior norm *external* to that person or entity (Weber 2003). Finally there should be overlapping governance structures that enhance the resilience of social shocks and adds to the resilience of adaptive governance (Berkes, Colding et al. 2003; Gunderson 2003; Walker, Gunderson et al. 2006)

Table 19 Intelligence

Traditional	Ecosystem-based Approach
Intelligence function, including selection of data to be collected, data collection, monitoring, and analysis is the responsibility of experts and scientists within various government agencies with fragmented jurisdictions.	System is facilitated by identification of intelligence needs and enabled by cooperative agreements among relevant entities to assure reliability, compatibility, timely analysis and accessibility. Intelligence must come from a broad array of participants that includes scientists, academics, the regulated public, and the public at large.
Information is kept within agency or department that collected and analyzed the data or information and access may be provided through data base or publication. No bridging organization exists to view the "big picture" and detect adverse trends or make policy changes as a result of trend data.	Intelligence must be communicated to an accountable entity for analysis and coordinated action, i.e. a person, partnership, or other entity that has an obligation or responsibility to an authority, group, standard, mandate or behavior norm <i>external</i> to that person or entity. Intelligence and information must be made readily available to researchers, scientists and the public.
Information and analysis largely communicated through publication in peer-review publications. Public and community have limited access to information and data. Public generally uninformed unless or until there is a crisis or "surprise."	In order for the public to be interested and be able to understand the data and other intelligence, significant public outreach and capacity building is required.



Promotion. The gathering of intelligence utilizing a broad spectrum of participating entities collaborating at a variety of scales within an ecosystem is vitally important. But what should happen to that information? How should it be used and by whom in order to decide upon the policy options that will best be able to achieve the goals of the community?

Promotion, sometimes called estimation, involves the function of recommending and mobilizing support for policy alternatives and serves to define and even limit the possible solutions to a problem. Thus promotion involves the development and analysis of alternatives as well as the subsequent efforts to win support and enthusiasm for collective action necessary in most cases to achieve needed change. Promotion necessarily includes political parties, lobbyists, pressure groups, people, and powerful organizations of all types (including business and environmental groups) working to shape and share values (Clark 2002; Clark 2008). While confusing and often frustrating, democratic promotional outcomes that add “agitational intensity to the dissemination of a value demand”, are nonetheless preferable to the totalitarian alternative of placing promotion exclusively in the hands of a single party that monopolizes and controls debate (Lasswell and MacDougal 1992, 29).

It is difficult to get around the reality that promotion, or the generation, transmission, and use of knowledge, not only comprise a technical process that creates and compiles scientific and local knowledge, but also a political process. Politics is part of the deal and can be a process that establishes goals to be implemented by policy.

Certainly there is a significant concern that special interest or selfish politics intrudes on the policy process with disappointing regularity. Healthy politics, however, that includes “policy relevant science, pertinent local information, constructive public involvement, and conflict resolution – can serve to clarify and secure the common interest in knowledge generation for environmental decision processes” (Ascher, Steelman et al. 2010, 8). There should be open, honest debate about what to do. Further, the decision process provides “a means of reconciling (or at least managing) conflict through politics in order to find a working specification of a community’s common interests” (Clark 2002, 57).

Promotion under an ecosystem-based approach to governance differs markedly from the traditional expert-driven planning model that relies almost exclusively on science- and expert-based technology. Under the traditional view, only experts are qualified to make and implement sound management plans. Promotion is done by bureaucracies – bureaucracies that are also responsible for enforcement of uniform rules and regulations (Fiorino 2006).

The alternative under an ecosystem-based approach would require the development of processes of promotion designed to get to the common interests over special interests. This will include strong public education and outreach followed by open debate about policy choices. Community-based initiatives can compensate for the limitations of bureaucracies.<sup>9</sup> This is very different from the notion that agency experts

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<sup>99</sup> One example of a community-based initiative currently in use is the Exeter River Dam Removal Study Process. This is a local initiative consisting of a working group with direct oversight of the study of the removal of the Exeter River Dam. It is a joint effort among local, state, citizens, federal agencies and other bureaucracies to determine whether the dam Exeter dam should be removed and the natural, social, and economic impacts of removal vs. non-removal.

formulate plans in order to solve problems. Further, social and cultural memory must be mobilized by developing links between key persons and providing a direction for adaptive governance. This can effectively build social capacity and therefore build resilience in social-ecological systems (Berkes, Colding et al. 2003). Further, the development of social networks can play a key role in giving practitioners the chance to develop support, *trust*, and sharing of lessons learned which can facilitate processes of change at multiple levels (Hahn, Schultz et al. 2008).

Social memory or the captured experience with change and successful adaptations embedded in a deeper level of values is actualized through community debate and decision-making process into appropriate strategies for dealing with ongoing change. Importantly, it links past experiences with present and future project and provides a foundation for modification of rules, typically referring to decadal time scales as opposed to months or a year (Hahn, Schultz et al. 2008). Social learning processes are present that link the ability of management to respond to environmental feedback and direct the coupled social-ecological system into sustainable trajectories. Social learning and memory provide context to social responses to ecosystem change, increases the likelihood of flexible and adaptive responses, and seems exceptionally important during periods of crisis, renewal, and reorganization (Berkes, Colding et al. 2003).

It is by using these ideas and methods that ranchers, state agencies, environmentalists, anglers, miners, and others were able to establish the Upper Clark Fork Steering Committee, a watershed initiative established in the early 1990s to solve a resource conflict that was headed for litigation by looking beyond traditional water management tools and fashioning a compromise agreeable to all parties (Brunner,

Colburn et al. 2002). Similarly, in 1992 environmentalists, loggers, residents, and others in Quincy, California simply lost patience with the rancor and division between environmentalists and logging interests in the community in the wake of the spotted owl decision. After numerous incidents of tree spiking, fist-fights, and finally gun shots through a local environmental lawyer's windows, a group of traditional opponents began to meet at the only location in town that was available, the public library, and ultimately agreed on a Community Stability Proposal for the management of the national forests in the surrounding area. When the plan met with disdain from the U.S. Forest Service as well as with national environmental organizations, the Quincy Library Group took their proposal to Congress and ultimately got their plan passed into law despite opposition from the Forest Service, Audubon and others (Wondolleck and Yaffee 2000; USEPA, NOAA et al. 2001). So what was the Quincy Library Group and who were the people that formed the group, negotiated an acceptable resolution, and promoted it all the way through Congress and, ultimately, to the President? Colburn (2001) described the group's composition:

The Quincy Library Group stabilized at about thirty participants after the town meeting in July 1993. They are employees of Sierra Pacific Industries and Collins Pine, county supervisors, an environmental lawyer, a biologist, a retired airline pilot, a forestry professor, moms, dads, husbands, grandparents, business owners, and more. Most are residents of Quincy, though a few live in neighboring towns. Participation is voluntary – members are not appointed by the QLG, though some members have actively encouraged others to participate. One member...took the initiative to assume the role of unofficial liaison and representative for ranchers, because the demands of raising cattle made it difficult for them to attend the meetings...(USEPA, NOAA et al. 2001, 186)

Thus a community-based initiative can work to clarify the common interest of communities embroiled in ecosystem-based conflicts or priorities through the development of a policy proposal. With persistence, community-based initiatives can build social networks that can survive to bring resilience to governance issues.

Table 20 Promotion

<b>Traditional</b>	<b>Ecosystem-based Approach</b>
Only experts are qualified to make and implement sound management plans intended to manage resources for the public good – often interpreted as for public use and consumption. Promotion is done by bureaucracies – bureaucracies that are also responsible for enforcement of uniform rules and regulations.	Promotion and politics involve honest debate using policy relevant science, pertinent local information, constructive public involvement, and conflict resolution – which can serve to clarify and secure the common interest in knowledge generation for environmental decision processes.
Special interest or selfish politics intrudes on the policy process with disappointing regularity to direct policy initiatives away from common interests toward powerful single or special interests.	Development of processes of promotion designed to get to the common interests over special interests. This will include strong public education and outreach followed by open debate about policy choices. Community-based initiatives can compensate for the limitations of bureaucracies. Further, social and cultural memory must be mobilized by developing links between key persons and providing a direction for adaptive governance. Social learning and memory provide context to social responses to ecosystem change, increases the likelihood of flexible and adaptive responses, and seems exceptionally important during periods of crisis, renewal, and reorganization.

There is another valuable lesson that can be learned from the many community-based initiatives that have been underway now for decades. Regardless of whether we are debating intelligence, promotion, prescription, enforcement, or any other of the decision process tasks, the public decision making processes should be perceived as legitimate, fair, and wise. Asking the following questions may go far in determining whether there is a perception of fairness that could enable successful initiatives:

1. *Is it Legitimate?* Is the process tied to existing law and regulation through the direct involvement of responsible officials? Does it provide for significant public review and comment opportunities for those who care about the issues but are either unable or uninterested in participating directly? If not, is it clear about how it is addressing and the topic or problem and open to the concerns of stakeholders?
2. *Is it Fair?* Does it involve credible representatives of those who will be affected by its decisions and recommendations? Is it open, accessible, and transparent so that no individual is excluded except by his or her own choice, and no decision is imposed without agreement? Finally, are decisions made so that they encourage consensus as opposed to capitulation (or at least provide acknowledgement of minority perspectives)?
3. *Is it wise?* Does the process encourage participants to focus on the problems to be solved? Does it promote creativity and flexibility? Is local knowledge used in the process? Does the process ensure that decision process ensure that decision making is consistent with scientific knowledge or highlight where it is not (Wondolleck and Yaffee 2000)?

The more of these questions that can be answered in the affirmative, the more likely it is that traditional governance can give way to more collaborative efforts that include community initiatives to solve the “wicked” problems that plague the health of our ecosystems (Table 20).

Prescription. In the prescription, or *selection*, phase, decisions concerning an appropriate law, policy, or management option are chosen. Thus the data, information,

and interests that were identified, debated and discussed in the first two phases are converted into regulatory and policy choices. The decisions in this phase result in the establishment of new rules or guidelines selected to solve a problem or deal with an environmental conflict or issue (Clark 2002; Clark 2008).

*It is beyond the scope of this study to propose a flurry of legislative and regulatory changes that need to be made in order to secure a sustainable future for the Bay of Fundy/Gulf of Maine region. I will attempt, however, to describe in broad terms the kinds of changes that need to be made if the governance that affects the region is to move in a more holistic ecosystem-based manner.*

The traditional or “old” regulatory forms of prescription were designed with a 1970s view of environmental problems; more specifically, obvious pollution from large industrial sources. Regulatory strategies that held polluters accountable through selective intervention by government based on a strategy of bureaucratic control were generally reasonable and effective tactics (Cortner and Moote 1999; Young 2002; Weber 2003). It is time, however, to move on and to recognize that environmental problems have changed to a significant degree:

*We have moved from a concern with just controlling pollution to also preventing it, reducing risk, promoting eco-efficiency, advancing stewardship, and achieving a sustainable economy and society over the long term. The environmental “problem” has continually evolved and been redefined. This means that in addition to worrying about pollution, we now want to use energy, materials, and water efficiently; design environmentally friendly products; think about the impacts of products over their life cycle; preserve habitat and species; protect the global commons; and worry generally about the effects of today’s actions on future generations (Fiorino 2006, 81).*

Thus environmental concerns today are far more encompassing than simply controlling pollution, rendering the traditional approach to regulation increasingly irrelevant to ecosystem preservation and resilience. Traditional regulation does little, for instance to address a variety of aspects of industrial performance that impact our ecosystems, including the use of energy, materials, and water. There is also little regulation over the effects of product use and disposal. This is not to say that government must intervene in these activities, but creative ways need to be found to balance the regulation using more cooperative and collaborative efforts (i.e. government must be at the table).

The political debate over the last 40 years has been polarized along two disparate lines of thought, both of which revolve around a “free market” vs. environmental regulation mentality. In short, those who champion a free market and fear the potential economic consequences that may accompany increased environmental regulation use a variety of strategies to prevent such regulation. On the other side of the debate are often those that believe that more stringent government regulation in the fashion of the traditional government approaches are necessary to prevent increased harm to the ecosystem at all scales. Our ideal system, however, promotes a different approach, another way, in which new relationships, structures, and roles are fashioned by careful planning with broad-based involvement and implemented on a trial and error basis in order to facilitate learning (Fischer 2000; Fiorino 2006).

Further, while there is little question that some form of regulation and other limitations will be necessary; society may simply not be able to afford the cost of the traditional methods of environmental regulation and enforcement. Dryzek (1997) argues



that the goals of cleaner air and water, fewer toxins and persistent organic pollutants circulating in the human environment, a future that includes environmental security, improving standards for urban, rural, suburban, and wilderness, collectively place incredible demands on traditional government. He calls it the “implementation deficit – a substantial gap between what legislation and high-level executive decisions clear will be achieved and what is actually achieved at street level” (Dryzek 1997, 82). In short, regulators working under traditional prescriptions simply cannot do everything that they are required to do under their own laws, rules, and regulations.

Despite the problems inherent in traditional government regulation, it must be made perfectly clear that the design and implementation of new prescriptions does not mean doing away with the old one. Government will always play a crucial role in regulatory matters. “The new governance arrangements are more of a supplement or complement to existing institutions than a complete replacement for them” (Weber 2003, 245). Many elements of the traditional regulatory scheme will provide a core for new initiatives. Government, for instance, will need to maintain core standards that place pressure on industry and others to continually improve performance. Further, government must have the legal authority and enforcement capability to hold participants accountable for meeting the core standards (Fiorino 2006; Armitage, Berkes et al. 2007; Steelman 2010).

New regulatory approaches, however, must transition away from the premise of the traditional regime that the regulated public will act for the common good only under threat of legal sanctions. Further, new regulation should reject the assumption that adversarial relationships are superior to collaborative ones. Although pressure on

participants must come from government and the community whenever appropriate, society must move beyond the habit of finding fault and assigning blame toward a search for solutions (Fiorino 2006).

Much of the discussion of the need for collaboration and cooperation discussed in the previous two sections are just as important for the adjustment and development of prescriptions in the future. Thus the goals of the prescription as established with significant public input should be clear. Prescriptions should then be consistent with those goals (Brewer and deLeon 1983; Clark 2002). It is far more likely that prescriptions will be consistent with community goals and norms if they are developed with procedures that integrate local knowledge and significant local participation (MilleniumEcosystemAssessment 2005a; Reid, Berkes et al. 2006; Seixas 2006).

Further, institutions created, consolidated or limited by prescription should be amenable formally or informally to integration horizontally and vertically and their jurisdictional impact should transcend political lines with mechanisms that authorize the exercise of jurisdiction throughout regional and local ecosystem boundaries (Gunderson and Holling 2002). Prescriptions should be flexible enough to allow for adaptive measures – enabling learning by trial and error. This ultimately means prescriptions should give those who enforce, apply, and review the regulations the ability to make appropriate adjustments as experience and learning develop.

Finally, standards set forth within any new prescription should allow for, or at least not preclude, the application of a precautionary approach when presented with uncertainty. The 1992 Rio Declaration specifically laid out the foundation for the precautionary approach in Principle 15:

In order to protect the environment, the precautionary approach shall be widely applied by States, according to their abilities. Where there are threats of serious or irreversible damage, lack of scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation” (UNCED 1992).

The Precautionary Approach developed out of the Precautionary Principle to deal with systems that may be slowly reversible, but are difficult to control, not well understood, and are subject to fluctuations in the environment and human values (Restrepo, Mace et al. 1999). While the United States has lagged in the implementation of the precautionary approach (Whiteside 2006), overall the United Nations has had a huge influence on the international acceptance of this concept. Not only was it given prominence in the Rio Declaration but it provided the driving force behind international agreements and, to some degree, domestic natural resources regulatory statutes (Rosenberg 2002).

The precautionary approach recognizes that the absence of full scientific certainty shall not be used as a reason to postpone decisions where there is a risk of serious or irreversible harm. However, guidance and assurance are required as to the conditions governing the actions that will be taken. Guidance and assurance are particularly needed when a decision must be made regarding a risk of serious or irreversible harm about which there is significant scientific uncertainty.

The plain language of Principle 15 highlights the need for national/international guidance. For the precautionary approach to be triggered, for instance, there must first be a situation where there is a threat of serious or irreversible damage. When that is present there must next be a perceived lack of certainty about the impact of the threat. Finally, affirmative action banning the release or preventing the harm may only occur if the

measure is “cost effective.” Who makes these decisions? How does an agency determine whether a threat has the potential for “serious or irreversible” damage? What should the guidelines be for the determination of whether a proposed measure is “cost effective?” Finally, who should bear the burden of proof for any of these issues? These are issues which must be considered by communities when they modify or adopt prescriptions.

What may make the precautionary approach unique (i.e. different from traditional risk analysis) is the notion that the burden of proof be on the proponents of any actions that might prove harmful to human health or the environment to show that the impacts will be benign, or at least that the harm caused will be outweighed by a ‘greater good’ (i.e. “reverse onus”). It still begs the question of when the actors have to submit such actions to an administrative body and what standards should apply to the decision process thereafter. One key will be the level of protection that society chooses. The threats can then be compared to society’s expressed level of protection (e.g. ranging from zero tolerance for persistent organic pollutants to some form of threshold limit values combined with monitoring and control rules with prearranged management actions in response to unanticipated monitoring results – for instance if a regulatory “total allowable catch” (“TAC”) is hit, by prior agreement the fishery shuts down).

Involvement of the public in the determination of the desired level of protection, through outreach and education, could be expanded so that transparency and full public input could give credibility to regulatory efforts. The bottom line is the need for overarching law or policy that permits the application of the precautionary approach to all relevant aspects of regulation. Guidelines and regulations developed in an agency-by-

agency fashion would have to meet certain requirements as defined by the legislation. The approach can be flexible. It could provide a “balancing of interests” approach so frequently found in law, that is, the magnitude of the threat of harm or irreversible damage would be weighed against the value to society of the actor’s planned act. The greater the uncertainty, the more conservative would be the criteria before actions are permitted. For example, the burden of proof may be difficult for industry to demonstrate that the risk of irreversible harm of the release of dioxins by the pulp and paper mills into the waters of Canada and the U.S. outweighs the social value of toilet paper that is whiter in appearance than toilet paper manufactured without the need to discharge dioxins. By the same token, the risk of genetically-modified foods might pale in comparison to the possible starvation of millions in drought-stricken and war-torn nations of Africa and Asia. Again, public input into these essentially value-based considerations is critically important.

The United States is not unfamiliar with the precautionary approach. In fisheries, the precautionary approach and its implementation have rather conveniently fallen into the hands of regulators in a manner that facilitates conservation measures and contains uniform implementation considerations. The precautionary approach has certainly been a key component in a series of binding and non-binding international agreements since Rio. These include the FAO International Code of Conduct for Responsible Fishing (F.A.O. 1995a) and the UN Agreement for Straddling Stocks and Highly Migratory Species (United\_Nations 1996). The United States is signatory to both these agreements (EPAP 1999).

The Code of Conduct integrates the precautionary approach into all aspects of fisheries management and explicitly admonishes parties that “States should apply the precautionary approach widely to conservation, management, and exploitation of living aquatic resources in order to protect them and preserve the aquatic environment.” It further emphasizes that “The absence of adequate scientific information should not be used as a reason for postponing or failing to take conservation and management measures” (F.A.O. 1995a; Restrepo, Mace et al. 1999).

In sum, the prescriptions developed and/or modified in our ideal ecosystem-based approach to governance would have a variety of characteristics (Table 20). Overall new regulations would adopt principles of social-political governance and facilitate shared responsibility and institutional arrangements that promote communication, transparency, and dialogue. The traditional “...strategies of control, commands, and deterrence, should give way to a strategy based more on incentives, learning, and accountability” (Fiorino 2006, 194). In addition strong, direct national governmental control of resources, especially living marine resources, creates a form of top-down management that makes enforcement of regulations and collection of reliable data difficult because of the resentment and resistance in the regulated community (Pauly and Maclean 2003). It’s probably time to develop prescriptions that are consistent with a broader, more informed, constituent base.

There are more specific elements that can be indicative of a movement toward a more flexible, ecosystem-based approach to governance. A few can be listed here (Table 21), but there are as many combinations and strategies as a creative society can invent. In

the first place, prescriptions should lend themselves to agency collaboration across policy sectors and jurisdictions with a focus on integrated problem-solving.

Table 20 Prescription

Traditional	Ecosystem-based Approach
Regulatory strategies that hold polluters and other environmental violators accountable through selective intervention by government based on a strategy of bureaucratic control using adversarial tools and techniques (inspections, fines, penalties, etc.)	A transition away from adversarial methods designed to punish violations toward greater emphasis on cooperation and collaboration between private and public entities to prevent pollution, reduce risk, and promote sustainability. New relationships, structures, and roles are fashioned by careful planning with broad-based involvement and implemented on a trial and error basis in order to facilitate learning
The regulated public will act for the common good only under threat of legal sanctions and adversarial strategies are the only way to affect behavior and produce positive outcomes.	Adversarial strategies and deterrence are not the only way to influence behavior. Collaboration and cooperation with partnerships designed to achieve economic goals, can promote eco-efficiency, innovation, and sustainability.
Centralized top-down command and control strategy of bureaucratic control is the best way to achieve uniform compliance.	Community and regional involvement in the development and enforcement of environmental regulations can increase learning, inform the public, and lead to greater progress towards goals.

Second, accountability should be built into any prescription. Thus agencies and other institutions should at a minimum be required to report to the public and to each other on status and progress on identified problems on a regular basis (Weber 2003). New prescriptions should also be designed to promote learning as a route to innovation and better performance. In order to accomplish this each new prescription will have to be flexible though to enable government and industry to change their behavior based on what they learn. This can be done by explicitly creating reliable monitoring, reporting, and feedback mechanisms; using neutral third parties and forums to document and help institutionalize lessons learned, including legal protections for good-faith efforts to

innovate, and building trust that promotes the sharing of information and open communication (Fiorino 2006). Finally, prescriptions should promote significant public involvement. This can be done by the mandated utilization of public and local knowledge, by strong public outreach designed to inform the public on the issues, and involving the public in ongoing program evaluations and appraisals (Becker 1993; Weber 2003; Whiteside 2006; Steelman 2010)

Implementation. This task is a combination of the traditional policy analysis framework categories of invocation and application (See, e.g. Clark 2008). Invocation encompasses the initial actions that communities, governments and/or institutions take to invoke, enforce, or otherwise implement a prescription. Application, on the other hand, is the process that a community chooses to ultimately characterize the cited behavior and determine whether the behavior is a violation of the prescription. Application also generally provides the process that determines what, if any, sanction or consequence will be applied for the violation. In the case of an inspector or field agent inspecting an industrial facility, the initial decision to issue a citation to the regulated entity for a perceived violation is an example of invocation, while the ultimate determination of whether the regulated entity is indeed guilty of a violation and, if so, the nature and amount of the penalty is an example of the application phase of the implementation process (Clark, Willard et al. 2000; Clark 2002). Ideally implementation should be perceived as “dependable, even-handed, realistic, and timely, and conflicts over the implementation of policies must be resolved in ways that are deemed fair by consensus of the participants” (Clark 2008, 53).



Implementation under the U.S. constitutional framework is, by design, fragmented. The framers of the constitution were concerned that too much power would be concentrated in one branch of government or institution, so separation of powers became the foundation of our nation's constitutional scheme (Plater, Abrams et al. 2004). Unlike a parliamentary process, where legislative and executive powers are fused, making consensus on environmental goals and priorities more likely, the "balance of powers" in the U.S. results in separate elections for president and Congress, often resulting in the executive branch and legislative branch coming under control of different parties. As a result, the constitutionally-independent judicial branch is often a major factor in the resolution of controversies and stalemates between battling government branches. The existence of multiple layers of governance, with policy implementation divided between federal, state, and local bodies, makes for an even greater challenge to the creation of policy and the development of implementation schemes (Kjær 2004; Plater, Abrams et al. 2004; Brunner and Lynch 2010b).

More specifically, the impact of our fragmented and divided governmental implementation scheme is profound. One example is the tremendous reliance in the U.S. on what has been described as bureaucratic rationality or, as discussed above, administrative rationalism (Dryzek 1997). This describes the U.S. implementation scheme's penchant for the use of bureaucracy for the implementation of environmental prescriptions. Thus the U.S. system is marked by a system based on a division of labor, subject matter specialization, technical expertise, uniform predictable rules, defined procedures, and a defined hierarchy with upper management controlling the behavior and activities of lower levels and field personnel (Hays 1959; Fiorino 2006). In essence:

Congress passes laws and oversees their implementation by agencies, which in turn prescribe rules and oversee the behavior of regulated firms. Agencies are highly specialized, with engineers, biologists, chemists, toxicologists, lawyers, economists, and statisticians, among others, in their ranks. Elaborate rules, applied as uniformly as possible, define the technology, monitoring, and other requirements that regulated entities must meet (Fiorino 2006, 39).

Thus the rules and regulations relevant to enforcement in the U.S. are created and implemented mainly through bureaucracies (Weber 2003; Brunner, Steelman et al. 2005; GLFA 1956). As a result, the implementation of laws passed by Congress and by state legislatures through the promulgation of regulations by agencies, are generally narrower in scope than in other parts of the world, emphasizing control over the manufacturing process and specific categories of pollution (Fiorino 2006). Furthermore, in the U.S. there is an enhanced focused on legal compliance and, unlike many other countries, less emphasis on overall environmental performance. In Sweden, Norway, Great Britain, and The Netherlands, for instance, governments set goals and design policies to achieve them through negotiated agreements, partnerships, and other means (Buhi and Feng 2009; GLFA 1956). In the United States, technology standards are routinely set forth in the applicable statutes and the rules and regulations promulgated by the bureaucratic agencies (Fiorino 2006). Thus U.S. businesses are constantly making decisions based upon the ever-present threat of litigation. A great deal of time and resources are spent by both agencies and regulated entities on “defensive science” striving to make decisions that will withstand judicial scrutiny (Quinton 2011).

The United States, on the other hand, emphasizes policy implementation through compliance and threat of sanction. Compared with Japan and several European countries the U.S. regulatory system is significantly more legalistic, adversarial, and punitive, with

a net effect of diverting the efforts of all sides to “pointless and dispiriting legal routines and conflicts” (Fischer 2000, 229). Indeed the United States regulatory and legalistic implementation style, described by Kagan (2011) as adversarial legalism, “uses more complex legal rules, more adversarial procedures, more punitive legal sanctions, and more judicial interventions into administrative decisions” (Fiorino 2006, 37). These practices have implications:

...American forms of regulatory law, processes for making regulatory policy, and methods of enforcing regulatory rules are more legalistic and more adversarial. Adversarial legalism does not necessarily make American regulation less effective than regulation in other economically advanced democracies – although it sometimes does. But adversarial legalism clearly makes American regulation more costly, more inefficient, and more inflexible. That inefficiency and inflexibility, moreover, tend to undermine the kind of government-business cooperation that is essential for fully answering the public’s regulatory prayers (Quinton 2011, 182)

Much of the cost, complexity, inefficiency, and seeming inflexibility of adversarial legalism results of the fact that, as discussed above, ecosystems and the interplay between humans and their environment are complex, adaptive, and dynamic. The human activities that impact the environment directly or indirectly are many and varied. Those activities that are perceived to harm the health, safety, and security of humans are limited or restrained by the rule of law. Laws require certain procedures, and demand that regulations and laws be applied fairly, consistently, and uniformly, i.e. to every violator. When uniform, consistent laws are applied across the board to the variety of human activities that may or may not harm the environment, there is tension. It is simply not possible to satisfactorily connect universal mandates of law and regulation indiscriminately to the immense variety of possible interactions without repeated

episodes of unreasonableness (Fiorino 2006; Buhi and Feng 2009). Often called “site-level unreasonableness” these particular encounters between regulated entities and regulators encompass the individual and cumulative experience of being subjected to inefficient, or unreasonable, regulatory action. “Site-level unreasonableness explains much of the present political and social discontent with protective regulation”(Bardach and Kagan 2010, 7) . “Yet government must govern, and if it cannot do so by forging perfect connections to the society it governs, then it will make do with imperfect connections” (Bardach and Kagan 2010, 3).

Thus traditional government regulatory implementation and enforcement relies upon uniform rules and regulations applied across the board to the regulated population resulting in inefficiencies and numerous cumulative incidences of unfair or unreasonable application (Fiorino 2006; Buhi and Feng 2009; Bardach and Kagan 2010). Given that regulators and the regulated public are often subject to uniform rulemaking and enforcement, for example, a great deal of time is necessarily spent to inspect and evaluate regulated entities. To regulated entities, it is a costly but necessary part of business to spend a great deal of time and resources to avoid violations. There is no incentive to go beyond the statutory minimums so while resources get squandered in order to develop defensive science, creativity and innovation are stunted. Trust evaporates (Fiorino 2006).

In sum, commentators are consistently calling for a regulatory evolution away from the old regulatory ways. As we have seen, the prescriptions and implementation inherent in the old regulation strategy impedes innovation; it is legalistic, fragmented, and inflexible; it is expensive; it has become largely irrelevant; and we are more and more confronting a burgeoning implementation deficit (Wilson 2000; Fiorino 2006; Walker

and Salt 2006; Whiteside 2006; Bardach and Kagan 2010; Steelman 2010; Quinton 2011).

It is unlikely that society can count on an overhaul of existing environmental laws. Change away from old regulation and transitioning toward a more holistic, ecosystem-based approach to governance will most likely have to come by way of changes in implementation. There are simply too many entrenched forces, including existing agencies, regulated entities, and NGO's all have a vested interest in maintaining the status quo. Most every existing entity is more geared for litigation than for exploring collaborative solutions. Change will have to "muddle through" with a large number of small steps that move the pendulum slowly over time (Fiorino 2006).

For the implementation task, therefore, the trick will be moving both invocation and application toward more community-driven, more voluntary, cooperative systems. Government could assist with the identification and clarification of community goals as well as develop measureable standards. It would be up to regional or community efforts to develop solutions to bring environmental indicators into compliance with those standards (Weber 2003; Armitage, Berkes et al. 2007).

Dryzek's (1997) discourse of ecological modernization borrows from many of the practices used by governments in Finland, Germany, Japan, the Netherlands, and other nations viewed as having successful environmental policy performance to offer some traits that might advance a government toward an ecosystem-based approach. Included in the discourse, for instance, is a description of a National Environmental Policy Plan, published every four years in the Netherlands, which identifies and integrates environmental criteria for all departments of government. The plan, which

relies on collaboration, not rules and penalties, focuses on a set of environmental quality targets and establishes a timetable for achieving them based on a model of how pollutants are generated in and travel through human social systems. The plan also looks beyond “end of pipe” discharges to “identify and change activities that cause pollution in the first place. The changes are identified in consultation with the relevant industry, citizen groups, and responsible government officials, especially those departments dealing with industry, agriculture, and transport” (Dryzek 1997, 163). It would not be a total stretch to envision a similar approach in the U.S. and Canada.

I am not suggesting that transition will be easy. There are plenty of bad apples in operation that have a history of environmental violations and will have to be dealt with using the conventional top-down deterrence model offered by old regulation. Traditional command and control uniformity enforced with threats of sanctions could slowly be replaced, however, by regional collaborative efforts utilizing partnerships, performance agreements, and cooperative assistance. Novel cooperative arrangements, including site specific environmental management contracts, could begin to be implemented with those in the regulated public with the best track records on environmental performance (Dryzek 1997; Dietz, Ostrom et al. 2003; Fiorino 2006).

Finally, in order for there to be realistic transition to a more collaborative and capacity-building system of implementation there needs to be an acknowledgement that the change and uncertainty that would accompany a movement toward ecosystem-based governance is significant. While innovation may be a process of “muddling through” (Dryzek 1997) it is still a foray into relatively new and uncertain territory. Increased discretion for field personnel, the use of partnerships and environmental performance

agreements, the tension between the need for a governance system that is based on learning and the need for some secrecy of trade secrets and other matters for commercial enterprises, are some examples of areas that will require guidance and conflict resolution. Thus there needs to be planning for increased use of alternative dispute resolution techniques, including facilitation, mediation, and, perhaps, arbitration (Fiorino 2006; Bardach and Kagan 2010). Further, for those issues that are not resolvable through negotiation or alternative dispute resolution, there should be a specialized court created with the exclusive jurisdiction to decide environmental issues. The United States expressly rejected the creation of an environmental court system in the 1970's with the start of the modern environmental era. New Zealand, on the other hand, made the creation of a specialized environment court a critical component of its environmental governance regime, with exclusive jurisdiction over all matters related to the environment and sustainable development. While the disadvantages and advantages of the court can be debated, it has had the effect of establishing a tribunal with environmentally-knowledgeable judges and staff as well as the creation of an exclusive bar of attorneys and staff experienced in environmental advocacy. Issues are therefore more capably and efficiently handled with less cost to the participants (Sproule-Jones 2002). These tools should be readily available, credible, and inexpensive relative to the costs of traditional litigation conducted in courts of general jurisdiction in state, provincial, and federal courts in the U.S. and Canada.

In summary, therefore, the task of implementation for a governance regime striving to move toward an ecosystem-based approach should first strive to reject the notion that industry will act only if threatened with legal sanctions. Traditional sanctions

Table 21 Implementation

Traditional	Ecosystem-based Approach
<p>The U.S. system is marked by a system based on a division of labor, subject matter specialization, technical expertise, uniform predictable rules, defined procedures, and a defined hierarchy with upper management controlling the behavior and activities of lower levels and field personnel.</p>	<p>Transition is needed to move implementation toward more community-driven, more voluntary, cooperative systems. Government could assist with the identification and clarification of community goals as well as develop measureable standards. It would be up to regional or community efforts to develop solutions to bring environmental indicators into compliance with those standards</p>
<p>Narrow, elaborate rules, applied as uniformly as possible, define the technology, monitoring, and other requirements that regulated entities must meet, emphasizing control over the manufacturing process and specific categories of pollution. Regulations relevant to enforcement in the U.S. are created and implemented mainly through bureaucracies. Regulatory reliance upon uniform rules and regulations applied across the board to the regulated population resulting in inefficiencies and numerous cumulative incidences of unfair or unreasonable application. Adversarial sentiment creates tension and is costly as industry engages in costly “defensive science” and incurs costs to avoid violations rather than to reduce environmental impact.</p>	<p>Adversarial relationships should give way to cooperative and collaborative ones with the emphasis on interactions designed to solve problems with strategies that are developed and shared with the input of scientists, regulators, the regulated community, and other interested parties. In consultation with industry, citizen groups, and government officials, plans created through collaboration can look beyond “end of pipe” discharges to “identify and change activities that cause pollution in the first place. Command and control could gradually be replaced with incentives and learning through trial and error.</p>
<p>Conflicts are resolved through costly traditional litigation and judicial intervention.</p>	<p>More reliance upon facilitation, mediation, and other forms of alternative dispute resolution. If court necessary there should be specialized courts with knowledge of environmental factors.</p>

would still be available but typically used for serious performance breaches or historically bad actors. In addition, when possible adversarial relationships should give way to cooperative and collaborative ones with the emphasis on interactions designed to solve problems with strategies that are developed and shared with the input of scientists, regulators, the regulated community, and other interested parties. In this way, command



and control could gradually give way to incentives and learning through trial and error. Further, improvement should be measured not in the number of administrative or regulatory actions taken, but instead by environmental performance as measured against measurable goals. Finally, conflict resolution should move away from traditional litigation in courts of general jurisdiction toward the use of alternative dispute resolution techniques. If those measures fail, then resolution should be through a dedicated court with specialized jurisdiction designed to adjudicate environmental disputes (Table 21).

Appraisal. The appraisal function involves the assessment of a decision process as a whole and of the success of particular prescriptions in achieving their goals. Thus the basic criterion is the policy objectives that were originally sought. Appraisals are therefore an important method of assessing whether a prescriptions and their implementation have effectively met the goals set by the community and who is responsible and accountable (Lasswell 1971; Ascher, Steelman et al. 2010). Appraisal provides a major opportunity for learning and course correction, for using the lessons of experience to adapt failing practices into future changes (Clark 2002). The main criteria for appraisals are dependability, comprehensiveness, continuity and independence (Lasswell 1971; Clark, Willard et al. 2000; Brunner and Lynch 2010b). Put more succinctly, the appraisal function requires that:

Even when decisions are made on the basis of the best information and with a high degree of consensus, they may not adequately address the problem in the ways anticipated. Initial conditions may also change, requiring shifts in policies. As time goes on, leaders and participants should evaluate how well the selected alternative has solved the original problem and, in larger terms, how well the overall decision process has served in achieving common interest outcomes (Clark 2008, 54).

In order to accomplish thorough and unbiased appraisals, trend data from relevant scales must be available and transparent. Local knowledge and scientific efforts need to be combined. One example is a periodic public assessment of the state of the ecosystem. This provides opportunity for meaningful public education and involvement. Further, it is critical that appraisals be carried out by third parties, i.e. NOT the agencies that are charged with programmatic responsibility (Lasswell 1971; Clark, Willard et al. 2000; Ascher, Steelman et al. 2010).

It is also important to view the appraisal function as the philosophical and practical home of adaptive management, which is frequently proposed as a tool to frame the management of the human activities that impact ecosystems (Holling 1986; Lee 1993; Gunderson, Holling et al. 1995). While appraisal is about the assessment of the success of prescriptions and implementation schemes, adaptive governance goes one step further to recommend that we have governance systems that are able to learn from the appraisal process and change course if anticipated results fail to materialize. Included in appraisal, therefore, is the need for trend data obtained through monitoring and other methods designed to inform governance of the status and change in key indicators over time as a Result of management actions (Berkes, Colding et al. 2003; Armitage, Berkes et al. 2007; Ascher, Steelman et al. 2010; Steelman 2010). “As a given policy is implemented, information gained is quickly fed back so that it can produce midcourse corrections in the specific policy being studied, and the experience gained can add to the general stock of environmental knowledge” (Stelman 2010, 202). In short, if society is to insist on a shift from regulatory strategies based on bureaucratic control to strategies based on learning and trial and error, appraisal functions that involve a broad base of agency,

stakeholder, and public monitoring and assessment will be critical to the quest to achieve common, as opposed to special, interests (Brunner, Colburn et al. 2002; Weber 2003; Fiorino 2006; Brunner and Lynch 2010b).

Table 22 Appraisal

Traditional	Ecosystem-based Approach
There is a community of interests and agency protocols built around any position. This makes it difficult for appraisals to be dependable and independent when so many rely on the continuation of a program.	Appraisal provides a major opportunity for learning and course correction, for using the lessons of experience to adapt failing practices into future changes. The main criteria for appraisals are dependability, comprehensiveness, continuity and independence
Trend data is usually gathered at the direction of experts. Periodic assessments, if any, are generally performed by experts with a possible comment period after the assessment is completed.	Trend data from relevant scales must be available and transparent. Local knowledge and scientific efforts need to be combined and included in a periodic public assessment of the state of the ecosystem.
Often assessments are performed by agencies/entities that are responsible for the implementation of a policy.	It is critical that appraisals be carried out by third parties, i.e. not the agencies that are charged with programmatic responsibilities.
Fragmentation is largely still the rule. Decisions are made by separate agencies with jurisdiction over a narrow component of an overall ecosystem.	Existence of a collaborative entity or single overarching body that can, formally or informally, accumulate the knowledge accumulated through appraisals and implement change to reverse adverse trends.

Therefore the key characteristics of the appraisal process in an ideal ecosystem-based governance regime, therefore, include periodic appraisals by entities unrelated to the agencies and institutions responsible for the regulation of the targets of the appraisals. Appraisals should provide unbiased trend data and utilize both local knowledge and

expert knowledge to deliver a thorough, dependable, and comprehensive product. Further, appraisals should be shared periodically with the public. Finally, appraisals should provide knowledge that can be utilized to learn from our regulatory efforts. A system should exist through either a collaborative entity or a single overarching governing body that can, formally or informally, accumulate the knowledge accumulated through appraisals and implement change to reverse adverse trends (Table 22).

Termination. This is the final activity of the decision process and occurs when a problem is solved by a previously selected prescription or course of conduct (Clark 1997; Clark 2008). Termination, like appraisal, relies upon the dependable conveyance of knowledge from intelligence generation through transmission, including thorough monitoring to assess whether the knowledge has proved that the original problem has been resolved (Ascher, Steelman et al. 2010).

Curiously, it seems that it is far from easy to terminate a policy action or prescription. “Often, if a decision process is successful, the institutions that were formed to address the problem remain, actively carrying out the duties assigned to them during the process” (Clark 2008, 93). In fact, the accumulation of knowledge about the success of a policy or even new discoveries do not in most cases cause the termination of old policies and the adoption of new ones. There are a variety of reasons for this phenomenon. In the first place, once a policy selection is made, it develops its own momentum. Any “buildup of expertise among scientists makes them resist radical new theories” (Ascher, Steelman et al. 2010, 94). In addition to the barrier of knowledge coalitions, attempts at termination must deal with those that have an economic stake in the continued existence of the policy and are therefore resistant to change or unlikely to

admit error. Further, advocacy coalitions like environmental NGOs and others tend to reject knowledge that runs counter to their interests causing policy debates to be prolonged and acting as barriers to termination (Ascher, Steelman et al. 2010).

Table 23 Termination

<b>Traditional</b>	<b>Ecosystem-based Approach</b>
Numerous factors combine to make it difficult to terminate a policy or prescription.	Ecosystem-based governance requires the periodic public assessment of the progress, status, and continued need for any environmental policy prescription or implementation scheme. The decision to terminate should be made by a bridging entity with knowledge of trend data.

It is clear that many of the concerns that apply to the need for dependable and comprehensive appraisal. Thus ideal ecosystem-based governance would require the periodic public assessment of the progress, status, and continued need for any environmental policy prescription or implementation scheme. The decision to terminate should be made by a bridging organization or entity with knowledge of trend data. This organization should be comprised of diverse representation from scientific, regulatory, private enterprise, environmental and public sectors (Table 23). There is no reason that such a body or process necessarily be vested with a legal mandate to enforce its decisions. It may be enough that parties follow recommendations of this overriding entity out of respect for its processes and opinions.

### **Conclusion**

Chapter III lays the groundwork and traces the literature that calls for a change in the manner in which society governs the human activities that impact the environment.

Every effort has been made to detail the problems with the current “mostly” centralized command-and-control bureaucracy and to explain the potential transition to a more holistic form of governance that moves into a more voluntary, collaborative, and adaptive force.

Using the information developed in the first part of this chapter, the policy sciences analytical framework was used to demonstrate how each task within the framework might change if our governance regime moved away from old regulation toward a more ecosystem-based approach. The framework also sets forth the characteristics that should exist under each task within the problem orientation, social process, and decision process in an ecosystem-based governance regime.

In chapters 4 and 5 the policy sciences analytical framework “ideal ecosystem based approach” will be used to examine the governance regimes extant in the Great Lakes Basin from approximately 1970 – 1992 (Chapter 4) and the Bay of Fundy/Gulf of Maine Watershed (Chapter 5). We will attempt to determine how the governance regimes examined in both cites compare with the ideal ecosystem-based approach developed in this chapter. In this manner we will be better able to determine what characteristics are present that might indicate whether the governance regimes are/were capable of adopting or using an ecosystem-based approach to the management of those human activities that impact the environment. Utilizing the methods described in Chapter 2 and the logic outlined in Chapter 3, we will now turn to the analysis of the two case studies.



#### IV. THE GREATLAKES BASIN

##### **Introduction and Background**

The Great Lakes Basin watershed is one of the world's largest freshwater systems. The lakes themselves occupy more than half a billion square kilometers with a shoreline of 17,000 kilometers (10,000 miles). More than 35 million people reside within its basin and 23 million rely upon the lakes for fresh water. The basin includes area within 7 U.S. states and 2 Canadian provinces (Figure 6) – and encompasses more land than England, Scotland, and Wales combined. The fresh water system of the Great Lakes basin comprise roughly one-fifth of the world's fresh surface-water supply (Sproule-Jones 2002; Botts and Muldoon 2005).

The Great Lakes are essentially a closed but interconnected system. In essence, it is one long river, (Evans and Regier 1990), and it is a 2,000 mile voyage from Duluth at the western end of Lake Superior to reach the Atlantic Ocean (Botts and Muldoon 2005). The lake system was formed by glacial processes, and those that affected the lakes the most took place during the Pleistocene era. Melting glaciers filled the basins until they reached their current configuration approximately 4,000 years ago (Grady 2007).

Formed by glacial melt, only one percent of water in the Great Lakes is renewed each year by rain and snow. Roughly the same amount flows into the sea. Thus



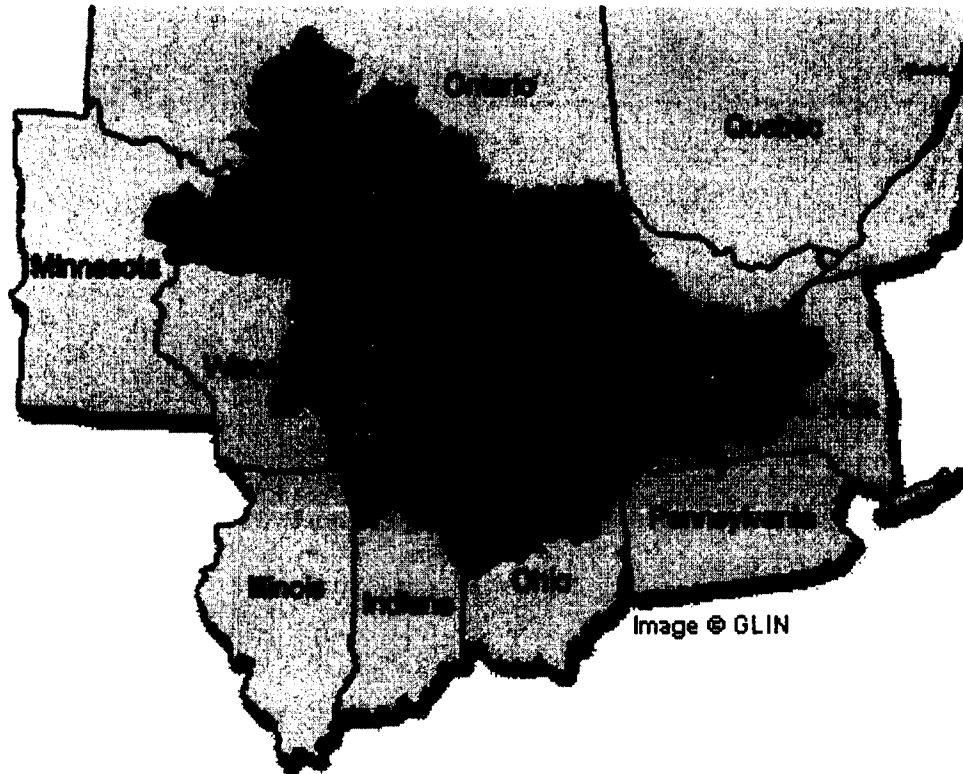


Figure 3 Great Lakes Basin Watershed (Used with permission Great Lakes Information Network)

pollution that winds up in the lakes mainly stays in the lakes (Dempsey 2004; Botts and Muldoon 2005)

The up and down history of resource exploitation in the Great Lakes region is well documented and a brief background and history of the evolution of the Great Lakes Water Quality Agreement is necessary at this point for context. Suffice to say, during the 18th and 19th centuries, the Great Lakes Basin was widely exploited for its natural resources, including forest products and fisheries. Major cities were built, and even rebuilt, on the back of Michigan and Wisconsin forests. By the late 19<sup>th</sup> centuries fish populations had crashed due to overfishing and loss of habitat. Cholera and typhoid, along with other water-related diseases, were major causes of death in lakeside

communities<sup>10</sup> (Colburn, Davidson et al. 1990). Laws and regulations relating to the control of human activities that impacted the Great Lakes ecosystem were fragmented between the U.S. and Canada and their respective states, provinces and local governments. As a predictable result, overfishing and pollution continued unabated into the 1960s, culminating in the public eye with the famous burning of the Cuyahoga River in Cleveland, the declaration of Lake Erie as “dead,” Love Canal, and other similar crises (Dworsky 1988; Dempsey 2004).

It was during this period that an angry and determined public, acting through a rapidly expanding list of citizens’ organizations that had emerged to combat pollution began to drive reform measures. The International Joint Commission (IJC), acting on a reference, instructed both countries to take action on water pollution issues in the Great Lakes. The initial 1972 Great Lakes Water Quality Agreement (GLWQA) between the United States and Canada was negotiated. It was essentially a water pollution agreement but effectively introduced controls on phosphorous discharges and “an extensive set of broad studies under the Pollution from Land Use Activities Research Group (PLUARG) was initiated” (Colburn, Davidson et al. 1990, xxv).

With increasing environmental degradation and active citizen involvement, the agreement was ultimately amended in 1978 with the declared purpose to “...to restore and maintain the chemical, physical and biological integrity ...of the waters of the Great Lakes Basin Ecosystem.” The ecosystem was defined as “the interacting components of air, land, water and living organisms, including humans.” Further evidence of the fact

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<sup>10</sup> For instance, in 1854 a typhoid epidemic in Chicago causes the deaths of some 5,000 people, and in 1891, the rate of death due to typhoid fever ad reached 124 per 100,000 people. Fuller, K., H. Shear, et al., Eds. (1995). The Great Lakes: An Environmental Atlas and Resource Book. Toronto, Government of Canada and US Environmental Protection Agency, *ibid*.

that the 1978 agreements had morphed into the restoration of ecological integrity as the major goal, not just improved water chemistry through pollution control, can be found in the definition of the Great Lakes system as all of “...the streams, rivers, lakes and other bodies of water that are within the drainage basin” (Becker 1993; GLWQA 1987).

The years of the 1970s through the mid-1980s, marked by open and transparent decision making with significant public input at all levels, integrated governance task forces and overlapping advisory boards, had an impact. The 1978 Amendments to the GLWQA recognized the link between land-based activities and water quality (GLWQA 1987), explicitly acknowledging the role of non-point source pollution. It formally adopted the ecosystem approach basin-wide (GLWQA 1987). The governance regime under the GLWQA in the early years is widely thought to have been a success (Donahue 1988; Becker 1993; Young 1998; Jackson 2005).

While the GLWQA speaks mainly to water quality and the impacts of land based activities, there is another critical component to the Great Lakes Basin ecosystem: the biological system, including the fish. Fisheries in the Great Lakes, including a once-significant commercial fishery, had seen a complete collapse caused by overfishing, the invasion of lamprey eels and pollution. In the 1950s, lake trout populations had been reduced to 99% of their 1930s levels. This drove the ultimate formation of the Great Lakes Fishery Commission (GLFC) through the ratification of a Convention between Canada and the U.S. in 1955<sup>11</sup>. Its charter recognized the value of ‘joint and coordinated efforts’ to address fisheries conservation (Convention 1955; Dempsey 2004). The

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<sup>11</sup> Convention on Great Lakes Fisheries between the United States and Canada signed September 10, 1954; entered into force October 11, 1955. 6 UST 2836; TIAS 3326; 238 UNTS 97.

convention was implemented through passage of the Great Lakes Fisheries Act of 1956 (GLFA 1956). While the job of the GLFC was initially to formulate a plan to combat the invasive lampreys, by the 1980s the Commissioners from both sides of the border, and their staffs, had cultivated and begun to practice a protective ecosystem policy by working closely with the IJC and its Science Advisory Board (SAB). Collaboration and coordination was also buttressed by the fact that members of the GLFC Board sat as voting members on the SAB under the GLWQA (Prelli and Becker 2001). The Convention further set the stage for an ecosystem approach to fisheries management in the Great Lakes with an institutional design that incorporated a decision-making process that promoted problem solving and a research based approach to the management of the Great Lakes basin ecosystem fisheries (Prelli and Becker 2001). They often reviewed land use and pollution impacts on fish, but stopped short of challenging the use and release of contaminating chemicals on the fisheries or the people who consumed them (Dempsey 2004).

The governance system under the IJC and the GLFC from 1978 until the early 1990s allowed for a social process that included a wide variety of actors, including government agencies, NGOs, citizens, and related institutions. In 1979 the IJC established a standing committee to assist in providing the public information service called for in the 1978 agreement (GLWQA 1987) The basic concept was that citizens have rights to participate in IJC activities and should be encouraged to do so.<sup>12</sup> The policy stressed that information should be provided while studies and activities were

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<sup>12</sup> Public participation in the governance of the Great Lakes had been mandated since 1909 by Treaty (1909). Treaty Relating to the Boundary Waters and Questions Arising Along the Boundary Between the United States and Canada. U.S.-Gr.Brit. 36 Stat. 2448..

being carried out, not just after decisions were already made. The aim was to increase the IJC's credibility by taking public opinion into account (Becker 1993).

The IJC was aware of the importance of public participation to the success of an ecosystem-based approach to governance. It was also cognizant that the public would be unable to participate meaningfully without education and increased understanding of the ecosystem threats. In its 1980 report "Pollution of the Great Lakes Basin by Land Use" the IJC advised that:

The PLUARG Public Hearings and the Public Consultation Panels which preceded them demonstrated that most people are unaware of the extent to which urban and rural land use activities affect the water quality of the Great Lakes and of the fact that they themselves may be directly involved and responsible for deteriorating ecosystem quality. The lack of awareness of the effect of the various land use activities on water quality was attributed mainly to the fact that there has been little or no public education with respect to these diffuse sources of pollution. It was also recognized that the acceptance and successful implementation of PLUARG's recommendations would be possible only if there were an informed public. A stronger educational program was recommended by many witnesses at the public hearings as being the best way to create this informed public. An informed and active public would also assist Governments in reaching acceptable solutions to nonpoint pollution problems and should be encouraged for this reason also. (IJC 1980, 69)

While the details of ups and downs of the Great Lakes resource exploitation, economic upheavals, and gyrations from ruin to recovery and back are oft-published legacies of the region, the story is more personal to me. My family moved to St. Joseph, Michigan, on the Southeast shore of Lake Michigan and at the mouth of the St. Joseph River in the summer of 1960. My father was a career member of the U.S. Navy, so being uprooted and moving somewhere every two years was no big deal, and I saw no reason to be especially excited about this new place.

Things changed. My first memories of our new home are all about the lake. Swimming in fresh water for the first time was a jolt. I remember how clean it felt and when you got out there was no residual stickiness that I associated with swimming in the ocean. I could ride my bike from our home with a cane pole and catch perch that made for incredibly tasty feasts. Ships could be seen transiting far offshore delivering iron ore from the Lake Superior mines to the steel plants in Gary and East Chicago.

St. Joseph was a small, working class town. Most of my friends' parents worked at a factory for Whirlpool, Auto Specialties, or one of many others in the area. There was a thriving fishing industry. Many restaurants had weekly "all you can eat" perch specials – a treat that was occasionally affordable for a family living on an enlisted man's wages.

As I grew up I watched the changes. Trips to the beach began to mean swimming through brown foam floating where water met the land. The perch disappeared. Mollhagen's fishery closed down and the odd fully enclosed lake fishing boats were no longer visible heading out to the lake between the piers. Alewives (we called them "shad") were everywhere in the lake, and swimming was now accompanied by seemingly millions of dead alewives floating ashore to pile up on the beach. The only fishing I could do was to submerge the end of my cane pole into the water and wave it around, hook trailing, to snag shad and bring them home to bury under my mother's rose bushes. The manufacturing plants began to close, moving their facilities to locations where, it was said, labor was cheaper and costs were low. This meant "the south" at first; later more plants closed as manufacturing moved off shore.

The town changed as well. Block after block of housing was torn down to make way for a new courthouse here and a shopping mall there. The factory workers, to me,

just faded away. The bowling alleys emptied. The annual picnic put on by Whirlpool for its workers, the highlight of every summer, got smaller and smaller, then just stopped. Too expensive, I suppose, and most of the workers were gone.

But in the early seventies, my high school years, the lake changed again. My father would get me up at 5 am on many school days in the fall and spring and we'd be off to put a small boat in the water and head out on the lake to troll for salmon and lake trout before he went to work and me to school. My parents and neighbors complained about having to buy phosphorous-free detergent, but the feasts returned and our freezer was full, literally, of fish - fish that, years later, we heard we shouldn't eat because of PCBs, mercury, and other persistent organic substances in their tissue. This advice we, like many, simply ignored. Pointy headed scientists weren't going to tell us that our fishing efforts were for naught. We had a freezer full of fish – always – and a dozen ways to filet, steak, boil, and barbeque them. Besides, why would the government bother to introduce salmon into the lake if you couldn't eat them when you caught them?

It was all there – on a very small scale. Right in front of my eyes I had experienced the degradation of a fresh water ecosystem, the demise of our manufacturing base and the humbling of an entire labor force. Yet news of these developments never seemed to strike home. I remember hearing of Lake Erie's "death" and thinking that it was a Lake Erie problem. The very real indicators of ruin and recovery through which I swam and fished seemed somehow disconnected from those "other" problems that I heard about on the news.

The fact is, however, that the Great Lakes were at a tipping point, precariously close to thresholds that would have been devastating to cross. The story of their

restoration, the governance changes, and the efforts of some very courageous and dedicated groups and individuals that helped steer recovery, may provide lessons for the present and the future. This is chiefly why the governance regime in the Great Lakes Basin during the time period leading up to the Great Lakes Water Quality Agreement, its amendments, and protocols, roughly 1970 through 1992, was chosen as a comparative case study for this project. It has personal meaning to me, and it also has many elements in common with the current situation in the Bay of Fundy/Gulf of Maine watershed. Both are somewhat isolated bodies of water with many influences from land-based activity. Further, many of the threats to the Great Lakes ecosystem are the same as those thought to be threats to the Bay of Fundy/Gulf of Maine: Overextraction of marine organisms, chemical pollution and eutrophication, together with toxic algae blooms, alteration of physical habitat, invasive species, and global climate change (Steneck 2001).

Given this brief background, I will now examine the problem orientation, social process, and decision process characteristics that evolved in the Great Lakes leading up to Great Lakes Water Quality Agreement of 1972 and its subsequent adjustments through 1987 and some of the impacts thereafter. These characteristics can be compared to the “ideal” characteristics developed through the use of the policy sciences analytical framework as set forth in Chapter III. In Chapter V I will follow the same process for the governance regime in the Bay of Fundy/Gulf of Maine Watershed.

### **Ecosystem-based Governance and the Great Lakes Water Quality Agreement**

The ability to reconstruct the context of events and actions taken 30 to 40 years ago in order to fit them within the analytical framework of the policy sciences is not



without challenge. For instance, in hindsight, the problems in the Great Lakes in the 1960s and 1970s and their causes appear clear. It needs to be understood the actions taken and policies developed were done in the moment. Thus while it may be clear to us today that phosphorous and phosphates were an important factor contributing to eutrophication in the Great Lakes, at the time no one could be sure that limiting phosphorous inputs from water treatment plants and banning the use of phosphate detergents would ultimately prove a turning point in the restoration of the lakes.

It is the intent of this project to make every attempt to approach and reconstruct the goals, trends, conditions, actions and policy process from a perspective that may prove helpful to the problems that exist today. Thus the fact that phosphates were banned in the region through piecemeal state-by-state legislation after 1972 may well be less important than the fact that there was a *process* that could be relied upon to explore the possibility that phosphate releases *should* be banned and subsequent trends monitored after the ban to learn whether it was a policy action that should be continued or adjusted based on the objective data.

### **Problem Orientation**

From the earlier discussion in chapters 2 and 3, it may be helpful to briefly reiterate the role of problem orientation in the analysis of the Great Lakes Basin watershed. Recall that the five tasks within problem orientation serve as an overall “strategy to address problems and invent solutions (Lasswell 1971; Clark and Willard 2000, 9). Thus:

In problem orientation, the problems at hand must first be specified in relation to the goals that people seek, thus permitting a clearer definition of the problems than is otherwise possible. Historic trends must then be described to see if events and decision making are moving toward or away from the specified goals. Next, factors or conditions that have influenced or caused these trends must be determined. When past trends and conditions are adequately known, projections of future trends are possible. Finally, after these four tasks have been completed and the necessary information assembled, alternative courses of action for achieving the stated goals can be invented; evaluated according to their effectiveness, efficiency, and equitability in solving the problem (Clark 2008, 57).

Goal Clarification. Goal clarification involves the process by which goals are determined for a given community. The emphasis on the protection and advancement of human dignity has historically been a fundamental quest of the policy sciences approach (deLeon 1988). When we consider that we are examining the effects of human decisions on human lives, which require a healthy, resilient environment capable of sustaining human life, commencing any investigation with a goal of human dignity begins to make sense. As to the goal of democracy, it is “well-rooted in many cultural traditions throughout history...for all people to have full opportunity to shape and share power, wealth, enlightenment, well-being, skill, affection, rectitude, and respect” (Lasswell and MacDougal 1992; Clark 2002, 89). Further it should be clarified that the policy sciences strives to achieve an overriding goal of the realization of human dignity for the many, not the dignity of the few at a cost of indignity for the many. Since the goal is dignity for the many, decision outcomes must aim at achieving equal opportunity for participation in power, wealth, well-being, and the other important values (Lasswell 1971).

As discussed in chapter III the key goal clarification characteristics of an ecosystem-based approach to governance are:

- 1) Meaningful community participation in the goal clarification process;

2) Strong public outreach and education efforts devoted to raising awareness and understanding of ecosystem issues and governance options, and

3) Multiple goals that overall embrace human dignity and equal access to governance with a premium placed on maintenance of the integrity and resilience of ecosystem functions.

How does the governance regime during the early years under the Great Lakes Water Quality Agreement stack up against our notion of an ideal ecosystem-based approach to governance?

First we must look to the extent of public and/or community participation and input into the goal process. As we know, the Great Lakes Basin ecosystem was a polluted and degraded mess by the mid-1960s. The initial goals for the Great Lakes Basin initially came from two powerful government sources. In the wake of the publicity that followed the burning of Ohio's Cuyahoga River and a massive oil spill off the California coast, the 1972 Amendments to the Federal Water Pollution and Control Act (the Clean Water Act) were passed into law over the veto of President Nixon (Gross and Dodge 2005). Under the 1972 Amendments, the objective was to "restore and maintain the chemical, physical, and biological integrity of the nation's waters." 33 U.S. C. § 1251(a).

The 1972 amendments to the Clean Water Act prohibited the discharge of pollutants without a permit and set the stage for the clean-up of publicly owned treatment works ("POTWs"). The Act, however, was applicable only to the United States and its territories. On the Canadian side, Parliament enacted the Canada Water Act (1970).

In the Great Lakes region, the International Joint Commission (“IJC”), a bilateral body of six commissioners, three from each country that had evolved from the Boundary Waters Treaty of 1909 between Canada and the U.S. (1909) had been investigating pollution problems in the region pursuant to references<sup>13</sup> received from both Canada and the United States (IJC 1970; IJCIRG 1978; IJC 1980). The IJC was responding not only to the growth of public concern about pollution, and references made to IJC, but also to citizen movements that “...exploded with demonstrations and campaigns throughout the late 1960s and early 1970s...public demands for actions increased as huge windrows of decaying algae piled up on Lake Ontario beaches, and a massive alewife die-off in Lake Michigan in 1967 not only interfered with swimming but threatened public water supplies and caused a secondary die-off due to botulism of shorebirds who fed on the dead fish” (Botts and Muldoon 2005, 14).

The Great Lakes therefore had general goals and objectives initially from two powerful sources – one stemming from treaty and the other from the Clean Water Act. One word, *integrity*, however, was never defined in the Agreement and its meaning continues to be debated (Colburn, Davidson et al. 1990). There is no question, however, that the word took on a broad and significant meaning to many of those responsible for

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<sup>13</sup> One of the powers granted to the IJC by treaty to assist in its function to resolve disputes and avoid conflicts involving the Canada/US boundary waters is the power to investigate specific situations and make recommendations to governments based on a “reference” received from either or both of the parties. The IJC began receiving references concerning pollution in 1946 and the GLWQA arose out of a 1964 joint reference concerning pollution in the lower lakes (Erie and Ontario) Botts, L. and P. Muldoon (2005). Evolution of the Great Lakes Water Quality Agreement. East Lansing, MI, Michigan State University Press.

the development of the GLWQA.<sup>14</sup> To some who participated in the GLWQA investigation and development, including influential members of the Science Advisory Board during these crucial debates, the notion of integrity<sup>15</sup> was synonymous with integration:

Integrity became a key word in the 1972 Federal Water Pollution Act [Amendments]. A senior ecologist George *Woodwell*... at Woods Hole... who had been working on the effects of radioactive radiation on a pine forest in on Long Island, NY... recommended to Senator Muskie to bring in the word "integrity" as a good thing to which to strive in the federal water pollution control. I suspect...I never found out why he proposed it...but, integration *was* a very good word in the '60s amongst activists. Gender integration, racial integration, and to some extent there was an emphasis on poverty. So, if you think integration, disintegration...that was a concept that sort of perfused the whole politics of those days it was a key consideration. It's actually related to justice. Integrity was related to justice. And our Great Lakes to me, and Lee Botts, and George and many more...we have got that. (Canadian Academic 2)

Policy and progress in the Great Lakes between the U.S. and Canada did not end with the 1972 GLWQA. While the 1972 Amendments to the Federal Water Pollution Control Act and GLWQA of 1972 announced laudable broad goals (and in the case of the Annexes to the GLWQA, some specific goals concerning particular contaminants), the GLWQA also directed programs and other measures for the achievement of the water quality objectives, including the development of measures for the abatement and control of pollution from land use activities. Article VI of the initial GLWQA agreement

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<sup>14</sup> "Integrity" was added to the GLWQA by the 1978 Amendments (1987). Great Lakes Water Quality Agreement of 1978, U.S.-Can., 30 U.S.T.1384; Protocol to Amend the Great Lakes Water Quality Agreement of 1978, Nov. 18, 1987, Can.-U.S., 1987 Can. T.S. No. 32. 30 U.S.T. 1384, *ibid*.

<sup>15</sup> Interestingly, Henry Regier once noted that: "...Proponents of the term "integrity" for the U.S. Federal laws [and citing, *inter alia*, to Woodwell] apparently understood that a political process in which benefit/cost ratios played a dominant role must threaten integrity..." Regier, H. A. (1993). *The Notion of Natural and Cultural Integrity. Ecological Integrity and the Management of Ecosystems*. S. Woodley, J. Kay and G. Francis. Ottawa, St. Lucie Press: 3 - 18.

authorized an investigation of pollution from land use activities, and mandated that the Commission would set up boards<sup>16</sup> and commissions and issue reports annually concerning the progress of the parties toward the achievement of water quality goals and the effectiveness of the programs (1972; Becker 1993; Botts and Muldoon 2005; GLWQA 1987).

Annual reports concerning the progress being made toward water quality objectives under the GLWQA were issued by the Boards and advisory groups to the IJC from 1972 through 1978.

Direct citizen participation in the work of the IJC under the provisions of the 1972 Agreement was relatively limited between 1972 and 1975. However, public interest in Great Lakes pollution problems continued to be very high, and citizens increasingly demanded access to information and a voice in Agreement work. Pressure for direct access to the Commission's work was exerted by citizen action groups, such as the Lake Michigan Federation, the United Auto Workers, and the League of Women Voters on the United States side of the Basin. Canadian citizen groups exhibiting an early interest in direct involvement included the Conservation Council of Ontario, the Canadian Environmental Law Research Foundation, and various local organizations, such as cottagers' associations (Becker 1993, 244).

As citizen pressure mounted, the IJC and its Boards began to recognize the need for public support in order to implement the terms of the GLWQA and build infrastructure, it took affirmative steps to galvanize citizen involvement (Becker 1993). The meetings between the boards and the IJC began to be made public in 1975 and "...in time presentation of the board reports to the IJC in public meetings became a mechanism

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<sup>16</sup> There were two advisory boards originally set up under the GLWQA in 1972. The Water Quality Board and the Research Advisory Board (later the Science Advisory Board) (1987). Great Lakes Water Quality Agreement of 1978, U.S.-Can., 30 U.S.T.1384; Protocol to Amend the Great Lakes Water Quality Agreement of 1978, Nov. 18, 1987, Can.-U.S., 1987 Can. T.S. No. 32. 30 U.S.T. 1384.

for increased public understanding of Great Lakes problems, as well as for citizen activism” (Botts and Muldoon 2005, 23). In addition, the IJC hired a professional public relations staff to augment its Great Lakes Regional Office.

The IJC reports and publication of documents and other measures increased credibility and boosted public involvement in agreement-related activities, often in the early stage of implementation (CUSIS 1991; Botts and Muldoon 2005). In addition, the 1972 GLWQA enabled the IJC to create the International Reference Group on Pollution from Land Use Activities (PLUARG) (Colburn, Davidson et al. 1990). The PLUARG panels, like the panels created for the Upper Lakes Reference Group (ULRG) were illustrative of the representation of a broad range of the public and interested parties in the process used by the IJC. Great Lakes Tomorrow was contracted by the IJC for outreach and pre-hearing educational workshops on issues relevant to the work of the IJC and its panels. The work of Great Lakes Tomorrow in these cases was:

...to prepare the public for the IJC hearings on technically complex reports. These IJC boards required the contractor to: develop community profile to systematically identify the groups and individuals whose interests would likely be affected, prepare lengthy mailing lists of individuals representing the target publics; and design and implement a media campaign to reach others who might have an interest. Besides recruiting participation from the public at large, those targeted publics were recruited explicitly to elicit their participation in the workshops and hearings (Becker 1993, 242).

PLUARG ultimately established 17 public advisory panels throughout the watershed. Representation on the panels went far beyond experts to include municipal leaders, elected officials, farmers, academics, environmental activists, labor unions and other interested individuals (Becker 1993; Botts and Muldoon 2005). “PLUARG really

did want to know what the panels thought. Panels met formally (at least) four times to discuss and make recommendations on the social, environmental, and economic aspects of the PLUARG study. Most panels also articulated their goals for the future of the Great Lakes to provide a context for their deliberations” (Becker 1993, 247). One significant result of the panel process was that PLUARG’s final report influenced the agenda of the IJC (Becker 1993; Botts and Muldoon 2005) and, as explained by a PLUARG participant, helped usher in the adoption of the “ecosystem-based approach” language incorporated into the 1978 protocol:

In 1978, when the PLUARG Report was going to come in, they asked us to facilitate the public process, but the committee had decided that, “oh my gosh, we’re going to have to have a public process because the treaty says we have to do this.” They didn’t do it at the beginning of PLUARG, they did it during the last year... We reported directly to both the Commission and PLUARG...the collective recommendations of what came up from all of those panels, on both about the process of engaging the public and about substantive issues. The general consensus was that the process that PLUARG had run, which Great Lakes Tomorrow facilitated, we facilitated all the hearings that went on around the lakes on both sides. We also reported as an organization on what we saw. The public composition didn’t matter because the panel was really diverse in terms of the representation. They included industry...by then everybody’s at the table...the result was that they really liked that model of participation and recommended that the Commission empower its reference toward another initiative to use similar process. To my knowledge it hasn’t happened since... Because the outcome of the process was a significant change in the Panel’s report in terms of what ought to be done with respect to what the references reported out. It was a very radical report in terms of what needed to happen. That was the thread that Great Lakes Tomorrow kind of ran through and realized, and when that report hit the fan, that we were going to a) change the Agreement—in 78 the agreement was renegotiated and the ecosystem approach was adopted, and so then that raised a whole other flag about what we needed to do in terms of getting our heads wrapped around it—what does this mean, how are you going to implement it, and what does this mean for the people who have to make decisions here, there and everywhere? That’s where the “Decisions for the Great Lakes Program” came from. It was to lay the groundwork for engaging



the relevant stakeholders in restoring the health of the Great Lakes. (US NGO/Academic)

It was not just PLUARG panel doing outreach in the Great Lakes. Another group, the Lake Michigan Federation, was doing outreach in connection with the Great Lakes Basin Commission (GLBC).<sup>17</sup> When the Basin Commission requested public comment related to a draft Framework plan designed to assess public sentiment on what was most important in the region. In other words, what did the public prefer on the issue of “environmental quality” versus “economic development?” The Lake Michigan Federation held a series of meetings around the region in 1975. As its president at the time recounts:

The mission of the Lake Michigan Federation was ... “citizen action to save the Great Lake.” So things continued and by 1975, ‘74/’75, the GLBC had a draft framework plan getting ready to be presented for the formal review that was part of the process laid out for it. One of the big issues was that under the...I can’t remember if they were called standards, rules, regulations or whatever, but the operating governance rules for the Basin Commission was, that part of what the plan was supposed to do was to say what was most important in the region. Was it economic development or environmental protection? There might have been a third. But, the real issue was between economic development and environmental protection. So, there was...the Basin Commission set up a series of public meetings to be held to pose that question, and because they were getting the most noise from Lake Michigan...I think they only had like four or six or seven such things altogether...but, four of them occurred around Lake Michigan... and this was a standard way we operated a lot in those days...issues would come up and we would carry out, in effect, an information or an education campaign to inform the local communities or organizations about the issues from the perspective as a regional issue that needed local input. (US NGO 2)

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<sup>17</sup> The Great Lakes Basin Commission was one of six regional “river basin commissions” that were created by the 1965 Federal Water Resources Planning Act. Its mission was to coordinate water resource activities between the 8 state and various federal agencies in the Great Lakes region.

As a result of these meetings, public officials were “astounded by the strong support expressed for “environmental quality: as a regional goal over economic development” (Botts and Muldoon 2005, 42).

From the above it is clear that goal clarification process utilized by the IJC was intentionally designed to gather broad public input as part its efforts to restore the Great Lakes under the GLWQA. Illustrative are the efforts of the PLUARG process, which ultimately altered the goals and agenda for the 1978 amendments to the GLWQA and ushered in the practice of using a basin-wide ecosystem-approach to the IJC’s efforts in the region. Also of note is the process used by the GLBC to gather input on priorities of the public by holding public meetings to determine whether the public preferred economic development or environmental protection as a focus of its new Framework plan. The result of its public outreach, perhaps much to its chagrin, demonstrated that the public was more interested in environmental quality than economic development.

Unfortunately the strength of the citizen involvement process fostered by PLUARG began to fade after the final recommendations and the passage of the 1978 amendments to the GLWQA. The cohesive group of citizen experts and participants was not used to monitor the actions of the Parties after the final Commission recommendations (Becker 1993) The public involvement that drove PLUARG can fairly take credit for the inclusion of the ecosystem-based approach in the 1978 amendments (Botts and Muldoon 2005), but there has not been sufficient public pressure or political will to follow through or implement other goals set out in either the 1978 amendments or the 1987 protocol (Colburn, Davidson et al. 1990; Becker 1993). The 1978 amendments,

for instance, adopt a “zero discharge” philosophy for achieving the standards for the persistent toxic substances.<sup>18</sup> Other than banning DDT, PCBs and dieldrin, no initiatives have been successful in banning other persistent organic pollutants (Colburn, Davidson et al. 1990).

The criteria for goal clarification under an ideal ecosystem-based governance regime were as follows:

- 1) Meaningful community participation in the goal clarification process;
- 2) Strong public outreach and education efforts devoted to governance options and ecosystem issues, and
- 3) Multiple goals that overall embrace human dignity and equal access to governance with a premium placed on maintenance of the integrity and resilience of ecosystem functions.

The experience in the Great Lakes under the GLWQA seems to demonstrate that the IJC reacted to immense public pressure by seeking community participation in the goal clarification process through its insistence on transparency, public meetings, and public debate which, as demonstrated by PLUARG, resulted in meaningful expression of community and public goals and interests (Table 24). The public outreach component of goal clarification was present during the same period with Great Lakes Tomorrow, the Lake Michigan Federation, and others traveling to venues around the watershed to educate people on the issues confronting the IJC and, then, reporting back their impressions and findings. Finally it would appear that the public participation in a variety of significant topics was broad, well-informed, and placed a premium on

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<sup>18</sup> Persistent toxic substances are defined at Annex 12 (1)(a) as “...any toxic substance with a half-life in water of greater than eight weeks...(1987). Great Lakes Water Quality Agreement of 1978, U.S.-Can., 30 U.S.T.1384; Protocol to Amend the Great Lakes Water Quality Agreement of 1978, Nov. 18, 1987, Can.-U.S., 1987 Can. T.S. No. 32. 30 U.S.T. 1384.

environmental quality. As the work of the Lake Michigan Federation demonstrated, the public preferred this attribute over economic development. In the case of PLUARG, the results are clear that the public believed that the GLWQA should be expanded to include the entire basin so that governance could be extended beyond the lakes into the watershed where land uses were impacting water quality.

Table 24 Goal Clarification

<b>Ecosystem-based Approach</b>	<b>GLWQA Governance</b>
<p>Meaningful public and/or community participation and input in the goal clarification process. National goals may provide guidance but community has broad input into how to achieve goals. Goal choices have broad community acceptance</p>	<p>Public interest high in region in 1970s. Many citizen action groups demanding direct involvement and access. IJC recognizes need for public support. PLUARG and UGLR panels and investigations hold hearings and draft reports to IJC. Major force behind 1978 addition of <i>ecosystem-based approach</i> to GLWQA. IJC annual and biennial reports and publications increase credibility and understanding of public. Annual IJC meetings made public and become mechanism for public understanding and civic activism. Regional office opened and public relations staff hired by IJC. Citizen participation on IJC Boards and panels.</p>
<p>Strong public outreach and education provide ability to establish community goals inclusive of human dignity and democracy and provide basis for clarifying common interests. Human dignity includes economic fairness and sustainability.</p>	<p>Wingread conferences begin early-on with broad participation. GLT contracted by IJC for outreach and pre-hearing educational workshops throughout basin. GLT also works with RAP facilitation. Lake Michigan holds public hearings at request of GLBC. Decisions for Great Lakes to educate and train leaders in the ecosystem approach and its implementation.</p>
<p>Multiple goals may be integrated that embrace human dignity, economic fairness for the many, and equal access to governance with a focus on maintenance and preservation of the integrity and resilience of ecosystem functions.</p>	<p>GLWQA articulates general goals and numerous specific goals. Democracy fostered by increased public participation, access and input to government decision making. Participants in GLWQA governance considered ecosystem "integrity" to include justice and equality.</p>

It is sad, however, that the PLUARG group of knowledgeable citizens was allowed to lapse. This was despite the fact that the IJC urged the parties to continue and expand the public participation component and to increase overall education and outreach (IJC 1980). The goals of the region are still in place – qualitatively to restore and

maintain the chemical, physical, and biological integrity of the nation's waters. While the original individuals involved in the development of the GLWQA Agreements may have intended for "integrity" to have a broader meaning that included basic human dignity and democracy (CUSIS 1991), the interpretations since that time have been far narrower.

So the involvement of the public in goal clarification has waxed and waned under the GLWQA agreements and protocols. It is important, however, to remember how public involvement made change possible for a significant period of time, and how difficult implementation has become without a galvanized citizenry. It is also important to realize the extent of public outreach and education and how instrumental such efforts were in creating a knowledgeable public capable of offering valuable local knowledge and input to regulators and IJC officials.

The final characteristic of the goal clarification task is whether there are multiple goals that overall embrace human dignity and equal access to governance with a premium placed on maintenance of the integrity and resilience of ecosystem functions. The key, again, may be the notion of *integrity*.

The GLWQA has numerous goals different from but related to water quality. The Great Lakes Water Quality Agreement establishes the overall environmental goal: "restoring the chemical, physical and biological integrity of the waters of the Great Lakes Basin Ecosystem" to achieve healthy populations of plant, fish, and wildlife populations and to protect human health. The Agreement mandates the protection and restoration of habitats vital for the support of healthy and diverse communities of plants, fish, and wildlife, with an emphasis on interjurisdictional fish and wildlife habitats, wetland

habitats, and those habitats needed by threatened and endangered species. Further, the GLWQA recognizes that in order to restore the biological integrity of the Great Lakes Basin Ecosystem self-sustaining populations of fish and other aquatic organisms must be protected (USEPA 1992; GLWQA 1987). Finally, the institutional mandate and structure of the GLFC enables it to collaborate and generate deliberations that identify interrelated components of the “fish system” and thereby determine catch limitations based on the needs for restoration and the health of the ecosystem. The focus, therefore, in collaboration with the IJC and the federal, provincial, and state agencies with responsibility for fisheries is on the common goal “...to sustain the functional integrity of ecosystems while producing desired resources and environmental services; any practices contrary to that goal are viewed as illegitimate” (Prelli and Becker 2001, 481)

Thus the goals and objectives extant under the GLWQA governance regime appear to have had multiple goals and objectives that embraced human dignity (via human health and greater access to decision-making) and that placed a premium on the integrity and resilience of ecosystem functions. Again, the goals and objectives may be satisfactory and sufficient, if achieved, to foster a sustainable governance system. The achievement of these goals, however, relies upon the Parties to the GLWQA. An examination of the trends of public participation, public outreach efforts, and toward the restoration and protection goals of the GLWQA will help determine whether progress is trending toward those goals.

Describing Trends. In order to assess the trends for the governance regime under the GLWQA, it is necessary to view the situation from the perspective of a time traveler transported to the late 1960s. Trends need to be examined in the context of what became

known to participants in the governance system under the GLWQA, its amendments, and the 1987 protocol, through the early 1990s.

The trends task in an ideal ecosystem-based approach to governance has been discussed and may be characterized by:

- 1) Collaboration and the use of reliable methods and data in order to measure whether socioecological variables are moving closer to, not away from, goals,
- 2) The open and transparent communication of the progress and trends data to policy makers and to an informed public with significant opportunities for community members to be involved with scientists in the assessment of trends using local knowledge and local preferences (Table 25).

Table 25 Describing Trends

Ecosystem-based Approach	GLWQA Governance
<p>The use of reliable methods to measure whether a suite of socioecological variables are moving closer to, not away from, goals established with significant input from community.</p>	<p>1972 GLWQA successful at stemming eutrophication due to phosphorus overloading. PLUARG key in expanding later agreements to include land-based activities. Emphasis in later GLWQA amendments and protocol shifted to toxic contamination. Collaborative efforts between IJC, WQB, SAB, GLU, GLBC, and the Lake Michigan Federation work to identify problems and sources and put pressure on toxics issues. Great Lakes Fisheries Commission collaborates with SAB and IJC on water quality, habitat, and fisheries issues. Introduction of Pacific Salmon as experiment rebuilds fish populations in the lakes. Trends show increasing threats from toxic contaminants.</p>
<p>Open and transparent communication of the progress and trend data to policy makers and to an informed public through frequent meetings, accessible information, and other techniques.</p>	<p>GLWQA emphasis on cooperation and collaboration with interlocking directors, citizen participation on boards and panels, biennial public meetings, active NGOs, IJC biennial reports and other publications. Biennial "state of the lake" reports published with assistance from citizens and NGOs. GLIN on-line resource established in 1998 creating public access to data, assessments, publications, and reports relevant to the GLB. Use of GLT and other NGOs for public education and outreach to create a knowledgeable base of "citizen scientists."</p>

In other words, trends are examined in terms of the movement of governance toward a more participatory and holistic ecosystem-approach; and whether the socioecological trends are moving toward more sustainable and resilient ecosystem functions.

As the previous chapter discussed, during the PLUARG process under the GLWQA, there was open and transparent communication by the IJC and its Boards to a public made more knowledgeable by extensive and effective outreach efforts. There was also laudable opportunity for community members to be involved with scientists and regulators in the assessment of trends through panel meetings, regular annual (then biennial) meetings of the IJC, and participation of knowledgeable citizens on IJC Boards and panels (IJCIRG 1978). The question that remains is whether there was evidence that trends moved closer to, not away from, the goals the period examined by this research.

The trend toward public action and participation under the PLUARG and UGLR processes, a trend that made the 1972 GLWQA and, to some extent, the 1978 amendments possible, began to fade after the 1978 amendments:

Unfortunately the IJC and the Parties 'dropped the ball' and never took advantage of the PLUARG's potential. The Commission failed to make use of the pool of expert and committed citizens to monitor the Parties' actions in response to the IJC's recommendations. The Parties failed to respond directly to the Commission's PLUARG recommendations in any formal way, although amending the Agreement in 1978 to formally adopt an ecosystem approach could be interpreted, in part, as a response. The Parties also failed to allocate resources to the IJC for follow-up on the public consultation process in PLUARG. Further, the knowledgeable citizen veterans of the PLUARG initiative didn't see any direct and substantive results in the GLWQA compliance activities of their own governments in response to the Reference Group's report. As a result, the citizens lost a certain amount of faith in the ability of both the IJC and the



Parties to work collaboratively with their constituencies. This 'critical mass' of advocates for early and decentralized implementation of the ecosystem management aspects of the 1978 Agreement was not cultivated further and the momentum was lost (Becker 1993, 248 - 249)

The 1978 Amendments to the GLWQA did not end public involvement in the Great Lakes Basin governance scheme, however. Great Lakes Tomorrow, the non-profit group headquartered in Hiram, Ohio, that had taken such an active role in public outreach and education throughout the basin, was kept busy and, among other projects, was asked to conduct a workshop in 1983 supported by the IJC, the Great Lakes Fishery Commission (GLFC), and others. The purpose of the workshop was to facilitate the movement toward the ecosystem approach mandated by the 1978 Amendments. Attendees included Commissioners and staff of the IJC, major corporations, foundations, local and regional elected officials and others. After identifying potential obstacles to its attainment, including rationalist thinking and lack of holistic perspective, the participants drafted a set of 33 strategies for implementation (Becker 1993).

Public participation thereafter began to coalesce more within established environmental organizations. The Lake Michigan Federation became an umbrella for most of the groups around Lake Michigan, while advocating for Great Lakes Basin-wide issues on behalf of its members. Another group, Great Lakes United (GLU), was formed in May, 1982, in a now mildly famous emergency gathering on Mackinac Island funded by the Joyce Foundation and arranged by agreement between "Save the River," from the Thousand Island region of New York and the Michigan United Conservation Clubs (MUCC). The purpose of the meeting was to consider MUCC's proposal to form a "Great Lakes Federation" and was attended by representatives from the UAW as well as

staff and members of local and national environmental organizations. GLU was formed and played a huge role in the negotiations for the 1987 protocol amending the GLWQA (Francis 1990). Convening some 19 citizens' hearings around the basin in 1986, the GLU ultimately published "*Unfilled Promises*," a report that called for faster and stronger measures to stem toxic contamination and laid out the argument for greater involvement of the public and more accountability for governments under the agreement. GLU also played key roles in organizing its binational membership to play roles in IJC's biennial meetings, and in fact meets once a year to develop consensus for positions to be advanced to the IJC (Botts and Muldoon 2005).

The extent and influence of public involvement in the governance of the Great Lakes Basin under the GLWQA has waned from the intense days after the original 1972 agreement and before the 1978 Amendments. While citizen involvement remained a potent force in many ways, the momentum built by the PLUARG and ULRG efforts was diminished somewhat following 1978. The trend after the 1987 protocol was for the greater participation of NGOs, mostly those national environmental organizations that had begun to join the movement in the 1980s. They were joined at biennial meetings of the IJC, starting in 1989, by numerous (and sometimes raucous) grassroots organizations concerned about toxic contamination. Their presence transformed IJC biennial meetings from dry exchanges of information into major demonstrations of public opinion. "The increased activism enhanced political support for the Great Lakes programs and led to new, strong U.S. legislation in support of the agreement in the United States, and to major policy developments in both countries" (Botts and Muldoon 2005, 136).

There was, however, still a governance regime, with two powerful governments linked by the GLWQA and a fragmented, multi-jurisdictional domestic legal scheme presiding over the binational Great Lakes Basin and its watershed. How well did governance perform? Were socioecological measures moving in the direction of goals?

The general goal agreed to by the Parties to the GLWQA for the Great Lakes through the 1987 Protocol is to "restore, and maintain the chemical, physical and biological integrity of the waters of the Great Lakes Basin Ecosystem (1987, Article II)" The ecosystem is defined as "the interacting components of air, land, water and living organisms, including humans, within the drainage basin of the St. Lawrence River" (1987, Article I (g)). As we have seen additional goals called for the protection and maintenance of self-sustaining fish populations and aquatic organisms and for protection and restoration of habitats vital for the support of healthy and diverse communities of plants, fish, and wildlife. The water quality trends will be examined first.

More specific goals and implementation strategies set forth in the GLWQA evolved through the 1972 Agreement, the 1978 Amendments, and the 1987 Protocol. The 1972 Agreement was concerned mainly with the elimination of phosphorous inputs via water treatment facility upgrades and a phosphate detergent ban. It also provided that the discharge of toxic substances in toxic amounts was prohibited, and the list of toxic substances has grown to over 400 in the 1987 Protocol (1987, Article II, Annex 10, Appendix 1-2), was prohibited. The 1978 Amendments included revised and more stringent water quality target loadings for phosphorous (1987, Annex 3). Since the PLUARG studies demonstrated the connection between water quality and land-based nonpoint sources the IJC, after a preliminary meeting with the GLFC, endorsed the

ecosystem-based approach for inclusion in the 1978 amendments. Finally, the 1978 Amendments introduced 'virtual elimination' as either a goal or philosophy.<sup>19</sup>

The demonstrated trends pertinent to this litany of goals and objectives have been mixed. Recall that the primary culprit for eutrophication and algae growth in the lakes, especially Lake Erie, was phosphorous. The primary purpose of the initial 1972 GLWQA was to reduce phosphorous and improve waste water treatment. This was largely based on a 1970 report in which the IJC highlighted the serious pollution problems in the waters of Lakes Ontario and Erie and the St. Lawrence River which was causing injury to health and property. The report also noted that 70% of the phosphorous in U.S. sewage and 50% of the phosphorous in Canadian sewage originated from detergents and recommended improved sewage treatment by municipalities and industry and a reduction in the phosphorous content of detergents "to the maximum practicable extent at the earliest possible time" (IJC 1970) As one member of the of the Research Advisory Board at the time described the situation in Lake Erie:

There was just severe gross pollution. There was nothing subtle about it. And then the lower lakes had all of the eutrophication as one form of nutrient enrichment, so they had all that to deal with, and that was pretty gross when you look back at it now. (Canadian Academic 1)

In fact, untreated sewage pouring into the lakes had been a problem for decades, as the following recollection from a former SAB member illustrates:

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<sup>19</sup> There is disagreement. Article II(a) of the GLWQA states: "The discharge of ... any or all persistent toxic substances be virtually eliminated..." while, at Annex 12(2)(a)(i) the GLWQA sets forth: "The intent of programs specified in this Annex is to virtually eliminate the input of persistent toxic substances in order to protect human health and to ensure the continued health and productivity of living aquatic resources and human use thereof..."

In 1943, as a thirteen year old swimming in Lake Ontario, just west of the mouth of the Niagara River, Four Mile Creek. Four Mile Creek was a famous well-known, very productive seining site. In 1943 we were swimming in Lake Ontario, my family had moved there, and at that time, soon after that they started urging people not to go into the lake because of polio, and it was the raw untreated sewage coming down from St. Catharines. I knew people who got polio. So Lake Ontario was a dangerous place. (Canadian Academic 2)

Over strong opposition from the Soap and Detergent Association, led by Proctor and Gamble, the IJC adopted strong phosphorous abatement recommendations in the 1972 GLWQA. Citizens and environmental advocates then pressed their state and provincial lawmakers to implement strict limitations through legislation. One by one Ontario and the states passed laws requiring the removal of phosphates from detergents. The USEPA reversed its previous stand and in 1977 joined with the IJC and its Water Quality Board to recommend that all states in the Great Lakes Basin adopt a detergent phosphate ban (USEPA 1977). The movement toward improved water quality received a boost from the provisions of the Clean Water Act that paid for 75% of costs for municipalities to improve their waste water treatment (1972). Spending on treatment plant projects in the Great Lakes alone exceeded \$8 billion from the late 1970 to the 1990 (USEPA 1991). As a result of these measures, by 1991 the USEPA was able to report to the U.S. Congress that nutrient levels in the Great Lakes Watershed had significantly diminished, and that “[t]he two nations have achieved a world-class success in abating nutrient-related algae problems in Lake Erie. Levels of many targeted contaminants have declined drastically in fish and wildlife, resulting in clear improvements in the health of many species” (USEPA 1991, i)

One key member of an NGO in the Great Lakes at the time described the impact of the GLWQA on water quality:

Q: Why do you think...when you say it was successful of the GLWQA process, what happened that made you think it was successful? What changed? Did the Great Lakes get cleaner? Did the water quality improve?

A: Yes. The water quality improved. For one thing, when we started, you could smell it, see it, and taste it.

Q: There's a correlation...there's a cause and effect between the agreement and the cleanup?

A: Oh yes. Absolutely. Because, the agreement at that time was so essential in driving action and the allocation of resources to build strategic plans, we had planning going on all over the basin for dealing with the point source stuff, you had all kinds of action on the part of both citizens and politicians on getting the phosphorous detergent bans. (US NGO/Academic)

While the waters of the Great Lakes visibly improved in a relatively short period of time, and basking in the glory of these improvements, additional monies poured in for Great Lakes research and monitoring. From 1975, the annual full RAB report was supplemented by increasing numbers of separate reports describing a proposal to combine the study of the structure and activity of persistent bioaccumulative toxic contaminants. As early as 1975 a monitoring and surveillance plan was in place to monitor the lakes, their tributaries, and other areas for pollutants, including persistent toxic substances (IJCWQB 1975). Reports thereafter began to express a growing concern about the number and extent of discoveries of toxic contaminants (IJCIRG 1978; USEPA 1980a). These discoveries were being made at about the same time that newspapers were trumpeting stories of Michigan dealing with the contamination of water supplies by polybrominated biphenyls (PBBs). Further groundwater contaminated with toxic

substances were being found in Great Lakes states, raising additional concern about preservation of the water quality in the lakes as a future source clean drinking water (Colburn, Davidson et al. 1990). When high levels of PCBs were found in fish tissue from a small lake on Isle Royale in northern Lake Superior it became obvious that chemicals were being transported long distances through the atmosphere as there were no other possible sources in this location. The RAB report also set forth the number of chemicals found in the Great Lakes that were persistent organic compounds and pointed out their ability to bioaccumulate. By the late 1970s nearly a thousand chemicals had been found, “though the list for priority action would be refined to 11 criteria substances” (Botts and Muldoon 2005, 47). Thus water quality trends in the Great Lakes were a mixed bag. Pollution due to nutrient overloads had vastly improved in a short time while, during the same time, monitoring efforts were revealing the existence of persistent organic compounds, including PCBs and PBBs in sediments and fish tissue, was escalating. As one individual involved in the RAB investigation at the time put it:

...they [had] made good grounds in cutting the phosphorus out of the water, and cutting back on eutrophication, and of course we've started finding more toxic contaminants of various kinds, and at least they tried to deal with them as they came across them as best they could, but then the more they got into...or agencies got into looking into the water and the sediment and the fish, the more they found, and of course as the detection levels became more sophisticated in the more you can find. So that threw it into the whole mode of trying to deal with toxic contaminants, and particularly in trying to identify the key ones, the ones that are known to be widespread within the lakes, and also have biomagnification properties and therefore potential for health effects. It revealed first in fish and wildlife, but then there's some sense that there may be some human concerns. So that evolved through the '80's and '90's... (Canadian Academic 1)

Thus the growing toxic contamination became the focus of the efforts of the IJC through the 1978 amendments and the 1987 protocol, including the call for “an ecosystem approach to management” based on “virtual elimination” of toxic contaminants (GLWQA 1987).

The trends in water quality in the Great Lakes have, like the trends in public participation, waxed and waned. The binational approach to governance so essential to achieving the goals of the GLWQA has deteriorated over the last 20 years (Jackson and Sloan 2008). The critical engagement of the public in Great Lakes issues and the accompanying sense of community has also largely fallen away over the same period (Krantzberg, Manno et al. 2007). But what about healthy fish populations – another important indicator in a region devoted to clean water and healthy ecosystems?

Stories of the bounty of Great Lakes fisheries in the 18<sup>th</sup> and 19<sup>th</sup> centuries abound. Boat loads of sturgeon were not uncommon near the Wisconsin shore where they were treated as nuisance fish and cast aside to die after being pulled from nets. When their value for caviar was discovered, the few remaining sturgeon were decimated. In the early 19<sup>th</sup> century boatloads of trout were not uncommon around Sault St. Marie. By the mid-1880s that commercial fishery had all but disappeared. In 1830 the Maumee River in Ohio was famous for its abundance of fish – some thirty odd varieties, including “[m]askinonge, pike, white and black bass, and catfish were caught, salted and sold fresh each year for food, amounting to some thousands of barrels yearly” (Dempsey 2004, 38) Landlocked Atlantic salmon, once prolific in Lake Ontario, were extirpated by 1903. Finally, whitefish, the delectable staple of Great Lakes commercial fishing, began to decline precipitously, with whitefish harvests falling from 24.3 million pounds in 1879 to



9 million pounds in 1899 (Dempsey 2004; Gaden, Krueger et al. 2008). The story of the demise of the whitefish fishery bears resemblance to many other similar stories around the globe:

The stunning advancement of nets and fishing gear, as well as the increasing number of commercial anglers, fueled ever-growing fears about the fate of the fishery. In the early 1800s most fishing was conducted close to shore and fish caught were sold to local markets. But the second half of the nineteenth century revolutionized fishing techniques, enabling harvesters to target more species, capture fish in deeper waters, and fish during a greater portion of the year (Dempsey 2004, 42)

Not surprisingly, the decline in whitefish caused attention to turn to lake trout and hearing. More elusive and greater populations kept this fishery robust well into the twentieth century before collapsing (Dempsey 2004). But, as a former Commissioner of the GLFC notes in this exchange, fishers in the Great Lakes can be persistent:

A: There's always been active commercial fishery on the Canadian side. On the U.S. side, [three] things caused the commercial fishery to go downhill fast. One of them was unionization of the fishermen. And secondly it was the sportfishermen. And the third one was the environment. A small commercial fishery still persists on the U.S. side.

Q: The commercial fishery in Canada was it for walleye?

A: Well, the blues but they disappeared, and then the walleye. And smelt was pretty important. Not necessarily on the US side, but the Canadian side in particular. The trawling that was done then and with strong federal subsidies, the smelt fishery was really quite effective for a long time. It wasn't as lucrative as, comparatively speaking, as the white fish industry. The walleye was never as important on the Canadian side as it was in the U.S. But they were important. And yellow perch came along. Yellow perch and walleye, particularly, were preadapted to succeed reasonably well in a highly eutrophic environment. They are preadapted to the way Lake Erie became. (Canadian Academic 2)

Unfortunately, the few lake trout and whitefish that survived until the 1930s became targets of lamprey eels, an invasive species that made it through the Welland Canal from the Atlantic and lived by feeding on fish – attaching themselves to the body of a larger fish and slowly draining them of life (Ashworth 1987). By the time that Canada and the U.S. ratified a Convention that created the Great Lakes Fisheries Commission in 1955 it was estimated that lake trout production was 99% lower than the average annual commercial catch in the 1930s. Commercial fishing was history. Sport fishermen abandoned the lakes (Dempsey 2004).

To add misery to the Great Lakes situation, a small silver fish, the alewife, began to sweep into the Great Lakes. Although it was forage for larger fish when there were larger fish, after predator populations crashed with the lamprey eel invasion, the population soon exploded in size. One of their most memorable traits was the mass die-off that occurred every spring, starting in the 1960s, when water temperatures began to rise. It was in response to the alewife issues that Michigan sought and received permission from other Great Lakes states and Ontario to try a field experiment. Thus in 1966 they released some 650,000 Coho salmon smolts into rivers around Lake Michigan and crossed their fingers. The same fall, young salmon returned to their streams of origin, filling the heads of recreational fishermen with dreams of a salmon fishery. The autumn of 1967 was better than anyone had could have dreamed (Dempsey 2004).

Salmon fought ferociously when hooked and, from personal experience, earned those who landed one bragging rights on the pier or back at the dock. Needless to say a powerful recreational fishing industry developed around the Coho and Chinook salmon introductions. Lake trout are now not an uncommon catch in the lakes as well.

Some disagree with the methods used, considering the introduction of salmon as simply unleashing another invasive species. Many, especially on the Canadian side of the lakes, thought that more effort should have been put forward to restore self-sustaining stocks of native fish. It was their belief that the introduction salmon was just another invasive species that crowded out lake trout and whitefish (Dempsey 2004). A former member of the Science Advisory Board as well as an advisor to the Great Lakes Fisheries Commission explained the different salmon introduction perspectives to me this way:

**Q:** What about the introduction of salmon...coho and chinook, good idea?

**A:** Well it represents just a different notion of what fisheries is or even what the lakes are, you could argue, and at one time there was a little bit of a difference of views I'm told that was told between the people coming from one side of the lake or the other. It's a good idea if you just use the lakes as essentially a holding tank, and you have plenty of put and take fishery, which creates economic benefits for the marina owners and all the other people that live in these little towns that are all upstate in terms of the geography of the jurisdiction. So you have these little upstate towns, you've got a little tourism going on, and everybody's happy and it seems to work. For a long time the people in Ontario Ministry of Natural Resources really much preferred to have self-sustaining stocks of native species. And they only wanted to put that as what we should be aiming for and that's where the lake trout come in was going to be the icon fish. And you can see that difference a little bit in some of the wordings in the visions for the Great Lakes that come out of the fisheries commissions, something like yes, they want self-sustaining stocks and so on with these fish, but one word in there, something like "judicious planting" that someone who is a lawyer might enjoy it, these visions statements that come out of these fisheries commissions. Which I think is a sense of saying okay, we agree to disagree. And then I suppose if you catch a fish where you put them in that would seem all right, but they don't always stay there. I used to spend a lot of time around Long Point on the north shore of Lake Erie. There's a tremendous sense of place there. Some of those Pacific Salmon used to spend the summer in the deep water right off the end of that point. So, locals would come out with their charter boats or their own boats, just around the villages around there at Long Point, and

they would catch these fish. The Americans put them in, we pick them up, and it seems like a sense of justice. (Canadian Academic 1)

Thus the demise of the Great Lakes fishery that included lake trout and whitefish from the 1800s through the 1960s was countered with a somewhat daring experiment by planting Pacific salmon. They took. Healthy populations of Pacific salmon flourished, foraging on alewife and other available food sources.

The recreational fishing industry in communities around the Great Lakes boomed. The emerging surprise, however, was the discovery that salmon and other fish had accumulated persistent toxic compounds in their tissue.

The first sport fish advisory was issued in the Great Lakes in 1971 for people consuming fish caught from the lakes (Fuller, Shear et al. 1995). Thus while there were populations of sport fish making themselves a new home in the Great Lakes, it would be a stretch to label them 'healthy' populations. Again we see that trends wax and wane. Increasing the biomass of recreationally popular sport fish only to discover that the flourishing populations had become indicators of the toxic contaminants in the Great Lakes was perhaps a mixed blessing. Time will tell.

Conditions. In an ideal system, condition analysis should be part of an iterative effort by scientists and community members to determine the causes or factors influencing trends. Resources should be available to permit scientists and others to sort out the various environmental signals and determine what conditions are factors in any negative ecosystem trends. The inquiry, however, should not be limited to ecosystem factors. Trends can be affected by the individual and institutional effects of economic activity. Thus special interest activity that detracts from the common interests of resilient

ecosystems may give rise to conditions that need to be investigated and, if necessary, abated.

The most harmful threat to the health and resilience of the ecosystem of the Great Lakes Basin under the GLWQA scheme is a possible trend away from the goal of restoring and maintaining the “chemical, physical and biological integrity of the waters of the Great Lakes Basin Ecosystem” and the fading interest in the ‘virtual elimination’ of the discharge of persistent toxic chemicals (Fuller, Shear et al. 1995; GLWQA 1987).

In order to understand the causes for the trends of increased discovery of toxic contamination in the Great Lakes Basin, as well as other positive and negative trends, any conditions analysis must incorporate not only the processes that permit collaboration and open discussion of causes and possible solutions, but the existing physical and biological characteristics of the region. As a starting point it was pointed out early in this chapter that the Great Lakes Basin was formed and shaped during the Pleistocene Epoch as glaciers sometimes 2,000 meters (6,000 feet) thick scoured the surface of the earth, retreating only to return several times. As the climate warmed, the glaciers melted, the land began to rise, and the water drained into the basins now known as the Great Lakes (Fuller, Shear et al. 1995; Grady 2007). Formed by glacial melt, only one percent of water in the Great Lakes is renewed each year by rain and snow. Roughly the same amount flows into the sea. With a flushing time from Lake Superior to the Gulf of St. Lawrence of some 600 years, pollution that winds up in the lakes mainly stays in the lakes (Botts and Muldoon 2005).

While there is no question that passage and flow through the lakes is slow, with time periods of decades to up to 600 years for a particle to pass from the innermost lakes

to the Atlantic (Dempsey 2004), the Great Lakes are not large vessels of still, uniformly mixed waters. There is movement. The lakes are large enough for the gravitational pull of the moon to cause tides in Milwaukee and Chicago of 4 – 5 centimeters (1.5 -1.8 inches) (Grady 2007). Winds can push surface waters from one side of the lakes to the other, lowering the water on the leeward shore while raising it to windward, sometimes in waves, called *seiches*, that can inundate a shore with sudden surges up 6 to 8 feet high (Fuller, Shear et al. 1995; Dempsey 2004).

In addition to the mainly horizontal effects of surface water movement, the lakes are subject to vertical mixing in nature of stratification and turnover. Essentially heat from the sun and changing seasons cause water in the lakes to become stratified, or layered. The density of water increases as temperature decreases, causing the lakes to form distinct layers in the summer months when increased sunlight warms up surface and coastal waters while deeper waters stay cool and more dense. As summer progresses, temperature differences increase and a middle layer, the thermocline, develops between the deep cooler waters and the warm surface waters (Figure 4).

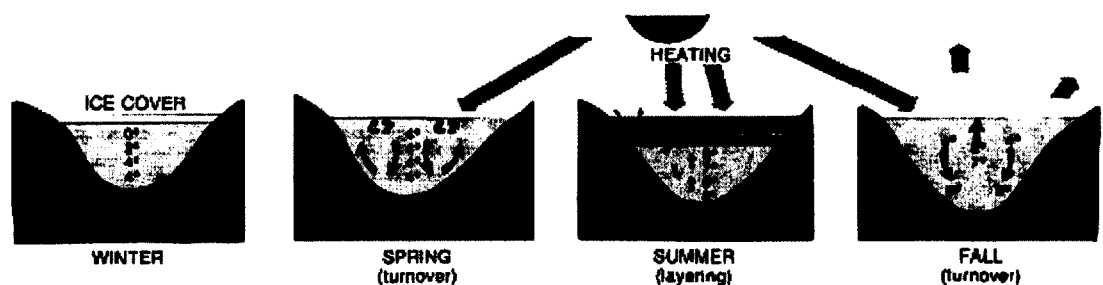


Figure 4 Stratification and Turnover

The warm surface and coastal layer is where most photosynthesis and algal production occurs. This productivity is magnified by the increased oxygen in the surface

layer due to mixing with the atmosphere. In the fall, surface waters cool and become denser, sinking to displace deep waters and causing a mixing or turnover of the entire lake. This sinking of oxygen rich surface waters to the deeper portions of the lake helps to prevent oxygen depletion, anoxia, in the lower levels (Grady 2007). Stratification in the summer months also tends to limit dilution of pollutants from land runoff and other inputs, concentrating pollution in the surface layer (Fuller, Shear et al. 1995). Another unique feature of these huge freshwater lakes is the appearance of a sharp temperature gradient, a vertical thermal bar, that prevents mixing of nearshore waters with open waters until early summer. This thermal bar concentrates pollutants close to shore until increasing sunlight allows for mixing (Fuller, Shear et al. 1995; Grady 2007).

The physical processes of the Great Lakes set the stage for the living resources that fill out the ecosystem of the region, or the “the interacting components of air, land, water and living organisms, including humans” (GLWQA 1987).

The living resources of any ecosystem begin with sunlight. Light energy from the sun is essential for photosynthesis of green plants. When sunlight and essential nutrients like phosphorus and nitrogen combine with oxygen, water, and inorganic carbon, water plants can survive. Plant material is consumed in water by zooplankton. Energy is transferred to the next step by organisms that feed on other animals (carnivores) or those that feed on both plants and animals (omnivores) (Fuller, Shear et al. 1995).

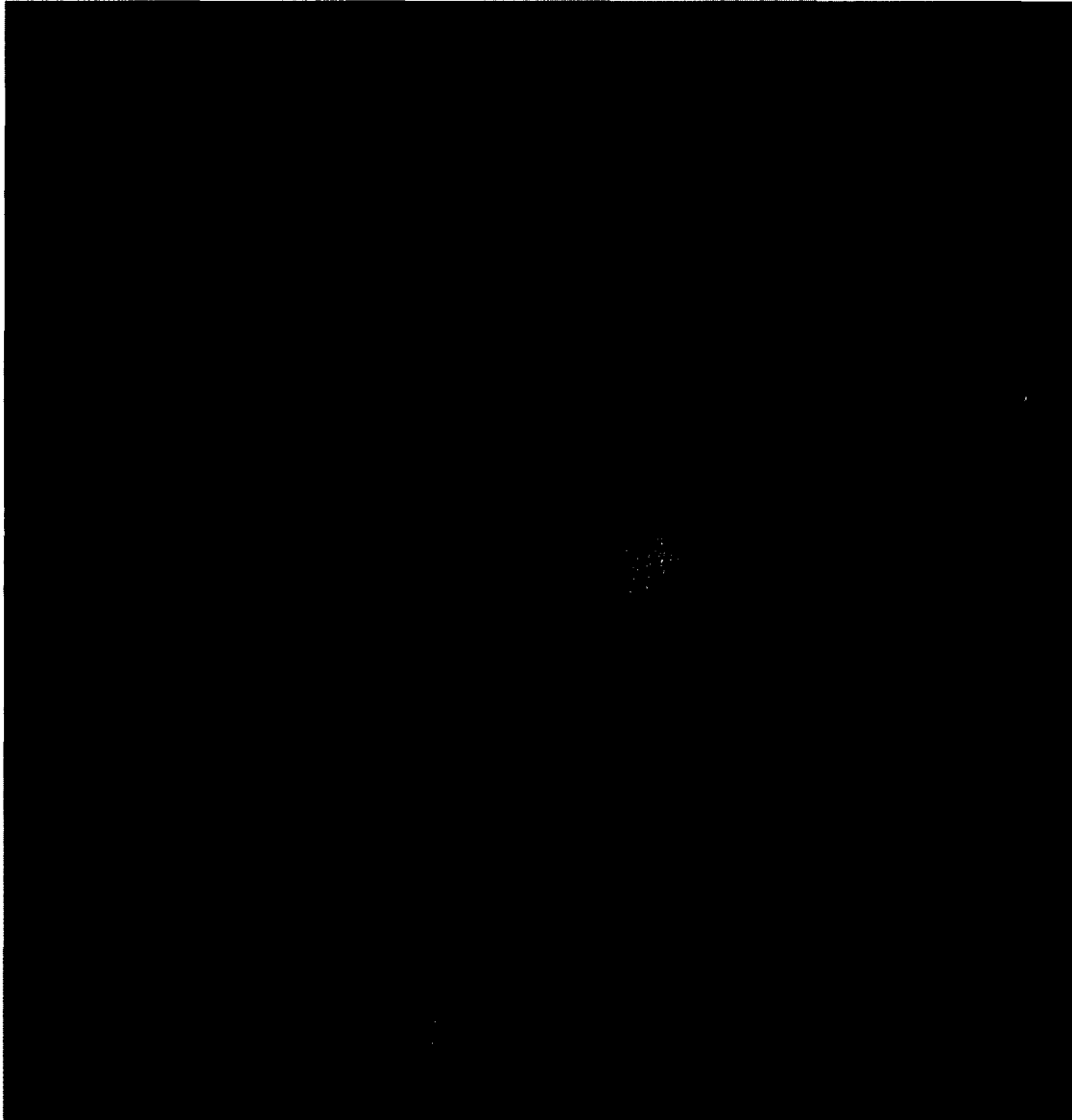


Figure 5 Simplified Great Lakes Food Web (U.S. EPA Great Lakes National Program Office)

In the Great Lakes, primary producers are largely comprised of *Rhodophyta* (red algae) and *Phaeophyceae* (brown algae). The most dominant variety of zooplankton, or primary consumer, is *diporeia hoyi*, although the invasive zebra mussel is making inroads as a primary consumer. Bottom animals such as mayfly nymphs also fulfill the role of primary consumer where the water is clean enough to support populations. Sculpin,



chub, alewife, and smelt are secondary consumers in the ecosystem, while cormorants and gulls along with the sport fish are tertiary consumers. At the top of the food chain are eagles and humans (Fuller, Shear et al. 1995) (Figure 5).

As the food web shown graphically in Figure 6 depicts, organisms at the higher trophic levels depend on the stability of the lower trophic levels in the web. If something goes wrong at lower levels, the effect at higher levels can be catastrophic. Phosphorus overloading in the Great Lakes, for example, caused massive algae growth at the bottom of the web, causing the biochemical oxygen demand (BOD) created by decomposing algae to threaten the survival of the entire web (Colburn, Davidson et al. 1990).

The food chain also demonstrates that some substances introduced into the food

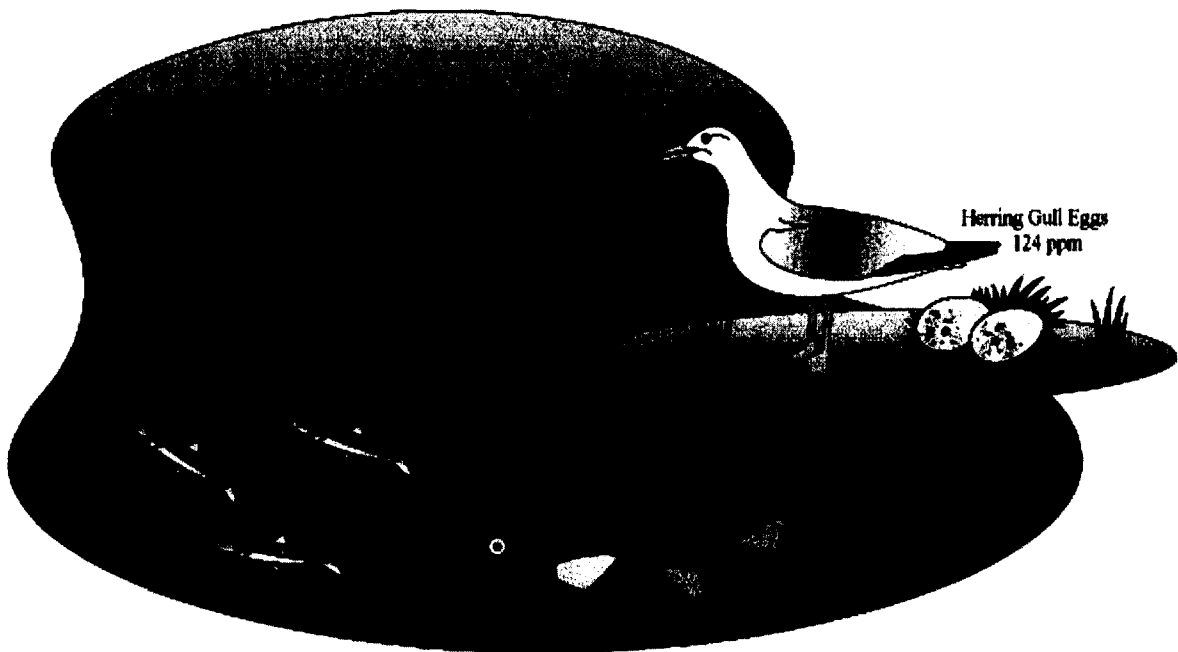


Figure 6 Bioaccumulation (EPA Regional Office)

chain can get consumed or absorbed and are retained in their tissue. The organism that consumes the substance is then consumed by predator in next higher food chain, and so

on. As this process continues up the food web, persistent organic substances become increasingly concentrated, or biomagnified. The GLWQA (GLWQA 1987) requires the Parties to maintain a list of substances known to have toxic effects and to continually revise the list as new substances become known. The Agreement also requires the Parties to monitor the lakes for the presence of persistent toxic substances (GLWQA 1987)

While a certain amount of dynamic change may be expected of any ecosystem (Gunderson and Holling 2002; Holling, Gunderson et al. 2002), humans have forced a great many unnatural changes on ecosystem dynamics in the Great Lakes. Overfishing,



Figure 7 Sources and Pathways of Pollution (EPA Regional Program Office)

habitat destruction, and invasive species nearly destroyed most native fish species.

Pollution, in the form of nutrient loading and toxic contaminants add stress to fish

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Pollution, in the form of nutrient loading and toxic contaminants add stress to fish

populations and may pose threats to human health (Fuller, Shear et al. 1995; Carson 2002). The Great Lakes, being very nearly a closed system, manages to accumulate pollutants from a variety of sources that ultimately enter the lakes in any number of ways (Figure 7). The conditions are almost ideal for the continued escalation of pollution, especially persistent toxic chemicals, in the Great Lakes Basin. As a former president of the American Fishery Society stated:

...if you think of it as a great river, and the lake's a great whirlpool, then it's kind of a watershed phenomenon, and what can threaten a watershed? Change in that watershed is a big thing. Things that can be concentrated downstream as a result of water: contaminants, nutrients, stuff like that. Land use practices generally, lots of different aspects of land use practices impact downstream. So, the whole...it's...when you take a watershed approach and seeing it as a river, that kind of focuses for me a regional thing, and then what kind of things are the river's behavior actually predisposed. (Canadian Academic 2)

An examination of conditions must not be limited to the natural ecosystems, and their potential for degradation, however. While the sections above have outlined some of the most significant natural processes, their susceptibility to further degradation, and detailed some of the more relevant legislation that have attempted to control and alter the behavior of humans toward their environment, the analysis of overall conditions requires us to look at the more general socioeconomic situation extant in the Great Lakes Basin.

Over the last century or more citizens in the Great Lakes Basin have seen several sides of a dynamic Great Lakes Basin ecosystem. Clear, clean water with a variety of healthy flora and fauna have changed when fish stocks have collapsed and beaches have become clogged with dead fish, oil, grease, debris, and ugly foam. Shoreland has been transformed in many cases from forest and wetland to golf courses, marinas, factories,

and homes. Legislation and regulation have helped to stem some of the abuse, but new threats continue to find a home in the Great Lakes Basin. The changes and trends over the last century have, however, been related to decisions made by officials in Washington D.C., Ottawa, and the capitals of one province and eight states. Well known Great Lakes historian Dave Dempsey (2004) captured the essence of these trends when he wrote:

While the multiplying problems of the last decade can be traced in great measure to a growing gulf between citizens and their governments, there is nothing unique in kind about this period. A close look at the history of the Great Lakes since the mid 1800s reveals that the same governments have always done only what the public permitted, or pressured, them to do. When exploiting the lakes for immediate riches seemed the wisest course, when the struggle for survival distracted the public, or when the faith of the electorate flagged in the ability of governments to solve the problems of individuals as well as the collective, the lakes frequently deteriorated. But when the full-throated voice of the citizen rang true, both individually and in great numbers, the lakes recovered (Dempsey 2004, 3)

In terms of this research, it is abundantly clear that common interests only prevail over special interests when the voice of the people collectively demand that the 'powers that be' rise in the face of pressure from single or special interests to act for the public good.

In truth, the pressure brought to bear on behalf of economic special interests since the early 1970s has been compelling. Once known as the manufacturing heart of America, the Great Lakes region is now better known as America's 'rust belt'. It has historically been the manufacturing center of the North America. Consider for a moment that in 1955 4 out of every 5 cars in the world were made in the US – mostly in the region in and around Detroit and northern Ohio. The combination of globalization and the oil crisis of the early 1970s, however, made smaller cars the rage. Innovation was left in the

dust as US manufacturers refused to consider changing costly and comfortable assembly lines. The economy of the manufacturing heartland went into a tail spin as the many industries that relied on automobile manufacturing, including parts manufacturers and steel mills felt the pinch. Flint, Michigan, for instance once had 100,000 workers employed by General Motors. In 2007 that number was down to 6,000 (Schifferes 2007). The water quality of the Great Lakes was not a priority to policymakers. Indeed, one individual involved in the evolution of the GLWQA believes that much of the initial success of Agreement was due to the economic meltdown in the region:

In the absence of deindustrialization the [the] water quality agreement would have never got off the ground. If Cleveland and Lackawanna, there's a big steel complex there, if these hadn't decided to deindustrialize, like Gary Indiana, also, back in Lake Erie, in the '50's and '60's there would have been trouble. (Canadian academic 2)

The economy in the rust belt did not improve from the 1970s through the 1990s. Neither, as we've seen, after the initial success of the phosphorus removal and water treatment plant upgrades of the 1970s, has the environment in the region (Dempsey 2004). When employment plummets and residents struggle to survive, it is difficult for governments to feel that water quality is a priority.

Thus when the ecosystem health in the Great Lakes is an issue, it must be remembered that the GLWQA documents are simply agreements between Canada and the U.S., known in diplomatic parlance in the documents as the "Parties." The Parties are in fact two sovereign federal governments who, by agreement, established the IJC as an entity with limited jurisdiction designed to supervise the observance of obligations assumed by treaty under the 1909 Boundary Waters Treaty (1909; Caldwell 1988). Both

Parties are, however, comprised of many different government agencies, each being pressured by often powerful, and sometimes desperate, special interests, which can override environmental prudence. To put it another way: The US and Canada together with “[t]he eight states and Ontario are answerable primarily to their own constituencies. So who speaks for the lakes? Hardly the governments” (Caldwell 1993, 20) .

The debilitating economic story in the Great Lakes region had operated to put a damper on measures that might be protective of the ecosystem. As a general rule, the conditions relating to the willingness of federal and state agencies to lead with innovative or environmentally enlightened efforts also waned after more conservative governments took the reins in both Canada and the U.S. in the 1980s. In the United States, President Reagan abruptly dismissed all three of the IJC Commissioners from the U.S. within two months after taking office. Abandoning the previous practice of appointing qualified candidates who were not replaced with every change in the presidency, Reagan appointed two individuals who had been state campaign chairmen in the election, and a third who was a former Republican congressman from New York. His administration also disbanded the Great Lakes Basin Commission, whose role had been to coordinate federal and state government agencies on matters related to the Great Lakes, and reduced funding for university and agency research and for regulatory programs. On the Canadian side, Brian Mulroney took office and promptly named political allies to the Canadian posts. None of the new commissioners from either side had any prior experience with Great Lakes issues or knowledge or understanding of the traditions that were critical to the IJC’s status as an independent advisory body committed to binationalism (Botts and Muldoon 2005). Or, as one commentator noted: “Observers inclined to cynicism see the

IJC today as a front for politically conservative governments that have no real commitment to the water quality agreements” (Caldwell 1993, 20).

An influential government regulator in the Great Lakes region put it another way:

You also have the phenomenon I believe that started in the 80’s with the Reagan administration where government was declared to be, for reasons of political expediency, the enemy. That message was, I think, conveyed, and trumpeted by more and more people who found it politically expedient to just say, very cavalierly, that government is an obstacle, government is interference with your rights, government doesn’t serve you, it harms you. I think we’ve had a generation or so of that kind of attitude that really has sort of affected public perception, public beliefs, and ultimate public values. (U.S. State Employee 3)

Apparently, the weakening and marginalization of the powers of the IJC was not cause for grief with the U.S. agencies with jurisdiction over components of the Great Lakes ecosystem:

The preference for partially decentralized implementation through duly constituted conventional units of government has been perceived by some observers as a bias of relatively conservative administrations in Ottawa and Washington against centralized regional governance and institutional innovation. This bias, to the extent that it exists, is congenial to the line agencies, especially in the United States. The United States Army Corps of Engineers, the Environmental Protection Agency, the Coast Guard, the National Oceanic and Atmospheric Administration, the Departments of Agriculture and Interior, and the Department of State would hardly act in character if they welcomed the growth of a coordinative authority for the Great Lakes to which their own planning and decision-making might be subordinated (Caldwell 1993, 18)

In the final analysis, the documents, committees, boards, and transparency of the IJC allowed for the existence of collaborative research, monitoring, and progress on environmental issues. In our ideal system, materials indicative of ecosystem trends are present and available. There are positive indications that a process for collaboration and



basin-wide cooperation existed even after neoconservative attempts to thwart the GLWQA *esprit de corps*.

There are still research laboratories in the region dedicated to the study of the natural processes at work in the Great Lakes Basin. NOAA maintains the Great Lakes Environmental Research Laboratory (GLERL) in Ann Arbor. The USGS has responsibility for the USGS Great Lakes Science Center, with a mission of “Advancing scientific knowledge and providing scientific information for restoring, enhancing, managing, and protecting the living resources and their habits in the Great Lakes basin ecosystem” (USGS 2011). The Great Lakes National Research Laboratory is run by the EPA. In Canada, the Canada Centre for Inland Waters, maintained by Fisheries and Oceans Canada (DFO), staffs the Great Lakes Laboratory for Fisheries and Aquatic Sciences. There are numerous universities in the basin and beyond who work on Great Lakes issues. They are all linked through the Great Lakes Information Network (GLIN), an internet web site that permits participants and the public to access data and articles that have been published relevant to the Great Lakes. In addition, the International Association of Great Lakes Researchers (IAGLR) is an active binational organization of Great Lakes Researchers, scientists, regulators, NGOs, citizen and watershed groups, First Nations, and others, which publishes a monthly journal and holds annual meetings open to participation and presentations from all researchers, NGOs, watershed groups, and interested parties. Thus the scientific community has maintained a spirit of cooperation, certainly stronger during the early years, but still in existence and still apparently a galvanizing force for researchers in the region.

There is, however, an underlying trend in the economics and political developments since the 1970s. The divisive forces that undermined the IJC traditions in the 1980s have played a role in attempting to return the Great Lakes region to governance by traditional fragmented scientific and governmental units. Budgets for research and collaboration have been slashed. As one regulator familiar with the evolution of the environmental regulatory scheme in Michigan described it:

Q: No, you misunderstood. I meant, the political pressure, the backlash, has to be a practical... is it a practical impediment to doing...

A: To doing our jobs? To carrying out our missions? Yes, absolutely, it's more than that, because it's...in Michigan, here's what happened. In order to respond to the articulated dissatisfaction with the time it takes to issue a permit within the state, two years ago the legislature modified our environmental code to require that, if we didn't issue a permit declaring application administratively completed within 30 days and issue it within a timeline, which can vary under program, then we had to refund a portion of the application fee, which had the following consequence: When we have fewer people to issue more permits and more authorizations, which is our current status quo, we have this self-fulfilling prophecy of being unable to meet our mission. Fewer people, fewer resources, requirements by law to make decisions quicker, in fact, the consequence of doing that has led us to probably deny more permits as the intended decision deadline came, based...where prior to having this deadline imposed upon us...we had more opportunity to work with the applicants on trying to design a ... project permitting some of the programs from being a dialogue and interaction between the applicant and the regulator. So, that's one consequence. The more pernicious consequence is now we find ourselves administering an entirely new program, obviously without any new resources, and that's the permit application fee return program. (U.S. State Employee 3)

It is clear that there have been special interest efforts that have come together to dampen the efforts of a lot of dedicated people who have been trying to focus again on water quality and ecosystem health issues. The prescriptions are present in the Great Lakes governance regime to collaborate, cooperate, and, with input from the interested

public, begin to experiment with solutions to the problems that exist (Table 26). In the years since the rise of public outrage in the 1970s, however, the pressure seems to have been removed from governments, and the door has swung open for special interests to dominate over those who would advocate for the public good. These developments are examined more closely in the next section.

Table 26 Conditions

Ecosystem-based Approach	GLWQA Approach
<p>Conditions analysis is iterative with collaborative efforts by scientists and community to gain and share knowledge necessary to determine the conditions that are factors in any negative trends. Conditions analysis explores more than ecosystem factors and examines social and economic factors in order to understand whether economic or other special interests are overriding common interests and the public good. Collaboration between scientists, regulators, and citizen participants jointly work to identify causes and conditions responsible for negative trends.</p>	<p>Spirit of collaboration and cooperation between scientists, regulators, NGOs, regional commissions (GLFC, GLBC/GLC). Biennial meetings of the IJC provide opportunity for social/natural scientists, economists, regulators, NGOs, and public to exchange information. GLU has biennial meetings to develop an agenda of concerns amongst its many NGO members to take to the IJC biennial meetings. Annual meetings of IAGLR provide opportunity for presentation and discussion of social, natural sciences, economics and related issues. GLIN on-line service provides access to basin-wide information and data.</p>

Projecting Developments. This task is about the use of accurate and reliable data about trends and conditions in order to project developments in the future, even if those projections are resisted by powerful special interests. History tells us that often policy makers are knowledgeable about trends and conditions, yet are either unwilling to buck political hazards or are blocked by special interest opposition (Clark 2002).

In our ideal system, reliable knowledge must underpin the projection of developments. If trends and conditions are such that projected developments appear to take a community away from its goals, away from progress toward human dignity, and

toward a weakened, less resilient ecosystem, there needs to be a system that will reward those who bring these issues to the attention of policy makers. There also must be a way for policy makers to make adaptive changes in an attempt to reverse negative trends without fear of retribution from a system more concerned with power and wealth than long-term environmental viability. Strong public participation is a requirement for reliable assessment and projection of developments (Table 27).

Table 27 Projecting Developments

Ecosystem-based Approach	GLWQA Approach
Through regular public education and outreach, an involved public collaborates with academic institutions, scientists, and policy makers to understand reliable data and project developments.	Public education and outreach favored and recommended by IJC. IJC philosophy: people must be made aware of the existing local problems and their impact on the Great Lakes ecosystem, and be encouraged to participate in solving these problems. Also education of government officials and other decision-makers advocated and implemented via educational programs such as GLT's Decisions for the Great Lakes
With the input of knowledgeable public, scientists and policy makers can acknowledge mistakes or policy failures, learn from them, and make adaptive changes, to reverse negative trends without fear of retribution from the governance system.	Problem-solving was the focus of IJC and SAB efforts. All ideas accepted. Public input critical. Scientists and agency board members worked on problems in their personal and professional capacity – no retribution for unpopular ideas. Binationalism - focus was on the good of the GLB, not necessarily the interest of respective federal or state governments or agencies.

From the discussions above, it should be apparent that there has been strong public involvement in the governance regime in the Great Lakes Basin under the GLWQA, especially during the early years. It perhaps bears expanding on the fact that

the IJC used outreach and education groups like Great Lakes Tomorrow to educate the public about the serious issues facing the water quality in the Great Lakes. After the PLUARG panel reports were completed, we have seen that the IJC and its boards gradually left the knowledgeable public galvanized by significant involvement with PLUARG and IJC out of the process after the 1978 amendments. Thereafter, when the Parties submitted a reference to the IJC to reevaluate the issue of regulating lake levels, the IJC commissioned a study group with participation by scientists, academics, and members of the public, to examine the issue. Four of the eleven board members were from the general public and the Study Board was advised by an 18 member Citizen Advisory Committee (CAC) appointed by the IJC (Becker 1993). The public, whose participation is mandated by the 1909 treaty, was also intended to play a large role in the remediation and restoration of the 42 localized “areas of concern” identified in the 1987 GLWQA Protocol (Becker 1993).

In addition to forceful public participation, another strength of the GLWQA process in the early years was the focus on collaboration among scientists, agencies, and the public. While this topic will receive more detailed attention in the discussion on the decision process, it is important to note the IJC tradition of binationalism. In 1911, at its very first meeting after adoption of the Boundary Waters Treaty, the U.S. co-chair proclaimed that the commission members were neither Canadians nor Americans, but representatives of all the people on both sides of the border. In 1972 Charlie Ross, a commission member under five presidents, affirmed that the Commission acted as a single body, without interference from the governments of the United States and Canada (Botts and Muldoon 2005).

Collaboration was also critical to the ecosystem approach built under the IJC GLWQA approach. Interlocking directors, acting on behalf of the good of the Great Lakes and not necessarily on behalf of a participant's agency, played a critical role in the ability of the IJC and its principle boards, together with the GLFC, to solve problems. One of the early participants explained it to me this way:

A: Let's step back a bit. In the '60's and '70's, the three main commissions, which were then the IJC, the Great Lakes Basin Commission and the Great Lakes Fishery Commission, all collaborated. The IJC, the Great Lakes Fishery Commission, and the Great Lakes Basin Commission which preceded the Great Lakes Commission which was interstate and expanded to international to pick up what was left hanging when Reagan closed down the Great Lakes Basin Commission. While I was a Commissioner for the Great Lakes Fishery Commission, I served as an advisor to IJC on the Science Advisory Board, and I worked with Mike Donahue on the Great Lakes Commission...all at the same time.

Q: So there were interlocking commissioners, members, advisors.

A: Yes. I was a commissioner on one, a scientific advisor on another, and Donahue and I co-sponsored some of CUSIS – George Francis mentioned Canada US Interuniversity Seminars yesterday. Donahue and I were leading a CUSIS initiative which was being managed out of the Great Lakes Commission. So, precisely at the same time, I was working in three different capacities. And not only I, I didn't do it by design; it's just the way it happened. So, the progress in the 80's came partly because each of the other commissions had connections with the IJC... It was the closest thing to a free market, you know, what people think of as a free market, in concepts and ideas. But, now this free market was constrained by concepts like justice, equity, things like that. Aesthetics. George is very sharp with aesthetics. And secondary to justice. I'm justice I think primarily... There were far more people who were involved locally, and then there were all sorts of ad hoc arrangements, intergovernmental arrangements between states. Something came together in the 70's and it worked. It was not formal and not informal, it was extra-constitutional that played a bigger role than the Constitution. (Canadian Academic 2).

Another key participant in the early GLWQA governance scheme explained the collaboration under the regime in a similar vein:

Well, the strengths I think were [the GLWQA scheme] provided the occasion, if you will, to let the water quality board, the science advisory board, [and] the IJC have people come together, whether they're representing jurisdictions or just representing people interested in aspects of the lakes. An awful lot just came about getting to know who they are and chatting and so on, and just following up the way you and I are doing right now. So there is a sharing of knowledge. So that sort of knitting together a little larger sense of the lake and what we might be able to work together to do is a strength. (Canadian Academic 1)

So collaboration took the form of commission members who could put the good of the Great Lakes in front of allegiance to government, agency, or special interests. It also came in the form of working with the public and listening to all ideas – the free market of concepts and ideas. Biennial IJC meetings provided valuable engagement between the SAB, the WQB, and the press with the public present in a very public discourse in open sessions. These efforts were buttressed by an interdisciplinary Great Lakes science community. In the late 1960s concern about fishery and lamprey eel problems and the reference on phosphorus spawned the establishment of the International Association for Great Lakes Research (IAGLR) in 1967. Its journal and well-attended annual meetings became venues for a greater flow of information within the binational Great Lakes community. Although begun by physical and biological scientists, by 1971 academic political scientists and others interested in natural resource management issues began to participate in earnest (Botts and Muldoon 2005).

From the above it appears that collaboration between the public and scientists to understand and even act on data was not a problem in the early years of the GLWQA. The concept of binationalism, the *esprit d' corps* within the scientific and regulatory community, the outreach efforts and related participation of the public in a variety of significant ways, and the willingness to share and discuss information all paved the way

for water quality improvement in the early years. There can be no question that these same factors also contributed to the ability to stand up to special interests and arrive at proposed solutions and policies that centered on the public good. The state-by-state effort to adopt a detergent phosphate ban over strong objection of industry is one example. As one participant said while explaining what integrity meant to many of those who were active in the early years of the GLWQA:

So, if you think integration, disintegration...that was a concept that sort of perfused the whole politics of those days...it was a key consideration. It's actually related to justice. Integrity was related to justice. And our Great Lakes to me, and Lee Botts, and George and many more...we have got that. (Canadian Academic 2)

Integrity, fairness and justice were obviously important to those who were involved in governance and policy decisions under the GLWQA regime. Similarly, writing in 1991 as part of the CUSIS gathering, Dr. Mimi Becker wrote about the importance of community as opposed to individual rights as they related to governance of resources shared by the United States and Canada:

We talked a lot about using different words, but underneath is the issue of community as a fundamental value versus the issue of individual rights. That difference tends to cover a lot of the discussion about how we approach regulation, negotiation, and what kinds of institutional arrangements need to be redesigned and how. This also is reflected in different attitudinal perspectives about the role of constitutional rights or prerogatives versus community obligations and litigation versus negotiation (CUSIS 1991, 39).

Dr. J.R. "Jack" Vallentyne, Senior Scientist for Canada's Department of Fisheries and Oceans (DFO) as well as a member of the Great Lakes Research Advisory Board, which evaluated the Agreement when it came up for review in 1977 and 1978, was quoted by historian Dave Dempsey as citing a more specific reason why the early



GLQWA regime could stand up for the common good and include notions of fairness, integrity, and community despite the opposition of special interests:

The International Joint Commission's tradition that persons serving on its advisory boards represent not the organizations that employ them, but their own capacities as citizens and experts, helped draw the best, least selfish, least compromised advice from its advisors... (Dempsey 2004, 192-93).

Thus, in the early years of the GLWQA, a host of knowledgeable citizens, scientists, and regulators, buttressed by a galvanized public and working in their personal and professional capacity, were able to set aside personal agendas and make some bold moves to reverse the negative trends that were surely killing the Great Lakes Basin. It would appear that the ideal characteristics for the projecting developments task of an ideal ecosystem approach as set forth in Table 28 appear to have been met in the early years of the GLWQA.

Inventing, Evaluating, and Selecting Alternatives. As pointed out above, an ecosystem approach requires that participants be emboldened to experiment and not face punishment if failure results from a well-conceived attempt. An integral part of governance is that there is a learning approach that focuses on improving policy and practice in the face of uncertainty. Governance and management strategies are considered experiments. Learning in our ideal world is promoted through both structural experimentation and management flexibility (Armitage, Berkes et al. 2007). Governance, and the ability to invent, evaluate, and select alternatives, must be adaptive (Regier and Baskerville 1986; Francis and Regier 1995; Straussfogel and Becker 1996; Costanza, Low et al. 2001; Kjær 2004; Brunner, Steelman et al. 2005; Fiorino 2006; Whiteside

2006; Armitage, Berkes et al. 2007; Steelman 2010; Brunner 2010a; Brunner and Lynch 2010b).

Under an adaptive governance regime, policy choices and interventions are treated as experiments (NRC 2009), relying explicitly on monitoring, evaluating, expanding successful interventions and terminating failed policies instead of expert-driven planning that relies primarily on science-based technology rather than trial and error (Francis 1993; Costanza, Low et al. 2001; Gunderson 2003; Brunner, Steelman et al. 2005; Fiorino 2006; Steelman 2010).

Thus alternative experimentation in our ideal system must employ social and decision making processes that make use, *inter alia*, of broad participation, rapid feedback, reliable intelligence, transparent promotion, and appropriate value trade-offs to create a process capable of coping with multiple, complex systems. No particular set of practices or governance tools can regulate human impacts so as to guarantee a resilient and productive ecosystem. In chapter III it was noted that really all we can do is attempt to design a system that operates under rules that allow sufficient information to be generated over time to enable participants to learn from their mistakes and continually adapt and improve the institutional system to operate within natural limits (Francis 1993; Costanza, Low et al. 2001; Holling, Gunderson et al. 2002; Folke, Lowell Pritchard et al. 2007; Steelman 2010; Brunner 2010a). These characteristics are many and varied, and for the governance regime under the GLWQA, the collaborative, citizen participation fueled, bold measures taken in the early years are illustrative of this task as part of an ecosystem approach. What hasn't been discussed above will be explained in the next two

sections involving the social and decision-making portions of our ideal system. So I will move on to discuss the social process in the Great Lakes GLWQA governance regime.

### **Social Process**

In this section the social process under the GLWQA governance regime will be examined. It should be understood that this analysis is a product of one person and that a detailed study of the social and institutional scheme in the subject study areas was not possible. Obviously countless individuals and institutions are involved in some level in decisions and impacts on the Great Lakes Basin ecosystem. This project attempts to gain a rough, mile-high view of some of those key actors. In addition, much information and research concerning the social process was presented in the preceding section on problem orientation in order to give the reader a better context of the challenges present in the Great Lakes during the pertinent time period. Every effort will be made to avoid duplication in this section.

It might help to be reminded that in the social process we must be cognizant that every participant in the use of resource services and every player with a potential say in the governance of the human activities that impact the ecosystem employs strategies in order to pursue particular values and/or outcomes. People tend to improve their well-being by acting in ways that they perceive will leave them better off than if they had acted otherwise and therefore engage in an interplay of human value trade-offs. Generally no amount of “cold, hard facts” collected by “neutral objective” scientists, no amount of “education,” or “transparency” can completely neutralize basic inherent value differences or perceptions among people. Certainly, however, this realization should not

take away from the fact that there are common interests and the need to attempt to clarify and secure them (Lasswell 1971; Clark, Willard et al. 2000; Clark 2002). To the degree possible we will now turn to an examination of the participants in the GLWQA governance regime.

Participants. As a reminder of the participant characteristics in ideal ecosystem management regime, discussed in Chapter III, there is an expectation or at least the opportunity for meaningful participation and input of a broad segment of the regulated population in decision making processes (Costanza, Norton et al. 1992; Pauly and Maclean 2003). Significant, meaningful public participation is required (Becker 1993; Francis 1993; Francis and Regier 1995; Cortner and Moote 1999; Clark 2002; Jackson 2005; Fiorino 2006; Folke, Lowell Pritchard et al. 2007). Participation must be open to almost any person or group with a significant interest in the issue (Becker 1993; Kjær 2004; Brunner, Steelman et al. 2005; Jackson 2005; Brunner and Lynch 2010b). Regulatory agencies must participate in coordinated and integrated fashion and allow softer local and regional input into governance (Regier and Baskerville 1986; Berkes, Colding et al. 2003; Folke, Lowell Pritchard et al. 2007). Citizen involvement and partnership designed to build “civic science” is needed, not public information programs to inform passively (Gunderson, Holling et al. 1995). Better governance and enhanced accountability can come through grass roots ecosystem management i.e. the ongoing, collaborative governance arrangement in which inclusive coalitions of the unlike (citizens, government regulators, small businesses, environmentalists, commodity interests, and others) come together to resolve policy problems affecting the environment,

economy, and communities of a particular place (Brunner, Colburn et al. 2002; Weber 2003; Brunner, Steelman et al. 2005; Walker and Salt 2006; Clark 2008; Steelman 2010).

We have already examined the somewhat remarkable history of public outreach, education, and significant participation from the early years of governance under the GLWQA (1987). But was the process open to any person or group with a significant interest in the issues? And did regulatory agencies participate in a coordinated and integrated fashion?

Ironically, citizen influence and the power of NGOs, beginning with the involvement of the Great Lakes Basin Commission (GLBC), the Lake Michigan Federation and the League of Women Voters (LWV), began even before the 1972 GLWQA was adopted:

And so, at any rate, in 1971, I believe it was late spring...I know it wasn't cold weather...I get a phone call from a staff member of the GLBC, and he tells me about a meeting that's going to place on Mackinac Island, at the Grand Hotel.... and that I need to go to this meeting... And the reason I should was because...he explained...that there was...the purpose of this meeting on Mackinac, was that it was a meeting of the governors and premiers in effect to ratify the GLWQA that had been negotiated and was going to be signed. This must have been early spring because the agreement was signed in April, and it was going to be signed...and so this was the ratification meeting, and there was a move afoot to omit coverage or inclusion of Lake Michigan.

I go up to the meeting and I find that there was a...and I can't remember all the names... but, ...and there were a couple of local LWV members, because...by local I mean Michigan LWV...because in those days, because water management and water resources was an ongoing concern of the League, as a practice, they tried to send two League members to any kind of public meeting that occurred related to water resources or water management, so...and me...and we were the citizens that were present at that meeting. So, I arrive on one day and right away I pick up that there had been an executive meeting the day before, before governors for Lake Michigan where they had agreed, or at least there had been a majority

vote...at that point I didn't know whether there was agreement among all four governors or not, but...to lobby that Lake Michigan should not be covered under the agreement for the obvious reasons...being entirely within the U.S. and so forth. So, anyway, there were sessions and presentations, and...the formal meeting was convened and Governor Milliken presided, and so the afternoon of the first full day of the formal meetings...and I don't remember what exactly caused me to stand up at that period of time, but I use this as an example when I'm telling young people, don't be afraid to do things because there are a lot of things I've done in my life that I know better now I shouldn't have done, but I'm glad I did, and this was one of them. So, I stood up, in the middle of the meeting, I said, Governor Milliken, excuse me, but you're forgetting Lake Michigan...Then I made a little speech, it's one system that's all connected, blah, blah, blah. He soon after adjourns the meeting for the day. There was a big formal meeting that evening, a fancy dinner, and so on and so forth, and as the meeting adjourned and broke up, then-Governor Pat Lucey of Wisconsin came to me and said, I agree with you, now let's figure out how not to let this happen. And so, we worked out a game plan, and the next day we instituted the game plan, and I think it's described in the book, and it was successful. And so, Lake Michigan, and if you want more details about it, I'll tell you what the game plan was and how we carried it out, was an enormous a lot of fun and I learned a lot from it. At any rate, so Lake Michigan got included under the GLWQA. (US NGO 2)

Thus one NGO and a couple of interested citizens managed to save the day for Lake Michigan and keep it included in the GLWQA. The IJC, shortly after the adoption of the 1972 Agreement, began to rely heavily on citizen involvement and scientific coordination. The initial Wingspread conferences at the Johnson Wax Convention Center in Racine, Wisconsin, are illustrative:

A: We made recommendations for some legislative change that came out of that. Then in 1976-77 there were a series of Wingspread conferences at the Johnson Wax Conference Center in Racine, Wisconsin - one of which was to assess the extent to which there was a need for a binational citizen organization that would focus on the Great Lakes.

Q: Who set up the Wing Spread conference?

A: That one was instigated by the Lake Michigan Federation, and it was funded by the Joyce Foundation of Chicago. Lake Michigan Federation was a group that the Lake Erie Basin Committee of the League had been working with over a period of time, because it was a collaboration of different organizations on Lake Michigan.

And, initially, the Lake Michigan Federation, because they had taken the lead to enable this, was kind of the lead organization for pulling people together and, if I recall correctly, that enabling group included some of the subsequent directors of Great Lakes Tomorrow...Frances, Regier, Dick Robbins, who was the then Executive Director of the Lake Michigan Federation; Arthur Timms, who was the Exec Director of the Conservation Foundation in Ontario, and Grant Merritt, who was head of pollution control in Minnesota. ...A state agency. So there was a mix of people there. There were some other Canadians...Oh, and John Yolton, who was the VP of the UAW, and he had a counterpart from Canada...the name escapes me.

There was no industry involved...They weren't invited. It was an attempt, because of the politics of the times, to form a coalition between labor and the environment so that industry could not succeed in getting the jobs versus the environment conflict going, which at the time, under the politics of the era, was their strategy. At the time that this thing occurred, this might have been '75/'76 maybe, the only way that we were dealing with industry was in court. It was very adversarial because of the accumulated muck.

There were... [also] First Nations present at that ..., Henry Lickers from the Mohawk tribe up on St. Regis reservation...Canadian...was there. So, that was the first Wing Spread conference. The result from that meeting was the formation of the binational citizen group Great Lakes Tomorrow. Its mission was to educate and engage the citizens of the basin in decisions about its recovery and future direction...The first thing we took on was a contract with the IJC to hold a series of public meetings to brief the public on the results of the upper lakes reference groups studies, and train them in how to participate in the IJC hearings. So, it was basically an education facilitation function. We published a newspaper...I think it was called The Great Lakes Tomorrow...as background information, and that was widely distributed. We also used that particular initiative as a way of beginning to develop the mode that we used with designating a local coordinator, local planning committee, and working with them to enable development of local capacity, so that we weren't controlling it, it was more facilitation and a way of engaging citizens locally in learning about their lakes and in having a say about how to move forward with solutions.

**Q:** Was this participation important in the Great Lakes, in the development?

**A:** It would never have happened without it. (US NGO/Academic)

It seems, then, from the above, that no efforts were spared to bring on board all those who had an interest. The only exception was industry, which was challenging the phosphate restrictions set forth in the 1972 Agreement at that time. With Decisions for the Great Lakes industry was invited in, as they were for the Hiram Conference.

There were a number of institutional players. The IJC has been discussed in the previous sections and an explanation of their role and importance is unnecessary here. There were two boards advising the IJC: The Research Advisory Board (later the Science Advisory Board) and the Water Quality Board (Figure 11). The Great Lakes Fisheries Commission also played a huge role in coordination with the IJC and its boards. There were regional coordinating bodies as well, chiefly the Great Lakes Basin Commission (GLBC) and the Great Lakes Commission (GLC).

The composition and duties of the IJC have been discussed in the previous section. The IJC is comprised of three commissioners from the United States and appointed by the President and three from Canada appointed by the Prime Minister. Historically, commissioners were appointed because of their unique knowledge or expertise or else as rewards for public service. Since 1980, however, appointments have generally gone to political allies of the President or Prime Minister. Further, appointments are not for a specified period of time and before 1980 there had never been a wholesale turnover in the panel of commissioners at the same time. Since 1980,



however, every president has dismissed the entire panel and replaced them with his own appointees (Botts and Muldoon 2005).



Figure 8 The IJC Administrative Structure 1972 – 1979

From its inception the IJC lacked the jurisdiction on issues of water quality to compel the U.S and Canada, the Parties to the GLWQA, to do anything.<sup>20</sup> Their role was to investigate and make recommendations. The annual and then biennial reports of the IJC were made available to the public and recommendations set forth in the reports were often acted upon by the Parties out of credibility and respect for the IJC and its Boards .(Dempsey 2004; Botts and Muldoon 2005)

The Water Quality Board (WQB) was created by the GLWQA to be the principal advisor to the commission. Its official membership included the heads of provincial and state environmental agencies. By tradition, the WQB is co-chaired by the director of the Ontario Regional Office of Environment Canada and the Director of EPA Region 5

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<sup>20</sup> It has always had authority to make decisions pertaining to water diversion and consumptive use issues. (1909). Treaty Relating to the Boundary Waters and Questions Arising Along the Boundary Between the United States and Canada. U.S.-Gr.Brit. 36 Stat. 2448.

(Botts and Muldoon 2005). One participant during the early days explained the WQB's function:

The Water Quality Board came as a representative of the agencies involved with water management or pollution control, and in a way it was argued that made a lot of sense, because they're the ones who ultimately have to do something, so they got involved in the discussions and consultations about what it is that you should do in setting general priorities there's more likely to be a follow-through on it. So, in that sense, they were using it as a forum to try and get things together, which would otherwise help maybe do what they're doing back home. So, that in a sense would be the positive side. It did look like it was a little bit of a closed shop sometime, and it even gave them the kind of special privilege role as chief advisory to the IJC and the science advisory group was more a matter of people coming from various agencies and organizations, I think, largely in their individual capacity, or because of the expertise they brought into it. So, they had a role as well. I don't know how the IJC balanced all of them in terms of what they were hearing from one against the other... (Canadian Academic 1).

The Science Advisory Board (SAB) is the body chiefly responsible for advising the Board on science-related matters under the GLWQA. The name was changed from the Research Advisory Board in 1978. The SAB included managers of Great Lakes research programs, scientists, social scientists, representatives of industry, environmental activists and others (Botts and Muldoon 2005). As the quote immediately above suggests, the Science Advisory Board was comprised of a wider array of participants with a broader perspective.<sup>21</sup>

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<sup>21</sup> Illustrative is the Terms of Reference for the Establishment of a Research Advisory Board, part of the original 1972 GLWQA, which provided:

4. The International Joint Commission shall determine the size and composition of the Research Advisory Board. The Commission should appoint members to the Advisory Board from appropriate Federal, State and Provincial Government agencies and from other agencies, organizations and institutions involved in Great Lakes research activities. In making these appointments the Commission should consider individuals from the academic, scientific and industrial communities *and the general public*. Membership should be *based primarily upon an individual's qualifications and potential contribution*

The Council of Great Lakes Research Managers, sometimes called the IJC's "Third Board" was never designated in the GLWQA, but it was formed by the IJC in 1984 and ultimately granted full board status in 1994, taking over the functions of the SAB (Botts and Muldoon 2005).

Another important participant under the GLWQA scheme in the early years was the Great Lakes Regional Office. Set up under Article VII of the 1972 GLWQA, the GLRO was to "provide a public information service for the program." The office was furnished with a binational staff and also functioned to provide clerical tasks for the IJC in its Great Lakes functions, and to its advisory boards. It was located in Windsor, Ontario in order to give it a convenient centralized location. It was also the function of the GLRO to coordinate activities with the GLFC, IAGLR, and others (Botts and Muldoon 2005).

The material immediately above discusses the participants that were in essence created by the GLWQA. But the GLWQA is basically an executive agreement or protocol. The Parties, as has been discussed, are actually the governments of Canada and the United States. Without the participation of federal and state government entities the GLWQA would be meaningless. The lead federal government agencies are the USEPA on the U.S. side and Environment Canada for the Canadian side. Thus a discussion of those participants who fall within the federal, state, and provincial jurisdictions is merited.

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to the work of the Advisory Board. [Emphasis added] (1972). Great Lakes Water Quality Agreement, with Annexes and Texts and Terms of Reference, Between the United States of America and Canada: 79.

The US EPA is the lead federal agency on the U.S. side. It was established by executive order of President Richard Nixon in 1970. It directs the U.S. federal activities implementation of the GLWQA mostly by virtue of its jurisdiction to enforce and implement the Clean Water Act (1972). The Great Lakes obligations were handed by the EPA to its Region 5 district headquartered in Chicago. Thereafter, in 1976, Congressional support was received and the Great Lakes National Program Office (GLNPO) was opened (Sproule-Jones 2002; Botts and Muldoon 2005).

On the Canadian side, Environment Canada, established in 1971, took the federal lead on GLWQA agenda items in Canada. In some ways, EC had it a little easier than the EPA as phosphates had already been banned in Canada in 1970 by the Canada Water Act (1970). It has been suggested that Canada may have used their own reductions in phosphates to their advantage in persuading the U.S. to adopt a ban in the 1972 GLWQA (Botts and Muldoon 2005). EC, through the negotiation of the Canada-Ontario Agreement (COA) handed off many of the Canadian federal responsibilities to the Province of Ontario. Under the COA Ontario became responsible for implementation of the GLWQA provisions, with the federal government paying for the capital improvements needed to update sewage-treatment facilities in the province while the Ontario EPA is used to impose effluent standards on all point sources discharging into the basin (Sproule-Jones 2002; Botts and Muldoon 2005).

The states bordering the Great Lakes have played a role to a great degree, sometimes for more of a role than they bargained. Under the U.S. Constitution, states can't negotiate treaties with foreign governments. Thus while the U.S. federal government negotiated the GLWQA with Canadian authorities, it was the states that

ultimately carried much of the burden to follow through with obligations made by the federal government. The role of the states was not all bad, however. There was pride taken in the massive improvement of municipal sewage-treatment plants as part of the Clean Water Act and GLWQA mandates, although when water treatment grants began to dry up after the 1977 Clean Water Act, and as more and more persistent organic chemicals were being revealed, some states began to balk at their clean water burdens. Some, especially Michigan, were unhappy at not being permitted to participate in negotiations for the 1977 Amendments and 1987 Protocol of the GLWQA (Botts and Muldoon 2005).

To their credit, however, states, provinces, and First Nations found ample opportunity to cooperate. Some notable achievements include the 1985 Great Lakes Charter and the Great Lakes Toxic Substances Control Agreement of 1986 (GLTSCA). Both are voluntary agreements, initiated by the Council of Great Lakes Governors, designed to facilitate the sharing of information and to take a unified stance to protect Great Lakes resources. The Charter was motivated chiefly by threats of massive water transfers out of the Great Lakes Basin and prevents any diversions that would have a significant, adverse impact on lake levels, in-basin uses, or the Great Lakes ecosystem (Colburn, Davidson et al. 1990). It “commits the parties to develop a common data base on water resource use and a cooperative management program that includes an inventory of surface water and groundwater resources” (Botts and Muldoon 2005, 213) By the late 1980s eight states and the provinces of Ontario and Quebec had signed the Charter. The data base was established by the Great Lakes Commission by 1988. (Colburn, Davidson et al. 1990; Sproule-Jones 2002; Botts and Muldoon 2005).

With so many players in the GLWQA governance scheme, there has been a need for regional coordination in order to facilitate the cooperative arrangements found frequently in the basin and to help overcome institutional fragmentation (Colburn, Davidson et al. 1990). In this light, attention will briefly be turned to the GLBC, the GLC, and the GLFC.

The Great Lakes Basin Commission was created on the U.S. side in 1967 to provide a coordinating mechanism for federal and state agencies as well as public participation in matter involving the great lakes. The commission was one of six river basin commissions established under the Federal Water Resources Planning Act in 1965 (1965). The Federal Water Resources Planning Act was established to coordinate state and federal policies and plans for the development of water resources.<sup>22</sup> It did this by permitting the President to form River Basin Commissions. When the GLBC was established water quality was by far the chief issue. It immediately began work on the development of a regional framework plan for water resources in the great lakes watershed (Botts and Muldoon 2005).

The Basin Commission consisted of 8 state members and 12 federal members. The Department of State was involved to make sure that Canadian Interests were taken into account. The Ontario Ministry of the Environment sent a representative to attend Commission meetings. In addition staff members of the ministry and other federal

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<sup>22</sup> More specifically, the Preamble to the Federal Water Basin Commission Act of 1965 provides:

AN ACT To provide for the optimum development of the Nation's natural resources through the coordinated planning of water and related land the establishment of a water resources council and river basin commissions, and by providing financial assistance to the States in order to increase State participation in such planning. 42 U.S.C. §1962

Canadian Agencies regularly participated in workshops and conferences that involved the Commission. The Great Lakes Water Quality Agreement was signed in 1972 and the Commission provided planning and analysis that were funded partly by grants and agreements with the US EPA. The Commission was shut down by the Reagan administration in 1981. When it was still in effect the Basin Commission provided a collaborative policy forum as well as technical analysis for GLWQA-related issues (Botts and Muldoon 2005; Krantzberg, Manno et al. 2007)

An example of one of its projects was helping to develop modeling techniques used in creating target loadings for phosphorous in the great lakes. Yearly meetings were held and attended by state heads of the Soil Conservation Service in the US Department of Agriculture. These meetings served as a forum where skeptics about the value of conservation tillage are said to have become advocates. US Coastal Zone Management and Canadian Shoreline Management (Binational Coordination) did not directly relate to this agreement but influentially expanded the Great Lakes Community. The Binational Coordination was made known through publication funded by a combination of the Basin Commission, U.S. Army Corp of Engineers, and U.S. Fish and Wildlife, and Environment Canada. These publications called for new strategies including the use of vegetation to stabilize shorelines instead of the use of engineered structural erosion control measures (Botts and Muldoon 2005).

The Basin Commission requested public participation and comment on a draft framework plan in 1975 through a series of public meetings. The very strong support for “environmental quality” over economic development was altogether astounding as was the general public turnout. All in all the GLBC played an important role in coordinating

state and federal agencies. The GLBC "...was disbanded by the Reagan administration in 1981." (Botts and Muldoon 2005, 42).

The Great Lakes Commission (GLC) is another regional body and was created by a U.S. compact in 1955 (Dempsey 2004). Its original purpose was to represent state navigation and shipping interests with the completion of the St. Lawrence Seaway. Although it was originally a member of the Great Lakes Basin Commission and focused on Great Lakes navigation issues, it negotiated a compromise with the states and agencies formerly coordinated by the GLBC to expand its role into a broader agenda that included environmental issues and the coordination of state and federal agencies. As a source familiar with the transition explained:

The authorizing legislation provided that, if a River Basin Commission was dissolved, the states could decide where the resources would go, and because the Basin Commission wasn't immediately dissolved...I participated in over about 6 months' time in a number of meetings, and the division within the GL states about whether or not to give the funding to the GLC. There had been controversy...not all the states had supported the GLC. One of the things I had to do as Chair was...there were certain state legislatures...and I had to go to every year and convince them they should get funds to the GLBC and the GLC, but there were certain states that did not want to give the resources to the GLC. So, the compromise that emerged...you know in our system everything is a compromise...the compromise that emerged was, yes, they got the resources...I was mad as hell...I had gotten a million dollars through OMB to work on energy conservation issues...and it all went to the GLC, but the compromise was that it was going to move beyond shipping and navigation issues. (US NGO 2).

So the GLC mandate expanded to include coordination of environmental issues for the state and federal agencies that the GLBC had formerly provided. As a source within the GLC and very familiar with the role of the GLC after the elimination of the GLBC explains:



We have a really broad mandate. We're fortunate in that the Compact that created us gives us broad authority to advise the governments that created us which are the states as well as the federal government on matters of Great Lakes use, development, and protection. It's very broad. We were created in the 1950s at the time that the St. Lawrence Seaway was being created and developed so I'm sure that a prime motivation was to manage water resources in the interests of commercial navigation, including water levels, water quantity, dredging – promoting maritime commerce and the shipping industry. The mandate in the Great Lakes Basin Compact is much broader than that. It includes water quality, conservation, tourism, recreation. Of course over time with the dawning of environmental awareness our portfolio has shifted much more towards environmental protection and restoration. We still have this history and emphasis on maritime commerce but it's shifted from commerce, water levels, dredging which is now maybe 20% of our portfolio and the balance over time has shifted toward environmental protection. (US Federal Employee 2)

So with the termination of the GLBC, which had been a remarkable vehicle to promote state, federal, and to some extent, international cooperation and collaboration, the GLC began to step forward to fill the gap.

The final Great Lakes Basin regional body that will be examined is the Great Lakes Fisheries Commission (GLFC). In order to understand the role of the GLFC it must be understood that while an international border runs through the middle of all of the Great Lakes except Lake Michigan, no international waters exist in the Great Lakes (Piper 1967). This is because the states and tribes in the region have the established authority to manage fish within their boundaries (Piper 1967; Nielsen 1999). Unlike oceanic coastal borders where state jurisdiction normally extends to a three miles from the shore, the fact that state borders in the Great Lakes extend to the international border makes it possible for states to assert their authority over federal jurisdiction and control the lake beds, waters, and fish of the waters of the Great Lakes (Piper 1967; Gaden, Krueger et al. 2008). Thus the GLFC is the binational entity that attempts to integrate

and coalesce the separate but complementary sectors of the non-federal governments (states, provinces, and two U.S. intertribal agencies) and the federal governments, and the GLWQA entities to integrate and take a coherent approach to what would otherwise be a hopelessly fragmented Great Lakes fishery (Prelli and Becker 2001; Gaden, Krueger et al. 2008). They are able to manage this by facilitating Joint Strategic Plans between all involved entities that include cooperation, consensus, accountability, information sharing, and ecosystem management (Gaden, Krueger et al. 2008).

Finally, no assessment of the Great Lakes institutional and governance regime would be complete without mentioning the powerful role played by the public both as an entity to themselves and through the work of environmental organizations. The role of a public unhappy about environmental trends in the late 1960s through the early 1990s has already been discussed in the Problem Orientation section above. There has also been some discussion of the role of environmental organizations like the League of Women Voters, the Lake Michigan Federation, and Great Lakes Tomorrow, and Decisions for the Great Lakes, a basin-wide leadership training program run by Great Lakes Tomorrow and funded by EPA, Environment Canada, the Joyce Foundation and others.<sup>23</sup> What remains is to note the importance of organizations that were able to bring together many separate environmental groups and form politically powerful political forces.

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<sup>23</sup> The “Decisions for the Great Lakes” program trained volunteers around the basin with a 40 hour course designed, *inter alia*, to create an informed binational constituency for the Great Lakes, to build public understanding of existing management structure and process and encourage better decision making through citizen access and participation; to organize a continuing network of citizens, scientists, educational institutions and agencies to share and use information and data to better manage the Lakes...GLT (1985). *Decisions for the Great Lakes: A Program to Improve Decisions for the Protection and Wise Use of Our Binational Resource Through Informed Citizen Participation.* Great Lakes Tomorrow. G. L. Tomorrow. Hiram, OH.

The Michigan United Conservation Clubs (MUCC), for instance, brought together many diverse constituencies and led the lobbying effort that resulted in a phosphate detergent ban in that state (Botts and Muldoon 2005). But more was needed, and citizens needed a basin-wide organization. It was the joint effort of MUCC and the New York NGO Save the River, a combination that had led the fight against an Army Corps of Engineers proposal to allow winter navigation on the Great Lakes, that finally got together to form a basin-wide organization. MUCC's Tom Washington and Save the River's Abbie Hoffman, were backers of such an organization, but frankly didn't see eye-to-eye. After a series of meetings on Mackinac Island, a new basin-wide group, Great Lakes United (GLU), emerged. GLU became a united voice for hundreds of organizations throughout the Great Lakes dedicated to preserving and restoring the Great Lakes and St. Lawrence River ecosystem, representing a diverse group of organizations that include labor unions, environmental groups, hunters, fishers, community groups, and citizens of the United States, Canada, First Nations, and tribes (Jackson and Sloan 2008). GLU holds annual meetings that seek the advice of these groups to develop by consensus an agenda to pressure Congress, the IJC, and other policy makers to collaborate and put the common good of a healthy Great Lakes Basin (Dempsey 2004; Jackson 2005).

Another key NGO, the National Wildlife Federation, coordinated all litigation through its Ann Arbor offices:

Q: The NWF, were and are they the principle litigation strategy component in the Great Lakes?

A: Yes.

Q: Is that still the case?

A: Yes.

Q: So if GLU or Lake Michigan Alliance or one of those groups has an issue that they want to litigate, do they typically go to NWF for help?

A: Not exclusively but there's always coordination.

Q: But there is a coordination mechanism they provide?

A: Yes. Absolutely. And that just developed. It's not necessarily formal and NWF isn't always the plaintiff for all the environmental issues that come up.

Q: But somehow they play a coordinating role even there?

Q: Informally, yeah. I mean, they're not always in the lead, though.... If you were somebody on water quality issues you would talk with NWF first, and if NWF didn't take the case, then GLU might go to another law firm. (U.S. Federal Employee 2)

Another source familiar with the litigation strategy verified that the NWF coordinated litigation efforts during critical periods in GLWQA governance regime:

Q: One last question. Remember the National Wildlife Federation - when they established the GL Resource Center, through the NWF, they basically did all of the legal activity that was required. Is that your understanding...?

A: Most of it. I would say...yeah, after it was established, they did do that, and actually, Cam Davis...well, yes...that's true...

Q: How did the NWF get in the position of coordinating all of the litigation?

A: Because they specifically...they had the resources...they were by far had the largest paid membership of any environmental organization...and they specifically...oh, God, to get into that, you had to go back to the history of legal litigation in the environmental movement as a whole...The way it was structured...they had...what they called chapters, affiliated organizations and so forth, but, they...those centers were created for the purpose of providing legal resources. That was their purpose. (US NGO 2)

Table 28 Participants

Ecosystem-based Approach	GLWQA Approach
<p>Significant, meaningful public participation is required. The expectation is for significant meaningful participation and input of a broad segment of the affected population in decision making processes. Participation must be open to almost any person or group with a significant interest in the issue. Active outreach to develop citizen involvement and partnerships and build “civic science” base</p>	<p>IJC actively encourages recognizes the need for an informed and active public. Encourages broad education plans because a knowledgeable public. IJC stresses that public involvement in the solution of local problems should be developed within the perspective of the overall Great Lakes ecosystem. GLT and other NGOs outreach and education. The Decisions for the Great Lakes program trains citizen leaders throughout the basin. GLIN, biennial reports, annual/biennial IJC meetings, citizen participation on IJC boards and panels, all serve to educate and engage the public. All participants welcome. Unions, NGOs, academics, environmental groups, agencies, hunters, fishers, and First Nations involved from the beginning.</p>
<p>Regulatory agencies must participate in coordinated and integrated fashion and allow softer local and regional input into governance.</p>	<p>Coordination and Collaboration of agencies by SAB and IJC. Binationalism, dedication to GLB, and participation in “personal and professional capacity” important. GLWQA, as amended, provided targets and goals, parties, and with 1987 AOC development, communities played large role in restoration efforts.</p>

The participants in the Great Lakes governance regime were many and varied. The fact that there was a critical mass of institutional and public support was important to the restoration of the Great Lakes during the early years of the GLWQA regime. It took more than the mere existence of an array of participants, however (See Table 28). The perspectives of those who participated were also important.

Perspectives. All participants have perspectives. Such perspectives can include conflicting ideas, feelings, and beliefs about a problem and often rest on basic beliefs. Social groups may coalesce around a perspective, but participants are individuals with their own beliefs, interests, loyalties, and faith. The way they see themselves, or their

identifications as members of some group, are important to explain their actions (Clark 2008). The actors that coalesced around the governance regime of the GLWQA in the 1970s and 1980s shared a deep and enduring concern for the overall health and integrity of the Great Lakes. There were moving quotes presented in prior sections of this paper from people who were involved in the GLWQA process during its early years. For awhile, anyway, people who put the good of the GLB ecosystem before other more parochial interests shared a belief in collaboration, cooperation, and citizen empowerment, became the “we/us” (as opposed to “they/them”) in the political and social system.

Perspectives under an ecosystem-based approach to governance requires a governance structure that looks to find common ground on policies that advance common interests (Lasswell 1971; Brunner 2002; Clark 2002; Steelman 2010). One common interest in ecosystem-based governance is to enable management to focus on the natural processes necessary to sustain ecosystem structure and function while recognizing the need for human and institutional involvement at every level of the ecosystem (Gunderson, Holling et al. 1995; Costanza, Andrade et al. 1998; Sutinen, Clay et al. 2000; Gunderson and Holling 2002; Berkes, Colding et al. 2003; Walker and Salt 2006). The common interest of maintaining and supporting ecosystem integrity should outweigh parochial interests in preserving bureaucratic turf or command and control hierarchy. In addition, the perspective necessary for ecosystem-based governance should be more universal and open to new ideas and experimental approaches rather than parochial and institutionally resistant to innovation.

Table 29 Perspectives

Ecosystem-based Approach	GLWQA Approach
<p>Perspective requires a governance structure that looks to find common ground on policies that advance common interests. In addition, the perspective necessary for ecosystem-based governance should be more universal and open to new ideas and experimental approaches rather than parochial and institutionally resistant to innovation.</p>	<p>During the first decade of the GLWQA there was strong support by the IJC and its Boards and panels to pursue common interests and interests of the health of the GLB ecosystem were paramount. Problem-solving approach to SAB and related IJC panels was to solicit and listen to all ideas – a universal approach – in order to make sure no potential innovation was overlooked.</p>
<p>Problem solving should be viewed as a flexible process with broad participation and a variety of perspectives and should be cognizant that environmental, social, and economic systems are related with problems that overlap and need to be approached with a concern for human dignity and a respect for democratic access.</p>	<p>IJC, SAB and other GLWQA participants shared an implicit commitment to the basin and to the equity and justice. Equity, fairness, and human health reached the operational levels under the GLWQA and were factors in the early years. Also, information and input was gathered from broad base of participants, overlapping board members, and knowledgeable citizens</p>
<p>Common interest in ecosystem-based governance is to enable management to focus on the natural processes necessary to sustain ecosystem structure and function while recognizing the need for human and institutional involvement at every level of the ecosystem. The common interest of maintaining and supporting ecosystem integrity should outweigh parochial interests in preserving bureaucratic turf or command and control hierarchy.</p>	<p>Language of the GLWQA and the Preamble to the Convention on Great Lakes Fisheries requires parties to focus on the entire ecosystem as a basis for sustaining the fisheries. The goal of the GLFC is to sustain the functional integrity of ecosystems while producing desired resources and environmental services. Dedication, commitment, and service in their personal and professional capacity enabled early participants to make difficult decisions that favored the common interests of the health of the GLB over other more narrow interests.</p>

Problem solving should be viewed as a flexible process with broad participation and a variety of perspectives and should be cognizant that environmental, social, and economic systems are related with problems that overlap and need to be approached with a concern for human dignity and a respect for democratic values (Dryzek 1997). Finally, perspective involves more than governance but extends to the expectations and demands of people. In an ideal world, citizens would have the knowledge necessary to adopt

collective, community-oriented values instead of the selfish materialism of consumer values (Becker 1993; Dryzek 1997; Clark 2002) (Table 29).

The governance regime under the GLWQA between the late 1960s and early 1990s thrived on a perspective that included a dedication to collaboration, cooperation, inclusion, and a desire to do good for the Great Lakes Basin that was stronger than the desire to profit or otherwise drain it of resources or resilience. Several factors accounted for this overall perspective. The first operating principle of the IJC requires that meeting locations are alternated on each side of the border and that the costs of joint activities are shared equally. In this manner since its inception the Commissioners have demonstrated that the symmetry demanded of the IJC offset the asymmetry in sheer size between Canada and the U.S. (Botts and Muldoon 2005)

The IJC's historic insistence on the binationalism of its Commissioners, described in the problem orientation section of this chapter, was certainly relevant to the perspective of activities by the IJC and its Boards and panels. This tradition of independence from consideration or interference from national interests is found nowhere in the treaty, yet it was essential to achieving the goals of the GLWQA (Jackson and Sloan 2008). Charles Ross, a Commissioner under five presidents, explained that the IJC acted "as members of a single body," with independence from the United States or Canadian government interference, even though appointed by the heads of each country (Botts and Muldoon 2005, 11). Thus independence and collaboration marked the process followed by the IJC and its boards.

Another operating principle that reflects the perspective of the IJC and its boards and panels was the principle that required each commissioner to operate "in his (or her)



own professional capacity and expertise” rather than as a representative of an agency, NGO, or any other special interest (IJC 1975; Botts and Muldoon 2005,12). Independent of the constraints that might be placed on individuals who might have to act within their roles as agency employees, this operating principle helped assure that attention and expertise was focused on the challenges of the Great Lakes Basin without worrying about their agency interests and limitations. Thus officials of various agencies crossed over and served on different Boards and panels within the IJC scheme. The affiliation of the participant was not important – the focus was on using knowledge and expertise to solve problems. As one member of the Science Advisory Board explained:

A: And at the staff level, a number of GL Fishery Commissioners were on IJC boards. And Great Lakes Commission had similar arrangements. Mike Donahue for years was co-chair of IJC’s Science Advisory Board. And so at staff level, there were some senior IJC staff that just consider themselves a cut above, they were quasi-diplomats and so on. But, generally at the staff level, it was like in CUSIS, people participated and the way we ran those meetings, when people participated, you couldn’t tell from where they came.

Q: People were there under their personal and professional capacity, not necessarily as representative of their agencies?

A: And to this implicit commitment to the basin and to the equity and justice. And they all shared that, and so you didn’t know where they came from, and of course they didn’t keep verbatim records. (Canadian Academic 1)

The process was independent early on under the GLWQA process. No one on the Water Quality Board or especially the Science Advisory Board really cared where their fellow board members were from or what agencies employed them. Their implicit commitment was to the basin and notions of equity and justice were important.

As the Commissioners explained in the 2<sup>nd</sup> Annual Report of the IJC (1975):

The Commissioners act, not as separate national delegations under instruction from their respective Governments, but as a single body seeking common solutions in the joint interest and, most important, in accordance with the agreed rules or principles set out in the Treaty. Significantly, all Commissioners make a solemn declaration in writing that they will faithfully and impartially perform the duties imposed under the Treaty. The effect of this declaration is to give the Commissioners a sense of the primary loyalty they have to the treaty system while they are serving (IJC 1975, 1).

Another characteristic of perspective in an ideal system is the willingness and ability to examine many different viewpoints – a universal approach to problem solving rather than a linear, parochial approach. One participant in the GLWQA process in the early years explained how this perspective helped to introduce him to the ecosystem approach:

We had a working group...we met regularly over two years, and put together our understanding. We started by saying that we were going to take every explanation...anybody who had any claim to expertise we'll take their hypothesis...we'll listen to accusations...before we bring in any of our own personal hypothesis. And we checked out every one of them. And to our surprise we found people who were using the same evidence to support different kinds of causal claims. We even had Barry Commoner arguing that Lake Erie's problems were due to atmospheric testing of nuclear weapons. We didn't take that one very seriously. But we took all the rest seriously. I was also very much struck by the fact that there was evidence out there that wasn't diagnostic of any particular problem. There was ambiguous evidence. So we started asking, what kind of evidence is diagnostic for a particular causal approach and which evidence was non-diagnostic. And that is how I got into the ecosystem approach. Even my expert colleagues were doing the same thing. People who had expertise in eutrophication were blaming all sorts of things on nutrient overload. People who knew about fishing like I did were blaming all sorts of things on overfishing. The people like Huxley, who knew about erosion were blaming erosion for lots of things. And we said well if we take an ecosystem approach you're obligated to sort these things out and try to attribute the cause where you have evidence, diagnostic evidence. That is one way of how I got interested in the ecosystem approach. (Canadian Academic 2)

Finally, an ideal ecosystem-based governance regime perspective requires a governance structure that looks to find common ground on policies that advance common interests.

Under the GLWQA scheme the IJC has no jurisdiction to force a Party to act in any particular way. It is chartered with the purpose of resolving disputes and avoiding conflicts. The IJC, and its related Boards and panels, have the ability to investigate only “such subjects related to the Great Lakes Basin Ecosystem as the Parties may from time to time refer to it” (GLWQA 1987, Article VII(1)(g)). Even upon reference, the IJC only has the power to hold hearings, make recommendations and draft reports and comments. While the IJC has the power upon request to arbitrate a dispute between the parties, in the more than 100 years of its existence this provision has never been invoked (IJC 1975; Botts and Muldoon 2005). Thus it appears that the perspective of the IJC has been to look for common ground that works for the good of the GLB in order to resolve disputes. They simply lack the power or authority to do anything but attempt through common fact-finding, collaboration and diplomatic efforts, to convince the Parties to act in the best interest of the Great Lakes Basin.

The participants in the Great Lakes overall governance scheme, as we learned in the section immediately above, go well beyond the IJC and its Boards. They include regional commissions and the federal governments of Canada and the U.S., as well as the state and provincial interests.

The Great Lakes Basin Commission and their role and perspectives were examined in the Participants section above. The Great Lakes Commission, as was discussed above, broadened its mandate to begin to take in the state and federal

coordination function previously fulfilled by the GLBC before it was shut down in 1983. Since its days as a mainly navigational compact in the 1950s the GLC has been not only broadening its mandate but it has also been honing its collaborative skills and building a process for US and Canadian interests to cooperate on a number of levels:

A: The compact that created us gave the Commission the authority to advise and consult with Canada and the provinces. That was what the states wrote into the compact. Congress said: "Thank you very much but we'll take care of the relationship with Canada."... they said that they didn't want a regional organization like us negotiating or consulting or anything involving direct consultation with the Canadian government... So Congress said no you can only be a US organization created by the involved States – you know the way compacts work – they have to go to Congress under the Constitution. We, however, recognize that there's another side to the border so we created by resolution a category of membership for the provinces called "associate commissioners" and basically treat them just like U.S. Commissioners. Technically they don't have a vote but we generally operate by consensus. So they sit at the table with our Board of Directors. They participate in all deliberations. We just had our annual meeting up in Québec city. Québec and Ontario are very active but technically they're not part of the Compact and technically they don't actually have a vote.

Q: But in all other respects?

A: It was a way for us to get around what Congress did when they took it up. (US Federal Employee 2).

So the GLC has made inroads into forging a solid relationship between US and Canadian federal, state, and provincial entities and now provides another forum where the participants can discuss issues and priorities. In this manner, the GLC has developed an innovative and flexible process with the broad participation of governments and entities on both sides of the international border. They are able to cope with a variety of perspectives and by their efforts and mandate must be cognizant of environmental, social, and economic influences. One example is the way that the GLC facilitates the various

entities around the Great Lakes to press the US Congress for funds for Great Lakes restoration efforts:

A: See we play very nice in the same sandbox. And the other thing about the Great Lakes is that we have a number of regional organizations and I am quite proud of the fact that since I came here one of my motives was to bring the regional organizations together so that when we do things like go to Washington we speak with one voice. In fact one of the things that I've heard from people in Washington with my work is that you guys come down here every year and you've got your list, you're ready for what some call the annual "begathon." And all those lists look a little bit different.

A: And you're all together on it?

No, we weren't. But now we are. Now we've actually done a one pager and that's kind of just a vehicle for getting all the organizations on one sheet of paper in terms of our annual legislative and appropriations priorities to Congress. And that was, I mean, I made that happen.

Q: How did you do that?

A: Just got everybody around the table and everybody had their longer, more comprehensive lists and we still have our four page summary of what we're asking for, and we just got together and looked at where the ven diagrams overlapped and found what we all agreed with, and we argue over every single word and then talk about what color paper it should be on and what pictures should be used and we actually divide up which organization is going to take the lead on each of the four or five elements. We bring the tribes in and we run it by our board of directors and we make sure all the states and all of our constituents can live with it.

Q: Is everyone at the table that needs to be there in order to...

A: I think we've done a pretty darn good job. I mean we have the Commission and our representation of the states. We have the Council of Great Lakes Governors and their more direct access to the governors. We have the cities through the Great Lakes and St. Lawrence Cities Initiative. We have the fishery commission. We have the NGOs through NWF and Healing Our Waters. We now have the Council of Great Lakes Industries at the table on our web page and the annual legislative agenda. And we have the tribes. (U.S. Federal Employee 2)

The above fairly characterizes the perspectives of the GLWQA entities and the GLC. The perspectives of the GLFC, federal agencies, and state agencies were discussed above in the problem orientation section of this chapter and will not be repeated here.

Situations. Participants to an ecosystem governance process may interact in formal or informal settings, on a number of levels, and regularly or only during crises. Thus the examination of the situations in which participants interact may have temporal elements depending upon how often the participants interact. It may also have spatial issues determined by the geographic boundaries represented by the participants. There may be institutional issues that depend upon the degree that power is centralized or decentralized in the region and whether regimentation is increasing or decreasing. Finally the issue is whether it takes a crisis for participants to mobilize participants to alter their perspectives and discourse-related practices in order to resolve the crises (Clark 2002).

In an ecosystem-based approach we would expect that there would be ample opportunity, or situations, for participants to communicate and collaborate (See Table 30). There has been a great deal written about the opportunities for communication, collaboration, and citizen involvement presented in the sections above, specifically the Problem Orientation and Participants sub-section. We have seen that there was a great deal of public outreach sponsored by the IJC and others during the 1970s and 1980s that resulted in a public prepared to question policy and participate in panels and decision making processes. We have also seen that the IJC held meaningful annual and, later, biennial meetings and, during the pertinent time period, gave the public chance for significant input.

The collaborative efforts of the GLWQA entities do not tell us much, however, about the conduct of the parties in the enforcement of domestic legislation like the U.S. Clean Water Act after the early years. All indications are that after the collaboration and cooperation shown during the first 10 years under the GLWQA, cooperative activity began to wane as conservative governments on both sides of the border began to isolate the IJC and its participatory decision-making model.

There has been little indication of movement towards a governance system that is heading toward partnerships with innovative techniques for working with industry other than the traditional confrontational methods. This is discussed further in the Effects portion of this section.

Table 30 Situations

Ecosystem-based Approach	GLWQA Approach
<p>Collaboration, communication and cooperation between government, stakeholders, and the public allow for governance that works more <i>with</i> participants than <i>on</i> them. This means more frequent collaborative interaction between government and participants at all levels. Further, agencies need to be less geared toward enforcement and more willing to be used as resources for local involvement and for solving problems where they arise.</p>	<p>GLWQA provides targets for Parties to reach, including toxic contaminant reduction and standards for monitoring and reporting. IJC advocates and encourages collaboration as well as education and outreach for public and for local government officials so they can better understand the nature of non-point source impacts and cumulative effects. IJC and GLWC work together, with continuous deliberations to evaluate conditions and trends in the entire ecosystem.</p>
<p>Decision-making and other collaborative processes are iterative and ongoing, not simply single-play problem-solving efforts. The need for passive formal public and adversarial public hearings can be reduced through citizen involvement and partnership, not just public information programs to inform passively.</p>	<p>IJC publishes regular reports, including state of the lake and basin-wide reports to the Parties. These are public documents and widely distributed. Governments respond to challenges raised in IJC reports. Biennial meetings set stage for presentation of Board reports to the IJC with public attendance and participation (especially in early years). Strong emphasis on education and outreach to empower a knowledgeable public. All information transparent and readily available.</p>

Base Values. In Chapter III it was pointed out that environmental policy disputes are almost always "contests over values" despite the fact that they are often masked in economic or environmental jargon or appear to revolve around technical issues (Layzer 2006).

The values that we will discuss in terms of the GLWQA governance regime include the typical assets or resources that participants use in their efforts to achieve their goals. All values, including authority, can be used as bases of power. Brewer and deLeon (1983) have listed the values pertinent to this inquiry:

*Power* is to make and carry out decisions

*Enlightenment* is to have knowledge

*Wealth* is to have money or its equivalent

*Well-being* is to have health, physical and psychological

*Skill* is to have special abilities.

*Affection* is to have family, friends, and warm community relationships

*Respect* is to show and receive deference

*Rectitude* is to have ethical standards

The characteristics of an ideal ecosystem approach to governance include a heavy reliance on significant public participation, vertical and horizontal collaboration, resilience, and learning through trial and error. The values necessary for the implementation of an ecosystem-based approach must move away from the traditional goals of power and wealth as ends in themselves. In order for implementation of an ecosystem-based approach to governance to have a chance there needs to be much more emphasis on utilizing power and wealth to obtain stronger inputs from the values of



knowledge, rectitude, well-being, and respect. A trial-and-error approach to management solutions, for example, requires a strong commitment to the gathering and sharing of knowledge together with an ability to acknowledge failures without the fear of punishment or the loss of funding.

Table 31 Base Values

<b>Ecosystem-based Approach</b>	<b>GLWQA Approach</b>
<p>Values sought should be consistent with goals of promotion of broad collaboration with emphasis on ecosystem resilience. The values of power and wealth should be utilized to press demands for common interests prioritizing human dignity, ecosystem integrity and resilience. Knowledge (enlightenment) should be a goal that is ideally gained from a variety of sources through a process of trial and error as much as through traditional experimental science.</p>	<p>Goals under GLWQA defined broadly with emphasis on ecosystem approach and resilience of ecosystem function. CWA goals consistent. Goals include reduction of pollution and virtual elimination of toxic contaminants. Broad coalition of scientists, agencies, IJC, SAB, and a knowledgeable public collaborate to solve problems using principles of binationalism and a free flow of ideas to experiment with policies and monitor results, with transparent communication fostering trust and accountability. Participants aware of and dedicated to human dignity, health, fairness and democratic traditions.</p>
<p>In order for implementation of an ecosystem-based approach to governance to have a chance there needs to be much more emphasis on utilizing power and wealth to obtain stronger inputs from the values of knowledge, rectitude, well-being, and respect</p>	<p>Values of knowledge, rectitude, well-being and respect gained through strong ethic fostered by binationalism, freedom and open exchange of ideas, and the participation of experts and citizens in their personal and professional capacities. Pressure applied by public, labor unions, NGOs and coordinated by umbrella groups like GLU help apply pressure to policy makers to utilize power public, not private, interests.</p>

In addition, collaboration and significant public participation will require a focus on the values of respect, affection, rectitude and well-being. There is simply no way to gain the trust, credibility, and respect necessary for problem-solving and planning collaboration

and public and broad-based community support without a shift more in the direction of these important values.

Thus our ideal system must first be characterized by resource sharing and collaborative efforts designed to bring a broad base of the public and regulated interests together with regulators to share ideas, develop knowledge, and gain mutual respect to identify goals, threats to those goals, and possible actions to take in order to preserve and restore ecosystem resilience. In an ecosystem-based approach to governance, base values come into play in both the goals for the governance of the ecosystem and in the implementation processes that seek to implement the goals (Table 31).

As set forth above in the discussions about goal clarification and trends in the GLB, the goals for the Great Lakes Basin, have largely been articulated by GLWQA and the Clean Water Act. The general goal agreed to by the Parties to the GLWQA for the Great Lakes through the 1987 Protocol is to "restore, and maintain the chemical, physical and biological integrity of the waters of the Great Lakes Basin Ecosystem" (1987, Article II). The ecosystem is defined as "the interacting components of air, land, water and living organisms, including humans, within the drainage basin of the St. Lawrence River" (1987, Article I (g)). As we have seen additional goals called for the protection and maintenance of self-sustaining fish populations and aquatic organisms and for protection and restoration of habitats vital for the support of healthy and diverse communities of plants, fish, and wildlife. Other, more particular goals and objectives have been discussed earlier in this chapter (toxic chemicals, virtual elimination, etc.).

These goals rely heavily on the base values of knowledge (enlightenment), well-being, respect, and rectitude for their achievement. In the discussions above there has

been ample evidence of the various ways that knowledge has been sought and acquired under the GLWQA scheme. In the early years we have seen how the public was involved in key aspects of learning, especially through PLUARG and UGLR studies. We have also seen how participants in the process fostered a 'free market of ideas' and all were welcome. As such the goals of the GLWQA regime seem to parallel with the goals necessary for an ecosystem approach to governance.

The second characteristic of the ideal ecosystem approach involves the *implementation* of the goals of an ecosystem-based approach to governance and the need to place emphasis on utilizing the base values of power and wealth to obtain stronger inputs of the values of knowledge, rectitude, well-being, and respect. The transition from goals to implementation is a bit tricky.

We have seen that during the early years of the GLWQA regime there was a strong *esprit de corps* that was created by the tradition of binationalism, freedom and open exchange of ideas, and the participation of experts and citizens in their personal and professional capacities (as opposed to representatives of agencies or institutions), the loyalty all shared for the betterment of the GLB ecosystem, strong public participation, public outreach and education, and education of local and other government officials. These characteristics and more gave participants in the GLWQA the ability to focus on the problems of the Great Lakes and a feeling of loyalty and allegiance to a healthy ecosystem in the GLB, complete with concern for integrity, justice, and democracy. The use of common fact-finding and reliance on transparent and reliable data added credibility to the IJC's efforts (Becker 1993; Botts and Muldoon 2005).'

The IJC, as has been discussed, acts mainly in an oversight capacity in the GLB. True implementation must come from the Parties. In an ideal ecosystem-based approach there should be an emphasis on utilizing power and wealth to obtain stronger inputs from the values of knowledge, rectitude, well-being, and respect as steps are taken to implement activities and policies that further societal goals.

The behavior of US federal and state agencies is often strongly influenced by industrial interests and a desire to minimize or avoid loss of values such as power, wealth (i.e. funding), and respect. In decisions involving potential adverse effects on important industries (e.g. virtual elimination), agency value losses include decreased budget allocations from unsympathetic legislatures so the costs of making decisions that adversely affect various industries are often perceived as too great to risk. Agencies rely on the support of elected officials and support is often tied to the satisfaction of those officials with the agency's contributions to or lack of interference with local or regional gains. Backlash against strong conservation methods that may impact economic productivity can be severe even at a local level (Kagan 2001; Wallace 2003; Armitage and Plummer 2010; Brunner 2010a).

Despite the differences between the IJC and the Parties to the GLWQA, there is a legacy of frequent and often innovative cooperation and collaboration between them. There have also been others, including labor unions and NGOs, especially when galvanized under the umbrella organization of Great Lakes United, that have often applied pressure when necessary to see that the trade-offs in base values were in the direction of accumulating knowledge and well-being, as disclosed by this former member of the SAB:

And so, people kind of didn't know what to do, especially since these things crossed so many political boundaries jurisdiction. So, we had a whole series of consultations. They had roundtable discussions around the basin. They had a series of initiatives to try to get a handle on it. Great Lakes United was formed between '78 and '87, to be the activist group, because Great Lakes Tomorrow was a facilitation and education group. But, we needed some group that was going to hold politicians' feet to the fire, and that was Great Lakes United. So, a couple of things happened in that period, one of which was Green Peace's zero discharge tour of the lakes, where they went about touting the only way to deal with toxic contaminants [was zero discharge] but, that occurred after GLU held a series of public hearings around the basin to get input from whoever wanted to show up and testify. They published a report, which I have on the shelf ... a justification for why that probably needed to be really explicit and that there needed to be... Also during that period, and while I was on the science advisory board, there was a lot of interest in getting a mass balance assessment of the contaminants. It started with PLUARG, but then it went on after that. In order to get mass balance, you need to know sources, causes, etc. So, there was a lot of that research going on in the system at that time. It became very clear that the only way that these watershed groups were going to be able to do what had to be done was to have a strategic approach. (US NGO/Academic)

And rectitude was a trait shared amongst many of those involved in the early years of the GLWQA agreement, typified by this comment from an individual who was one of the leaders within the GLWQA regime for many years:

Nothing I've ever done has been divorced from justice, so far as I know. My deontological ethic ranks higher than my commitment and objective interest in policy and science. (Canadian Academic 2)

Others tried to foster these value trade-offs that sought knowledge and well-being rather than wealth and power for power's sake. The Great Lakes Basin Commission, as discussed earlier, was a powerful coordinating force. And while it took a while the Great Lakes Commission ultimately evolved an active role in filling the gap left when the GLBC was shut down.

The governance system of the Great Lakes during the time frame of the early 1970s through the early 1990s was essentially overseen by the IJC. The prescriptions, or laws and regulations that were in existence were ample to provide base value trade-offs that gave priority to well-being, knowledge, respect, and rectitude. The GLWQA and the Clean Water Act provide ample justification and enforcement capacity to implement these priorities. The problem, as we have seen, is that as interpreted and enforced by the Parties, when not receiving pressure from an angry or galvanized public, there is a need to guard against the trend to place a premium on activities that procure wealth and power for the sake of wealth and power (Caldwell 1993; Dempsey 2004).

Strategies. Thus far in the analysis of the social process at work in the Great Lakes in first two decades of the GLWQA we have examined the participants, their perspectives, the situations in which they interact, and the base values that are used to achieve the goals of the participants. The strategies employed by the participants will be examined next.

The four basic strategies that were identified in Chapter III may be listed as follows:

- *Diplomatic strategies* use communication among and between the leaders and/or elites of any group or agency;
- *Ideological strategies* involve communications to a public that is wider than just leaders or heads of agencies and include public talks, newspaper and other mass media appeals and, in the extreme, propaganda;

- *Economic strategies* that consist of practices that rely on the production and distribution of goods and services. Boycotts and labor actions are included in economic strategies (Clark 2002), and
- *Litigation* which in this study is defined as disputes that are submitted for binding resolution by a third party.

In Chapter III the need to move toward a governance system that moves away from regulatory enforcement efforts geared toward targeted interventions at point sources and problem areas in the form of commands to different classes of firms mandating change in existing technologies or behavior was discussed at some length. In place of coercive command and control regulatory conduct, at least to some degree, should be a movement toward cooperation and collaboration in decisions about processes and raw materials, sustainability planning integrating environmental goals with other social and economic goals using diplomatic and ideological strategies (Table 33). Certainly there will always be a need for basic rules backed by the coercive power of the state in order to keep firms in line and not give unfair competitive advantage to environmentally noncompliant firms (Harrison 1995; Kagan 2001; Kjær 2004; Fiorino 2006). The point is that ecosystem-based approach governance would seek to work with the regulated public to a greater degree.

In addition to the need to move away from coercive regulatory conduct and litigation, the literature and case studies discussed in chapter III suggest the need for a *bridging organization* that connects, navigates, and/or coordinates the interests of different institutions and stakeholders across organizational levels should also be an integral part of adaptive governance of social-ecological systems. As was pointed out

earlier, such organizations provide social incentives by rewarding and creating space for collaboration, value formation, and innovation. The collaboration that bridging organizations initiate is *strategic*; conditional on the goals to enhance the values that may tend to promote the sustainability and resilience of the ecosystems (Hahn, Schultz et al. 2008).

Table 32 Strategies

Ecosystem-based Approach	GLWQA Approach
<p>An ecosystem-based approach would rely more on ideological and diplomatic strategies, moving away from regulatory enforcement efforts geared toward targeted interventions at point sources and problem areas which take the form of commands to different classes of firms mandating change in existing technologies or behavior. Instead there would be cooperation and collaboration in decisions about processes and raw materials, sustainability planning integrating environmental goals with other social and economic goals.</p>	<p>At the binational level ideological and diplomatic strategies are the only strategies available to the IJC and the GLFC. Biennial as well as relevant special reports are issued to raise issues and challenge the Parties. NGOs through GLU hold biennial meetings to develop an agenda of concerns among its many NGO members to take to the IJC biennial meetings. Decisions for the Great Lakes trains citizen leaders and promotes lasting networks. Annual meetings of IAGLR provide opportunity for presentation and discussion of social, natural sciences, economics and related issues. GLIN on-line service provides access to basin-wide information and data. Interlocking boards.</p>
<p>Litigation will play a role as there is a need for basic rules to be backed by the coercive power of the state in order to keep firms in line and not give unfair competitive advantage to environmentally noncompliant firms. Litigation would, however, rely more upon alternative dispute mechanisms, including facilitation and mediation.</p>	<p>Litigation is a not the preferred option. Diplomacy and ideological efforts should act to bring parties together to resolve differences in a collaborative manner. Litigation is last resort and is conducted by the Parties to the GLWQA or stakeholders, not the IJC or GLFC. NGO litigation conducted or coordinated by NWF.</p>
<p>The existence of a <i>bridging organization</i> that connects and navigates the interests of different stakeholders across organizational levels should be integral part of adaptive governance of social-ecological systems. Such organizations provide social incentives by rewarding and creating space for collaboration, value formation, and innovation. The collaboration that bridging organizations initiate is <i>strategic</i>; conditional on the goals to enhance the values from the ecosystems</p>	<p>IJC and GLFC act as bridging organizations and provide direction, coordination, and accountability to actions of the parties. SAB, WQB, and other IJC panels and Boards work to analyze basin-wide data and advise parties as to trends and potential ecosystem problems. Also identifies bigger picture needs and assists stakeholders and interested parties to collaborate, anticipate, and resolve issues. Parties with an issue may ask for objective investigation and assistance from IJC via reference.</p>



Thus in a traditional governance scheme, strategies typically are built upon a basis laid by formal laws and rules. Reliance is therefore generally upon regulation using economic or social intervention to force compliance with uniform rules. Where this intervention fails, litigation provides the remedy (Kagan 2001; Fiorino 2006). Thus *status quo* strategies use litigation, and by extension enforcement with the threat of litigation, as a principle weapon in the management arsenal (Steneck, Vavrinec et al. 2004; Walker and Salt 2006; Bardach and Kagan 2010). With no alternatives, litigation becomes a tactical and strategic weapon employed by all sides to a policy conflict. It is the courts that become another political venue for the losers in prior policy battles fought in Congress, or in the agency regulatory process, can launch another assault. In this way litigation provides a stalling mechanism to the policy process and creates a bargaining chip to be bartered for concessions from opponents (Rosenbaum 2008).

The strategies employed under the governance regime of the Great Lakes Basin vary depending upon the policy level. This section will discuss the binational prescriptions that apply to the governance in the basin. These prescriptions include the GLWQA, the GLFC, and the Great Lakes Charter (GLC). An examination of the federal, provincial and state institutions and their roles in the governance of the activities that impact the GLB will be set forth in the decision process analysis which follows later in this chapter.

It is important to understand that the binational governance regime in the Great Lakes Basin, with contributions by the IJC, GFLC, and a cast of frequently unified NGOs and citizens groups, is designed to stress diplomatic and ideological approaches as

opposed to the traditional enforcement/litigation model. Because the consequences of preventing ecosystem harm from happening are invisible to the untrained eye, and the benefits of an ecosystem approach are not readily discerned, public outreach was critical. Great Lakes Tomorrow and others traveled the basin to educate create a knowledgeable public (Christie, Becker et al. 1986). The Decisions for the Great Lakes program trained citizens to be leaders through a 40 hour course, presented around the Lake Ontario watershed, designed to educate the public and build lasting networks between government, scientists, regulators, and the public (GLT 1985). The principle governance mechanisms, together with their binational boards and supporting casts at work in the Great Lakes Basin, had the potential during the relevant time period to channel contending parties and groups into less expensive and more efficient ways of resolving disputes than litigation.

The IJC is an important bridging organization despite the fact that they lack formal powers of enforcement. There is no mechanism by which they can compel compliance under threat of sanction. The purpose set forth in the GLWQA, for instance, is for the Parties “to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem.” To achieve this purpose the Agreement provides that the Parties, defined as the Government of Canada and the Government of the United States, “...agree to make a maximum effort to develop programs, practices, and technology necessary for a better understanding of the Great Lakes Basin Ecosystem and to eliminate or reduce to the maximum extent practicable the discharge of pollutants into the Great Lakes System” (1987, Art. II).

The GLWQA is overseen and to some degree coordinated by the IJC. As discussed, the Agreement gives the IJC no direct enforcement powers. The powers and responsibilities of the IJC are set forth in the Agreement. Its primary role is to “assist in the implementation of this Agreement.” In doing so, it may *inter alia* collate, analyze, and disseminate data and information supplied by the Parties and State and Provincial Governments “relating to the quality of the boundary waters of the Great Lakes System...” It may also “...tender advice and recommendations to the Parties and to the State and Provincial Governments on problems of and matters related to the quality of the boundary waters...including specific recommendations concerning the General and Specific Objectives, legislation, standards and other regulatory requirements, programs and other measures, and intergovernmental agreements relating to the quality of these waters.” There are a variety of other responsibilities that are crucial to the function of the IJC, including the ability and discretion to publish any report or statement related to its reference, the ability to conduct investigations on subjects related to the Great Lakes Basin Ecosystem when referred to it by the Parties, the *requirement* to make a “full report to the Parties and to the State and Provincial Governments no less frequently than biennially concerning progress toward the achievement of the ...objectives...This report shall include an assessment of the effectiveness of the programs and other measures undertaken pursuant to this Agreement, and advice and recommendations.”

Significantly, the IJC may “at any time make special reports to the Parties, to the State and Provincial Governments and to the public concerning any problem of water quality in the Great Lakes System” (1987, Art. VII). Thus the IJC uses its powers to assess the state of the ecosystem in the Great Lakes Basin to hold the Parties accountable

through biennial reports and public meetings. Other reports and investigations deemed a part of their role are also published and challenge the Parties to remedy or further investigate perceived threats to ecosystem resilience (Colburn, Davidson et al. 1990; Becker 1993; Prelli and Becker 2001; Botts and Muldoon 2005).

In addition to the IJC, ideological and diplomatic strategies may be found nested within other bilateral governing bodies. The Convention on Great Lakes Fisheries was adopted by Canada and the U.S. in an effort to develop solutions to fisheries issues related to the lamprey eel introduction and to other water quality issues that impacted a shared fishery. Like the GLWQA, no direct enforcement tools were granted to the Great Lakes Fishery Commission, but its preamble stresses that "...joint and coordinated efforts by the United States of America and Canada are essential in order to determine the need for the type of measures which will make possible the maximum sustained productivity in Great Lakes fisheries of common concern" (CGLF 1954; 1956). The institutional scheme and procedural mechanisms developed by the Parties to the Convention enabled them to by-pass costly and time-consuming international litigation over the establishment and division of total allowable catches and related issues. Instead, the Parties were able to deliberate and continuously compare the results of their consensus policy decisions with findings related to the condition of the entire ecosystem (Prelli and Becker 2001).

With the CGLF institutional arrangement it became possible:

*... for parties to "find" for the ecosystem over and against parochial economic or political interests that might otherwise seep into deliberations. Accordingly, they can work to formulate responses to the problem of sustainable fisheries that could lead to recovery and long-term maintenance of both the ecosystem and of those who depend upon it for food and jobs (Prelli and Becker 2001, 481).*

Thus during the years pertinent to this project the IJC and the GLFC shared the leadership role in the development and implementation of governance and management through the use of diplomatic and ideological strategies. With no ability to bring formal enforcement actions to compel environmental compliance, there were few realistic alternatives. As was discussed earlier in this chapter, the IJC and the GLFC are dependent upon the efforts of the Parties, including states and provinces, for implementation of recommendations and policy developed on a binational level. Thus potential solutions and policy developed by an impressive array of scientists, citizens, and regulators using a transparent ecosystem-based approach can be dashed on the shoals of political and regulatory reality at the federal, state, and provincial levels. These entities are, of course, bound by formal, fragmented laws, rules, and regulations created by political systems on both sides of the “dotted line” that divides the United States and Canada. This fragmentation and the problems that are inherent in the current regulatory regime will be discussed in greater detail in the next section of this chapter describing the decision process and will not be explored further here.

Before we move on, however, it is important to mention one additional source of binational diplomatic and ideological strategies. The GLWQA as it existed after 1978 not only represented a binational commitment between the governments of the U.S. and Canada, but it also spawned a movement toward cooperation and coordinated action by the governments of the states and provinces in the Great Lakes Basin. The Council of Great Lakes Governors, formed first by six states in the Great Lakes Basin in 1983 and shortly thereafter by New York and Pennsylvania, took it upon themselves to negotiate various agreements that are extremely relevant to the diplomatic and ideological

advancement of cooperative efforts to protect and restore the Great Lakes Basin (Colburn, Davidson et al. 1990).

In 1985, the eight governors from the United States and the Premiers of Ontario and Quebec signed the Great Lakes Charter. The Charter obligated the states and provinces to, among other things...”to conserve the levels and flows of the Great Lakes and their tributary and connecting waters; to protect and conserve the environmental balance of the Great Lakes Basin ecosystem; to provide for cooperative programs and management of the water resources of the Great Lakes Basin...” (CGLG 1985). The Great Lakes Charter also included a provision calling for the development of a common data base on water resource use. This provision was carried out by the Great Lakes Commission and exists today as the Great Lakes Information Network (GLIN), a fully operational on-line tool available to researchers, regulators, as well as the general public<sup>24</sup> (Colburn, Davidson et al. 1990).

The Governors and Premiers went further the following year by signing the 1986 Great Lakes Toxic Substances Control Agreement (GLTSCA). The GLTSCA has been described as an “...extremely ambitious document that commits the signatories to reducing toxic substances in the Great Lakes basin (Colburn, Davidson et al. 1990). Signed by the Great Lakes Governors in 1986, and endorsed by the Premiers of Ontario and Quebec via a memorandum of understanding in 1988, the GLTSCA called for the integration of permitting process for discharges to different media, interstate cooperation

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<sup>24</sup> The Great Lakes Commission is an interstate compact consented to by the U.S. Congress. In the 1970s and 80s it was comprised of representatives from the eight GLB states and focused on collective concerns surrounding transportation, economic development, resource management, and environmental quality. As was pointed out earlier in this chapter, the GLC evolved to include representatives of federal governments and agencies as well as representation from the provinces of Ontario and Quebec.

in hazardous waste management planning, development of common health advisories on fish contamination, and in general provide for greater consistency between the provinces and the states in the GLB (CGLG 1986; Colburn, Davidson et al. 1990).

With help from NGOs and the Great Lakes Governors and Premiers, the governance regime under the GLWQA during the 1970s and 80s relied to a great extent on ideological and diplomatic efforts. This section has described the strategies mandated by the binational instruments. In previous sections, we have discussed how ideological and diplomatic strategies were employed by citizens groups, panels, NGOs and others. While implementation is left to the Parties, and top/down enforcement and litigation strategies have played a significant role at the federal, state, and provincial levels, the spirit of cooperation and collaboration promoted by the binational entities in the early years of the GLWQA accomplished a great deal without resort to more coercive judicial intervention. This will be discussed further in the Decision Process analysis.

Outcomes. Outcomes, generally short-term but may be medium or long-term as well, are the culminating events measured in terms of values that may be seen as indicative of progress, or not, depending on the perspective of the participants. Outcomes may take the form of changes in process, or institutions, which, at least in terms of a transition to ecosystem-based governance, indicate movement toward the creation and implementation of the perspectives and institutional structures that are conducive to innovation.

In terms of our ideal system, progress would be indicated by efforts to share power with and distribute more values to a greater portion of the public. If analysis of the values set forth in our social process reveals that more power and wealth is being

accumulated by fewer entities, this would reflect a negative trend to those who seek to move in the direction of a more ecosystem-based approach to governance (Table 33). If, on the other hand, there are tangible efforts toward creating governance processes and structures that encourage public participation, collaboration, the mobilization of local knowledge, and more adaptable, accountable, and flexible management, then outcomes are headed in a direction consistent with ecosystem-based governance (Brewer and deLeon 1983; deLeon 1999; Clark 2002; Clark 2008).

Table 33 Outcomes

<b>Ecosystem-based Approach</b>	<b>GLWQA Approach</b>
<p>Transition toward a more adaptive ecosystem-based approach to governance. Innovative measures are tried that transform current governance entities and create new or modified value institutions that get beyond scientific management and strict command and control hierarchy of bureaucracy using local input and collaborative processes.</p>	<p>Negotiation and adoption of the GLWQA in 1972. Negotiation and amendment of GLWQA in 1978 specifically adopting basin wide ecosystem approach to governance. Board and commission structures that encouraged collaboration and problem-solving without regard to agency or national affiliations. Adoption of Great Lakes Charter. Adoption of 1987 protocol to GLWQA. Strong public involvement and transparent collaboration. Negative outcome of closure of GLBC met with increased role of Great Lakes Commission.</p>

There have been a variety of important outcomes, both substantive and symbolic, associated with the evolution of the GLWQA governance regime. One important outcome is the emergence of the ecosystem-based approach to governance and the ultimate inclusion of language mandating ecosystem-based governance in the Great Lakes Basin in the 1978 Agreement (1987; Becker 1993). The original 1972 Agreement laid the groundwork by seeking input and involvement from the public in investigating the possibility that water quality was impacted by land-based activities. The innovative



educational outreach methods, strong public participation, and compelling local input into the IJC's reference concerning the impact of land-based activities certainly produced an outcome of public and institutional awareness of the value of local input and the need for change away from traditional fragmented command-and-control enforcement and toward more collaborative processes (Colburn, Davidson et al. 1990; Becker 1993; Jackson 2005).

There have been many other outcomes that have spun out of increasing access to governance under the GLWQA. These include the goal of virtual elimination of toxic substances along with a zero tolerance for the release of toxic substances from the 1978 Protocol to the GLWQ. Perhaps the most important outcome of the early GLWQA regime, however, was the development and use of a process that included a far greater role for the public and for public education and outreach, greater collaboration between government agencies at various levels of government, greater cooperation between and among NGO's, and other examples described in this chapter. There is, however, a flip side to the outcome component. There are often negative outcomes for some governance participants or outcomes that have negative impacts on progress toward the goals of participatory ecosystem-based governance. Clark (2008) describes how opening up decision-making in the greater Yellowstone region, for example, caused problems among some: "For people whose livelihoods are based on the expectation of certain kinds of decision-making power over the use of resources...In other words, opening up the arena to other participants will likely seem very threatening to those few who had previously had exclusive power" (Clark 2008, 49).

One of the most active individuals involved in the governance regime in the early years of the GLWQA reflected on the impact that at least some government agencies had on the ecosystem-based approach when he was asked about the nature of ecosystem-based governance:

The ecosystem approach is maybe like that tapestry with maybe a dozen or two dozen different fibers working in different ways. And any particular practitioner of the ecosystem approach may have competence or old-fashioned rationalist expertise, in several of them. And nobody has competence on the whole thing. But, in the Great Lakes, until the neocon revolution pretty well destroyed remediative measures in the '90s, many different people from many different interest groups could operate, could contribute to that mosaic and were welcome. Nobody understood it rationally. It's not understandable rationally. It's complex. It's not understandable in a linear rational way. You can't write a linear algorithm, a closed linear algorithm to explain, to define the ecosystem approach. It's kind of like a democracy – applied in a particular way. (Canadian Academic 2)

Thus one strategic outcome of collaboration, cooperation, public involvement, and ecosystem-based governance, put simply, was the effort to keep GLWQA activities, especially those related to public involvement, under the radar of federal agencies on both sides of the border, as this example from the former Chair of the Great Lakes Basin Commission demonstrates:

A: Among the things that I did, that I instituted at the Basin Commission was, there was a prohibition by OMB of citizen advisory committees, because there's been such a proliferation of them with the environmental explosion in the early '70s, that OMB had officially prohibited citizen advisory committees, so I set up something that we called PIWG—Public Involvement Work Group, we called it...didn't call it an advisory group, but that's what it was.

Q: Now why did OMB ban...how could they ban citizens groups?

A: They banned official citizen advisory groups to federal agencies as a budget concern.

Q: So, you set up the working group?

A: Yes, we set up PIWG, and then I worked with the states...I asked all the state members to suggest members, and that's how the State of New York suggested Abbey Hoffman, only we didn't know he was Abbey Hoffman.

Q: Right, right, I've heard the story.

A: So, we formed this group and it functioned. I never heard any feedback from any agencies. Bureaucrats aren't very imaginative...most of them are, but not all...so, the public involvement work group had the effect of bringing together people from all the 8 Great Lakes states and setting the stage for greater involvement with the GLWQA, so that's what I can sum up to tell you. (U.S. NGO 2)

Negative outcomes were often more direct. The federal governments on both sides of the border were clearly threatened by the public involvement and collaboration that came out of the GLWQA and especially the PLUARG initiatives in the 1970s, as described by this veteran of Great Lakes Tomorrow and the PLUARG process:

We reported directly to both the Commission and PLUARG...the collective recommendations of what came up from all of those panels, on both about the process of engaging the public and about substantive issues. The general consensus was that the process that PLUARG had run, which Great Lakes Tomorrow facilitated, we facilitated all the hearings that went on around the lakes on both sides. We also reported as an organization on what we saw. The public composition didn't matter because the panel was really diverse in terms of the representation. They included industry...by then everybody's at the table...the result was that they really liked that model of participation and recommended that the Commission empower its deference toward another initiative to use similar process. To my knowledge it hasn't happened since. Because the outcome of the process was a significant change in the report in terms of what ought to be done with respect to what the references reported out. It was a very radical report in terms of what needed to happen. I don't think that the EPA was ready for it. And also it was at the beginning of the Reagan Administration. The guys who had worked so hard on that [PLUARG] report ... who were from the soil conservation service, got sent to Siberia, and the chief guy, Robertson, who I think was the head, came from Washington, went back one weekend and his office was locked, and he suddenly found himself in North Dakota just like that. Just about the time

that was ready to really hit the fan in terms of next steps, Reagan took over and tried to systematically disembowel the Great Lakes initiative. (U.S. NGO/Academic)

In sum, the outcomes of the GLWQA regime in the early years included governance that was innovative, oriented toward problem-solving, and courageous. Perhaps most important was that it led to the adoption of participatory ecosystem-based governance under the auspices of the IJC, its boards and panels, and to some degree, the Parties. The educational outreach of Great Lakes Tomorrow, Decisions for the Great Lakes, the Lake Michigan Federation, the Great Lakes Basin Commission, Great Lakes United, and others led to strong and persuasive public involvement in critical basin-wide restoration efforts. Ecosystem-based governance was not only developed and nurtured it was ultimately included in the Great Lakes Water Quality Agreement as a formal binational prescription. For a period of time this outcome meant that the public was galvanized and pressure was successfully applied to state legislatures to defeat special interests and pass bans on phosphates in detergents.

The positive outcomes, however, set the stage for other more negative reactions and outcomes. As suggested by Clark (2007), those who typically had exercised exclusive power over environmental regulation began to “hear the footsteps” and slowly began to chip away at the progress made by the innovative and progressive outcomes of the GLWQA regime of the 1970s and 1980s. The outcomes, therefore, both positive and negative, morphed into more enduring effects discussed in the following section.

Effects. The effects of decisions and social process must be anticipated. Effects refer to the long-term changes in the value positions and institutions in the relevant

community. They are outcomes writ large, i.e. long-term outcomes in terms of values, processes, and institutional innovation (Clark 2002).

In essence, effects developed for our ideal system would include innovative measures that transform current governance entities and create new or modified value institutions that get beyond scientific management and strict command and control hierarchy of bureaucracy using local input and collaborative processes (Brunner and Steelman 2005; Coe-Juell 2005; Fiorino 2006; Folke, Lowell Pritchard et al. 2007). It would allow for softer and more voluntary local or regional regulation of activities that impact the ecosystem consistent with community goals and consistent with national standards. There should also be evidence of a greater acceptance by regulators of public and community input and decision-making (Table 34).

Table 34 Effects

<b>Ecosystem-based Approach</b>	<b>GLWQA Approach</b>
Transition toward a more adaptive ecosystem-based approach to governance. Innovative measures are tried that transform current governance entities and create new or modified value institutions that get beyond scientific management and strict command and control hierarchy of bureaucracy using local input and collaborative processes	Principle effect was the acceptance and success of the outreach and public education efforts culminating in PLUARG and related reports. These effects led to explicit incorporation and implementation of basin-wide ecosystem approach into the 1978 amendments. Other effects included the push-back from entrenched government and private interests threatened by the change in governance.

In the discussion concerning outcomes from the GLWQA the focus was on one overall critical outcome: The emergence of the ecosystem-based approach to governance applied throughout the Great Lakes Basin. As we know, the original 1972 Agreement laid the groundwork by seeking input and involvement from the public in investigating

the possibility that water quality was impacted by land-based activities. The innovative educational outreach methods, strong public participation, and compelling local input into the IJC's reference concerning the impact of land-based activities certainly produced an outcome of public and institutional awareness of the value of local input and the need for change away from traditional fragmented command-and-control enforcement and toward more collaborative processes (Colburn, Davidson et al. 1990; Becker 1993; Jackson 2005). As a result, the ecosystem-based approach was specifically defined and formally adopted as part of the 1978 protocol amending the GLWQA:

(g) "Great Lakes Basin Ecosystem" means the interacting components of air, land, water and living organisms, including *humans*, within the drainage basin of the St. Lawrence River at or upstream from the point at which this river becomes the international boundary between Canada and the United States (1987, Art 1(g)) [Emphasis original].

Thus the notion that humans were an integral component of the ecosystem, a relative outcome of efforts of PLUARG and the references set forth in the 1972 GLWQA, became a became a truly lasting effect and legacy via the 1978 language. Another related effect was the recognition of the manner in which human activities interacted with other components of the ecosystem. Henry Regier, a former Commissioner of the Great Lakes Fisheries Commission and key participant in much of the GLWQA Science Advisory Board activities in the 1970s and 80s summarized this interrelationship in the simplest of terms:

We recognize two polarities or subsystems within the Great Lakes basin ecosystem: the natural and the cultural. These can only be distinguished in a general way; we see no clear boundary between them. Abstractly, the whole system may be viewed as a dynamic self-organizing network in which the human and nonhuman are connected in countless ways. On

balance, these two subsystems in and around the Great Lakes are interacting adversarially rather than mutualistically (Edwards and Regier 1988, 19).

Thus the broad primary outcome of the early years of the GLWQA regime, the ecosystem-based approach to governance, evolved into a lasting change in the Great Lakes Basin. The notion that humans were but one component of a larger ecosystem and that their activities needed to be factored into notions of ecosystem health and resilience was an effect that required fundamental change in institutional attitudes. Integrity was recognized as a complex attribute that was comprised of the individual acts of a multitude of actors, with impacts that influenced the welfare of many in ways that are not immediately apparent. It was also recognized that ecosystem integrity, including natural and cultural ecosystems, could not be assured through the simple intervention by some level of government, be it federal, state, provincial, or local (Edwards and Regier 1988). This evolution of thought and attitude was and is a primary lasting effect of the GLWQA regime evolution.

There was a progression to this evolution. The whirlwind of change that began with public dissatisfaction and demonstrations over social and environmental issues in the 1960s and led to legislative initiatives like the National Environmental Policy Act (1970a), the Clean Water Act (1972) and the Clean Air Act (1970) in the United States.

As discussed previously, the deteriorating environmental conditions in the Great Lakes led to the adoption of the GLWQA by the United States and Canada in 1972. With public involvement and focused efforts of scientists and others on both sides of the border, information and data gathered at a variety of scales led to the amendment of the GLWQA in 1978. Thereafter, with increasing harm caused by invasive species and the

elevated threats posed by persistent organic pollutants often emanating from land-based activities, the GLWQA was amended by protocol in 1987 (1987).

Some argue that the 1978 amendments, and later the 1987 protocol, in some ways had the effect of reducing the credibility of the IJC process. The argument is that by adding the virtual elimination/zero tolerance provisions to the amendments that the provisions became too aggressive. As a member of the Science Advisory Board of the IJC at the time described it, these were goals that were simply unattainable from the start:

Q: Does the fact that [the ecosystem approach to governance] made it into the 1978 agreement; did it change anything in the approach in reality?

A: Well, remember, the '78 agreement came right before 1980, of course, and you know what happened in 1980.

Q: Keenly aware.

A: And the point is what happened the U.S. sooner or later happened on the Canadian side. We were in synch. The '78 agreement, especially as a substitute, subsequently the '87 protocol, irritated the hell out of industry. And the concept of zero discharge virtual elimination was I think just not credible. The industry balked. Just to make a point: no chlorine, no table salt, end of discussion. I can never understand...I used to say well, okay, they're using it as a code word for doing what they want. An unattainable idea out here, that if you could do it, then that's what you aim toward. I could never understand zero discharge/virtual elimination, other than that everybody recognized that this is an unattainable idea. The anti-contaminant campaign—chlorinated hydrocarbons—as code word for chlorinated or brominated, that whole campaign never had support of the public health establishment as such. It had individual public health experts. But the public health establishment never came to favor it. Because they were using chlorinated hydrocarbons all the time for sanitary purposes in the house. The public health said you're not going to use chlorine to clean up a mess in your sink or something? Give me a break. And also, the public health people never got behind it to any extent at all and the clinical health people were, of course, sold up to here in chlorinated pharmaceuticals. And they weren't about to want to get rid of halogenated pharmaceuticals then. And there were all sorts of reasons but they irritated the hell out of the chlorine industry, and the chlorine industry just got the senior decision makers to turn it off. They got a reprieve. Our



side, and I'm fighting chlorinated hydrocarbons right here in Elmira. But, Commissioner Durnill when G. H. W. Bush first appointed him to the International Joint Commission, he didn't know that guy had a family harmed seriously by some halogenated hydrocarbon. So, Durnill had a personal stake in getting rid of them. I think if this had been known to the Bush Administration, Bush wouldn't have put him on the commission. But, they got a breath of life then in the late '80's, early '90's. But that faded out and the chemical industry just closed it down. So, effectively, the '87 protocol, was never implemented. (Canadian Academic 2)

So the inclusion of the virtual elimination/zero discharge provisions in the 1978, though perhaps popular with the public and with environmental groups, had the practical effect of weakening the impact of the entire Agreement. Thereafter, after declining support and outright animosity from the conservative national administrations on both sides of the border, the 1987 Protocol was negotiated. One of the results of the 1987 Protocol was the creation a Binational Executive Committee (BEC). Under the new Protocol, the BEC was constituted with members from Environment Canada and the EPA and tasked with assisting the Parties with meeting the requirements of the GLWQA. There is a solid group of activists and veterans of the GLWQA process that believes that the creation of the BEC effectively thwarted efforts to continue the strong public participation tradition of the GLWQA regime by reducing transparency and placing GLB ecosystem decision into the hands of experts within the given federal agencies, by-passing public and broader community involvement (Krantzberg, Manno et al. 2007).

Thus the effects of the initial GLWQA of 1972 were powerful. Initially the concept of including humans and land use activities within has had a powerful and lasting effect – few would question this reality in this day and age. Also important was the introduction of the notion that broad public participation, adaptive and flexible

governance, transparency, and officials acting in a personal and professional role rather than as representatives of nations or agencies, could function to solve problems and restore ecosystems damaged by human activity. These are strong and positive effects in the realm of ecosystem-based governance.

Other realistic effects were, though predictable, not advantageous the quest for ecosystem integrity, including clean water and air. One effect was that public participation waned. In addition there seems to have been a reaction of entrenched government agencies and private corporate interests designed to thwart the effectiveness of changes in governance. The 1987 Protocol that amended the GLWQA is an example of a provision that, while on its face appeared to enlist the expertise of EC and EPA in the IJC governance scheme, in reality laid the formal basis for the unraveling of the participatory governance scheme originally contemplated by the Agreement.<sup>25</sup>

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<sup>25</sup> In fairness, at least one of the interviewees who has been involved in the GLWQA evolution believes that public support has not waned but has merely evolved:

Q: What's happened to the public participation?

A: What's your point? Is your point that it has diminished?

Q: Yeah.

A: No I would say it's evolved.

Q: Okay. Explain...

A: Well it's not focused on water quality or the water quality agreement per se; it's focused now on aquatic invasive species and Great Lakes restoration...And that has less of a direct connection to the water quality agreement. The IJC and the water quality agreement haven't been able to adapt and evolve as quickly for a lot of reasons that are very obvious to you - going to the Department of State and External Affairs. So the movement now and the push from public advocacy standpoint is to do something about ballast water and releases from other vectors and make this Great Lakes regional collaboration and restoration plan real by providing funding. And that's where the citizen energy is focused right now.

Q: No more of these meetings though where you actually get the Science Advisory Board in front of the IJC with a huge audience. That doesn't happen anymore?

A: Well, it's evolved. There is a Great Lakes restoration annual conference that's sponsored by the Healing Our Waters coalition which is modeled after the Everglades coalition and is focused on the issues of the Great Lakes. (U.S. Federal Employee 2)

The effects of governance change, therefore, may be positive or negative in terms of trends that lead communities and regions either toward or away from their goals. The longer term effects of the GLWQA experiment are still playing out – even as those active in the coordination and implementation of strategies strive to stay “below the radar” of the federal governments on both sides of the border. As one representative of a regional compact described it:

A: The compact that created us gave the Commission the authority to advise and consult with Canada and the provinces. That was what the states wrote into the compact. Congress said: “Thank you very much but we’ll take care of the relationship with Canada.”

Q: In what form?

A: Well they said that they didn’t want a regional organization like us negotiating or consulting or anything involving direct consultation with the Canadian government...

Q: So can we now understand why the \$475 million pot from the Great Lakes Restoration Initiative is a total US initiative?

A: Not exactly. There’s a little bit more to the story. So Congress said no you can only be a US organization created by the involved States – you know the way compacts work – they have to go to Congress under the Constitution. We, however, recognize that there’s another side to the border so we created by resolution a category of membership for the provinces called “associate commissioners” and basically treat them just like U.S. Commissioners. Technically they don’t have a vote but we generally operate by consensus. So they sit at the table with our Board of Directors. They participate in all deliberations. We just had our annual meeting up in Québec city. Québec and Ontario are very active but technically they’re not part of the Compact and technically they don’t actually have a vote.

Q: But in all other respects?

A: It was a way for us to get around what Congress did when they took it up. (U.S. Federal Employee 2)

Clearly the lasting effects of the GLWQA are a complex and mixed-bag. On the one hand, and I believe most importantly, there was once a governance regime that, for a time, was characteristic of an adaptive, inclusive, transparent ecosystem-based approach to governance. The significance of this fact cannot be overstated. On the other hand, the successes of that governance regime created push-backs in the form of entrenched interests devising ways to water-down the characteristics of the ecosystem-based nature of the GLWQA regime.

There are lessons here. In the first place it is apparent that the social process for an ecosystem-based approach to governance can be created. Meaningful broad-based public participation combined with governmental processes that focus on problem-solving, knowledge, and rectitude can exist with the assistance of courageous actors who perceive the value of a resilient ecosystem to be more important than gains in power and/or wealth so long as there are government agencies that accommodate these values. Another lesson, however, is that even where a social process can be established that nourishes and fosters an ecosystem-based approach the participants must be proactive and take steps to preserve the processes that led to the initial success.

### **Decision Process**

The third and final portion of the policy sciences framework that needs to be discussed is the decision process. Much of the information, background, and data concerning the decision process has been set forth and absorbed within the prior sections involving problem orientation and the social process. Every effort will be made to avoid unnecessary duplication.

Natural resource policy and management are generally analyzed on the basis of the decision process employed in the execution of the agency's mandates. An examination of the decision process practiced in a given ecosystem governance regime for this study involves the mapping of six interlinked functions of intelligence, promotion, prescription, implementation, termination, and appraisal. This systematic analysis can turn up flaws in the decision process that cause restoration plans to fail. Knowing how a decision process works, or doesn't work, participants can maintain good practices or correct a poorly functioning one. A decision process can be a way of reconciling or at least productively managing competing interests and policies through politics. Politics will always be with us because people seek different policies that reflect their particular, or "special", interests. In many cases, however, as in sustainability management, people must reconcile interest differences to clarify and secure their common interest. Investigation should reveal who establishes what the common interests are or should be. In terms of ecosystem-based governance, trends can be determined that might indicate whether intelligence data is reliable and linked to the appropriate scales within an ecosystem, whether such intelligence is being communicated to policy makers in a meaningful manner and, ultimately, whether a structure exists that allows for decision makers to react to intelligence in an adaptive fashion. Note that ecosystem-based governance requires a decision process that is open and transparent, not slanted toward special interests and power (Clark 2002). In terms of ecosystem-based governance, trends can be determined that might indicate whether intelligence data is reliable and linked to the appropriate scales within an ecosystem, whether such intelligence is being communicated to policy makers in a meaningful manner and,

ultimately, whether a structure exists that allows for decision makers to react to intelligence in an adaptive fashion, and whether there is impartial third-party appraisal of existing policies that will permit participants to adapt or even terminate programs (Clark, Willard et al. 2000; Wilson 2000; Armitage, Berkes et al. 2007). Note that ecosystem-based governance requires a decision process that is open and transparent, not slanted toward special interests and power (Clark 2002).

Intelligence. Intelligence is the process of obtaining and processing information and making it available to decision makers, stakeholders, members of the public, and others (Clark 2002). It involves the generation of knowledge, the transmission of knowledge, the use of knowledge, and the effects of knowledge on the policy process. Knowledge relevant to environmental decision making may be generated by scientists or it can come from other sources, including local knowledge. Intelligence is simply the process used to gather information about the problem(s) at hand and the relevant context and should incorporate characteristics like timeliness, dependability, and creativity (Clark 2008). The purpose of intelligence is to provide reliable data and information that permits an understanding of whether conditions in the ecosystem are trending toward or away from the goals of the region (Busch and Trexler 2003). Reliability turns on whether intelligence is comprehensive and gathered from appropriate scales in order to detect trends and changes in ecosystem resilience and function (Lasswell 1971; Gunderson and Holling 2002; Gunderson 2003; Reid, Berkes et al. 2006). Data gathering and analysis should, in an ideal world, be inclusive and open to honest debate. Policy makers, as we have seen in the prior sections, must be willing to put special interests and bias aside and make decisions based upon the available data. The data, and the decisions, should be

understandable to the public. Intelligence that reveals trend direction should lead to policy responses through an adaptable and accountable process (Busch and Trexler 2003; Gunderson 2003; Brunner 2010a).

Earlier in this chapter there was discussion centered on the idea that our current *status quo* of limiting the gathering of intelligence largely to scientists and other experts who then confine transmission of research and data to members of their own discipline needs some improvement. Knowledge disseminated through peer-review processes may help to ensure some measure of reliability and assurance of rigor, but it also has the effect of screening out knowledge that policymakers should take into account (Ascher, Steelman et al. 2010).

Intelligence and complex natural science information cannot simply be dropped on an uninformed public. The public must be informed and interested and therefore be able to understand the data and other intelligence. Thus the groundwork necessary to create an informed public is necessary before significant public outreach and capacity building can be meaningful (Becker 1993; Fischer 2000; Berkes, Colding et al. 2003; Weber 2003; Walker and Salt 2006). Local groups able to inventory and sample the natural resources with results communicated to a variety of actors, including the general public, using a wide range of methods, are preferable to the kind of closed process we have now that collects and transfers knowledge only amongst a select group of peer review journal aficionados. Information, collected by a range of volunteers under the guidance of a blend of scientific and local knowledge and transferred freely provides the basis for feedback loops required for the holistic and sustainable management of complex systems (Walker and Salt 2006).

In the Problem Orientation and Social Process sections of this chapter, many aspects of the Decision Process were absorbed and discussed within the analysis. I will attempt to limit the discussion, as much as possible, to the time period of the initial years of the GLWQA governance regime – meaning from 1970 through the early 1980s. It is my view that this was the period in which the major reforms in governance were developed and implemented – before they were slowly eroded and discredited by unsupportive government administrations on both sides of the border.

Water quality monitoring began early in the Great Lakes and an alarming 1970 report by the IJC (IJC 1970) set in motion the process that culminated with the signing of the original 1972 GLWQA (1972). As discussed earlier, the original 1972 Agreement called for enhancement and restoration of “water quality in the Great Lakes System” and for the prevention of “further pollution of the Great Lakes Basin Ecosystem owing to continuing population growth, resource development, and increasing use of water...” (1987, 1). Annex 1 of the original agreement set forth specific water quality objectives covering a broad range of conditions and constituents, including targets for dissolved oxygen, total dissolved solids, pH, Iron, phosphorous, radioactivity, along with interim objectives for temperature, mercury (and other heavy metals), and persistent organic contaminants.<sup>26</sup> As has been discussed, the 1978 Amendments to the GLWQA expanded on the elimination of the targeted compounds and pollutants and adopted the ecosystem approach to the entire Great Lakes Basin (1987).

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<sup>26</sup> “...persistent organic contaminants that are toxic or harmful to human, animal or aquatic life should be substantially absent in the waters” (1972). Great Lakes Water Quality Agreement, with Annexes and Texts and Terms of Reference, Between the United States of America and Canada: 79.



Thus specific goals and targets for the reduction of contaminants in the Great Lakes were initially supplied by the original 1972 Agreement (1972). What remained was to undertake the task of designing a process designed to provide reliable intelligence that would indicate whether environmental conditions were trending toward or away from the objectives of the Agreement.

It took time. During the first five years of the GLWQA governance regime, the IJC, through input from its boards and from those involved in references like the Upper Lakes Reference Group and the Pollution from Land Use Activities Reference Group (“PLUARG”), wrestled with the options for the development of a monitoring plan agreeable to the Parties and adequate to cover the Great Lakes. PLUARG, for instance, the entity set up by the IJC to research the effects of land use activities on the water quality of the Great Lakes, began their work early. A 1973 workshop brought together voices from around the basin to discuss their knowledge of problems and monitoring issues in the Great Lakes (PLUARG 1973). In February, 1974, PLUARG<sup>27</sup> submitted to the International Joint Commission a “Study Plan to Assess the Great Lakes Pollution from Land Use Activities.” The plan set forth four principle tasks: an assessment of the problems, an inventory of land use activities, an intensive study of selected watersheds, and lake (open water) studies (PLUARG 1974). On the Canadian side, a detailed study plan was submitted to the IJC designed to determine the extent and sources of contamination from agricultural watersheds. These watershed studies sampled waters in

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<sup>27</sup> A description of PLUARG’s inclusive basin-wide approach to the challenges posed by the original 1972 GLWQA is set forth in the Problem Orientation and Social Process sections of this chapter.

the nearshore of the Canadian shoreline as well as sampling near agricultural run-off areas and at the mouths of rivers (PLUARG 1975).

The development and implementation of these various plans was constantly monitored by the IJC and its Boards. Reports from PLUARG as well as state/provincial and federal agencies were provided on a regular basis. The efforts of the monitoring groups extended beyond the threats posed by phosphorus and other nutrients. Illustrative is the concern expressed by the IJC in its 1975 Annual Report to the Parties concerning biomonitoring results:

The Commission again in 1975 expressed its deep concern to governments about the concentration of polychlorinated biphenyls (PCB's) in the Great Lakes. Contamination by PCB's continues to be extensive and it is obvious that a voluntary program by the sole North American manufacturer to limit sales has not resulted in a decrease in PCB burdens in fish (IJC 1975)

Clearly the IJC and its Boards were receiving intelligence relevant to the goals and objectives of the GLWQA of 1972. The problem was that data was coming in from a broad array of participants, protocols were not uniform, and there were gaps that made it difficult to understand the state of the broader ecosystem and often impossible to detect trends. One member of the Research Advisory Board at the time described the process during those years:

We had a working group...we met regularly over two years, and put together our understanding. We started by saying that we were going to take every explanation...anybody who had any claim to expertise we'll take their hypothesis ...we'll listen to accusations...before we bring in any of our own personal hypothesis. And we checked out every one of them. And to our surprise we found people who were using the same evidence to support different kinds of causal claims ... [W]e took...all the rest seriously. I was also very much struck by the fact that there was evidence

out there that wasn't diagnostic of any particular problem. There was ambiguous evidence. So we started asking, what kind of evidence is diagnostic for a particular causal approach and which evidence was non-diagnostic. And that is how I got into the ecosystem approach. Even my expert colleagues were doing the same thing. People who had expertise in eutrophication were blaming all sorts of things on nutrient overload. People who knew about fishing like I did were blaming all sorts of things on overfishing. The people like Huxley, who knew about erosion were blaming erosion for lots of things. And we said well if we take an ecosystem approach you're obligated to sort these things out and try to attribute the cause where you have evidence, diagnostic evidence. That is one way of how I got interested in the ecosystem approach. (Canadian Academic 2)

The IJC highlighted the somewhat scrambled intelligence process in its 2<sup>nd</sup>

Annual Report (1973):

...progress toward meeting the agreed objectives cannot yet be confirmed on the basis of the scientific data and information supplied to the Commission. Aside from the difficulties of collecting water quality data on such immense bodies of water under variable natural conditions, the sampling and analytical procedures employed in the several jurisdictions are not consistent and as a result the data made available from these sources is not comparable and does not lend itself to "collation, analysis and dissemination" by the Commission (IJC 1973, 1).

It took five years, but in 1975 Great Lakes Surveillance Plan was adopted through the Water Quality Board and the IJC (WQB 1975). Figure 9 summarizes the evolution of surveillance strategies over those first five years using comments in early IJC reports.

The Surveillance Plan has not been static. It has evolved as the flow of data disclosed new trends or fresh environmental threats. In 1976, with the increasing threats posed by toxic contaminants and the development of new technology, the IJC challenged the Parties to commit to increased funding to include basin-wide biological monitoring (IJC 1976). Similar challenges to buttress surveillance monitoring were issued the following year in anticipation of the adoption of an ecosystem-based approach to

governance for the entire Great Lakes Basin – which would include land-based activities due to the findings and recommendations of PLUARG (IJC 1978). In 1983 the IJC revisited and modified the surveillance plan to reflect additional concerns.

1972	GLWQA mandates “monitoring, surveillance...necessary to ensure compliance” with requirements for abatement and control of pollution and substantial elimination of “discharges of toxic persistent organic compounds (1972)”
1973	“...progress toward meeting the agreed objectives cannot yet be confirmed on the basis of the scientific data and information supplied to the Commission...Moreover, insufficient resources of qualified personnel have been assigned by the government agencies to assessment and interpretation of the basic data obtained. The Water Quality Board is now endeavoring to develop the basis for the necessary coordination of the agencies' monitoring programs so that over-all water quality and trends in the Basin may be assessed on a continuing basis (IJC 1973,1)
1974	Data from labs and state/provincial agencies show levels of mercury, dieldrin, and PCBs detected in fish in excess of FDA tolerance levels. DDT levels declining. “Water quality surveillance programs are currently being conducted by governments at a level that does not provide adequate information. Surveillance plans recommended by the IJC's Water Quality Board and described in its 1974 Annual Report will require increased commitments of funds and personnel” (IJC 1974, 3) .
1975	Each year since the signing of the Agreement, the Commission has advised governments that it could not report accurately on progress, or lack of it, toward achieving the goals of the Agreement because existing surveillance programs were inadequate. The Water Quality Board has now developed a comprehensive surveillance program which when implemented would overcome the shortcomings of the present programs. The Commission fully endorses this program ...Because of the critical need to launch the program as soon as possible and recognizing time constraints of the budgetary cycle in the United States and Canada, the Commission has already taken action on this matter. In a separate communication ... to the Parties, the Commission has urged them to ensure that fiscal programs over the next 10 years provide ongoing funds at the level proposed (\$16 million annually), for the Agencies of federal, state and provincial governments having responsibility for water quality surveillance and monitoring activities in the Great Lakes. The Commission now reiterates its concern and urges once more the recommended actions (IJC 1975a, 4).
1975	Great Lakes International Surveillance Plan forwarded by the Water Quality Board and adopted by the IJC (WQB 1975; IJC 1976).
1976	The Commission notes with satisfaction the report of the Water Quality Board that Governments are now providing adequate funding for point source monitoring within the current Great Lakes International Surveillance Plan. It is imperative that efforts by the two Governments should continue to support this international surveillance program, at least to the levels presently established, and that Governments ensure that funds appropriated for this purpose are fully expended...The Commission also believes that there is a need for a greater and early emphasis on biological monitoring and on the monitoring of biologically sensitive nearshore areas. While aspects of biological and nearshore monitoring are included in the Surveillance Program, their present scope appears to be insufficient to assess the effectiveness of the revised Water Quality Objectives...which are based on the protection of the most sensitive beneficial use of the Great Lakes, usually aquatic life or human health. This need is also inherent in a growing overall concern for the impact of Great Lakes pollution on biological resources and human health. While this matter will be subjected to a more detailed study...in order to provide further advice to Governments, the Commission recommends that Governments undertake to ensure an adequate level of funding as soon as possible for the additional monitoring necessary to complement adequately the present chemical and physical monitoring programs in the Great Lakes (IJC 1976, 3).
1977	Although the Commission notes that remedial programs have begun to show limited results in the reduction of phosphorus concentrations and levels of PCBs, DDT, DDE, mercury and Mirex in some parts of the lakes, it is aware that these improvements have not yet reached substantial proportions, nor are they basin wide. The Commission ...recommends: ...that the International Great Lakes Surveillance Plan be funded in full, at least through 1987

Figure 9: GLWQA Evolution of Surveillance: The First Five Years

Given the above it would appear that the first decade or so under the governance structure and process of the GLWQA agreements matches well with the characteristics of the Intelligence function of the ideal system (Table 35). There was active surveillance from a variety of sources at representative scales gathered with the assistance of a broad base of participants. The surveillance, while conducted by the parties, was ultimately coordinated by the IJC and its Boards. The results of the surveillance activities were reported out each year in a various forums, including annual meetings of IAGLR, the biennial IJC meetings and formal reports to the Parties, and beginning in the late 1980s on-line through the Great Lakes Information Network (GLIN). The active and at times raucous involvement of the public at IJC meetings has been described in prior sections.

Table 35 Intelligence

<b>Ecosystem-based Approach</b>	<b>GLWQA Approach</b>
<p>System is facilitated by identification of intelligence needs and enabled by cooperative agreements among relevant entities to assure reliability, compatibility, timely analysis and accessibility. Intelligence must come from a broad array of participants that includes scientists, academics, the regulated public, and the public at large.</p>	<p>The original 1972 GLWQA sets out targets and objectives for water quality in the waters of the Great Lakes. PLUARG uses inclusive basin-wide panels to set forth and implement activities that include monitoring at a variety of scales - from land-based to open lake sampling. Great Lakes Surveillance Plan adopted in 1975 and reviewed and updated periodically thereafter provides for coordinated basin-wide monitoring plan.</p>
<p>Intelligence must be communicated to an accountable entity for analysis and coordinated action, i.e. a person, partnership, or other entity that has an obligation or responsibility to an authority, group, standard, mandate or behavior norm <i>external</i> to that person or entity. Intelligence and information must be made readily available to researchers, scientists and the public.</p>	<p>PLUARG data and reports submitted and available to IJC, RAB, WQB, and all participants and the public. Ultimately all documents and information made available on-line (late 1980s) through the Great Lakes Information Network (GLIN). GLWQA library and office in Windsor, Ontario provides public information and direction until closed in the 1980s.</p>
<p>In order for the public to be interested and be able to understand the data and other intelligence, significant public outreach and capacity building is required.</p>	<p>PLUARG, Great Lakes Tomorrow, the GLBC, Lake Michigan Federation, engage in public education and outreach to develop an informed public.</p>

The fact that the IJC and its Boards continued to alter and amend the Surveillance Plan demonstrates both adaptability and accountability. In almost every respect, therefore, the characteristics of our ideal ecosystem-based governance regime were met in the early years of the Great Lakes Water Quality Agreement regime – at least as far as the intelligence function was concerned. We next look at how well the promotion task measured up to our ideal standards.

Promotion. Using data and information gathered as part of the intelligence function, recall that promotion, sometimes called estimation, involves the “thoughtful assessment of options and alternatives” (Brewer and deLeon 1983, 83). Promotion serves the function of recommending and mobilizing support for policy alternatives and serves to define and even limit the possible solutions to a problem. It is the stage where information and data gathered as a result of the intelligence task are debated and discussed and alternatives and options are recommended and debated (Clark 1997).

As we have seen, promotion under an ecosystem-based approach to governance differs markedly from the *status quo*; that is, expert-driven planning models that rely almost exclusively on science- and expert-based technology. We have noted that under the traditional view, generally only experts are qualified to make and implement sound management plans. Promotion is largely the role of bureaucracies – bureaucracies that are also responsible for enforcement of uniform rules and regulations (Fiorino 2006).

Promotion also includes politics, bringing with it an array of political parties, lobbyists, pressure groups, people, and powerful organizations of all types (including business and environmental groups) working to shape and share values. (Lasswell 1971; Brewer and deLeon 1983; Clark 2002; Clark 2008). While it has been noted that the

participation of a broad range of promotional actors, many with opposing interests and values creates an “agitational intensity to the dissemination of a value demand”, it is nonetheless preferable to the totalitarian alternative of placing promotion exclusively in the hands of a single party that monopolizes and controls debate (Lasswell and MacDougal 1992, 29). Politics, as was discussed earlier in Chapter 3, need not be divisive and polarizing. Indeed, in an ideal world, healthy politics that includes “policy relevant science, pertinent local information, constructive public involvement, and conflict resolution – can serve to clarify and secure the common interest in knowledge generation for environmental decision processes” (Ascher, Steelman et al. 2010, 8). The politics of promotion should include honest debate about what to do. Further, the overall decision process must provide “ a means of reconciling (or at least managing) conflict through politics in order to find a working specification of a community’s common interests” (Clark 2002, 57).

Promotion during the early years of the Great Lakes Water Quality regime incorporated many of the aspects thought consistent with ecosystem-based governance (Table 37). We have seen that in the early years under the GLWQA, intelligence was funneled to the IJC from broad-based surveillance, research, and monitoring activities conducted under the GLWQA by the Water Quality Board , the Research Advisory Board (later the “Science Advisory Board”) the GLFC, PLUARG, as well as federal and state/provincial agencies on both sides of the border (IJC 1976; PLUARG 1978; IJC 1980; Regier and Baskerville 1986; Becker 1993; Prelli and Becker 2001; Dempsey 2004).

The approach to problem-solving and policy-making utilized by the IJC in the early years had many characteristics of an ecosystem-based approach to governance and we have discussed many of those characteristics earlier in this chapter. Consistent with the notion of promotion in an ideal ecosystem-based governance regime, during the first decade of the GLWQA there was strong support by the IJC and its Boards and panels to pursue common interests and the health of the Great Lakes Basin ecosystem were paramount. The problem-solving approach of the SAB and related IJC panels was to solicit and listen to all ideas being promoted from multiple interests – a universal approach – in order to make sure no potential innovation was overlooked. IJC, SAB and other GLWQA participants shared an implicit commitment to the basin and to the equity and justice. Equity, fairness, and human health reached the operational levels under the GLWQA and were factors in the early years. Also, information and input was gathered from broad base of participants, overlapping board members, and knowledgeable citizens.

Of course, any examination of the promotion task in the Great Lakes must recognize that decisions and policy making at the level of the IJC must consider the somewhat limited role played by the IJC as the coordinator and overriding organizer whose function under the various iterations of the GLWQA is to cajole and informally pressure the Parties to meet their obligations under the Agreement (1909; 1972; IJC 1973; IJC 1974; IJC 1975; IJC 1975a; IJC 1976; IJC 1978; PLUARG 1978; IJC 1980; 1987). Despite differences between the IJC and the Parties to the GLWQA, however, there is a legacy of frequent and often innovative cooperation and collaboration between them. There have also been others, including labor unions and NGOs, especially when



galvanized under the umbrella organization of Great Lakes United, that have often applied pressure when necessary to see that the trade-offs in base values trended in the direction of educational outreach and accumulating knowledge and well-being, as demonstrated by the comments of a former member of the SAB during the early years under the GLWQA:

And so, people kind of didn't know what to do, especially since these things crossed so many political boundaries jurisdiction. So, we had a whole series of consultations. They had roundtable discussions around the basin. They had a series of initiatives to try to get a handle on it. Great Lakes United was formed between '78 and '87, to be the activist group, because Great Lakes Tomorrow was a facilitation and education group. But, we needed some group that was going to hold politicians' feet to the fire, and that was Great Lakes United. So, a couple of things happened in that period, one of which was Green Peace's zero discharge tour of the lakes, where they went about touting the only way to deal with toxic contaminants [was zero discharge] but, that occurred after GLU held a series of public hearings around the basin to get input from whoever wanted to show up and testify. They published a report, which I have on the shelf ...a justification for why that probably needed to be really explicit and that there needed to be... Also during that period, and while I was on the science advisory board, there was a lot of interest in getting a mass balance assessment of the contaminants. It started with PLUARG, but then it went on after that. In order to get mass balance, you need to know sources, causes, etc. So, there was a lot of that research going on in the system at that time. It became very clear that the only way that these watershed groups were going to be able to do what had to be done was to have a strategic approach. (US NGO/Academic)

Under IJC leadership in the early years, therefore, promotion took many forms, including a focus on galvanizing public participation and fostering honest discussion and debate on issues relevant to the health of the ecosystem<sup>28</sup> (Becker 1993; Jackson 2005).

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<sup>28</sup> The importance of organizations such as Great Lakes Tomorrow, the Lake Michigan Federation, Great Lakes United, Decisions for the Great Lakes, the Great Lakes Basin Commission, and others in their efforts to provide outreach and education and build capacity in the form of an educated public has been highlighted in the social process section of this chapter. In addition, the importance of the annual and biennial meetings of the IJC, with the open reporting of the progress made by the Parties under the

Promotion activities under the GLWQA regime allowed for a social process that included a wide variety of actors, including government agencies, NGOs, citizens, and related institutions. Thus, during the early years, promotion was relatively a “bottom up” effort. In recognition of this blossoming process, in 1979 the IJC established a standing committee to assist in providing the public information service called for in the 1978 agreement (GLWQA 1987).

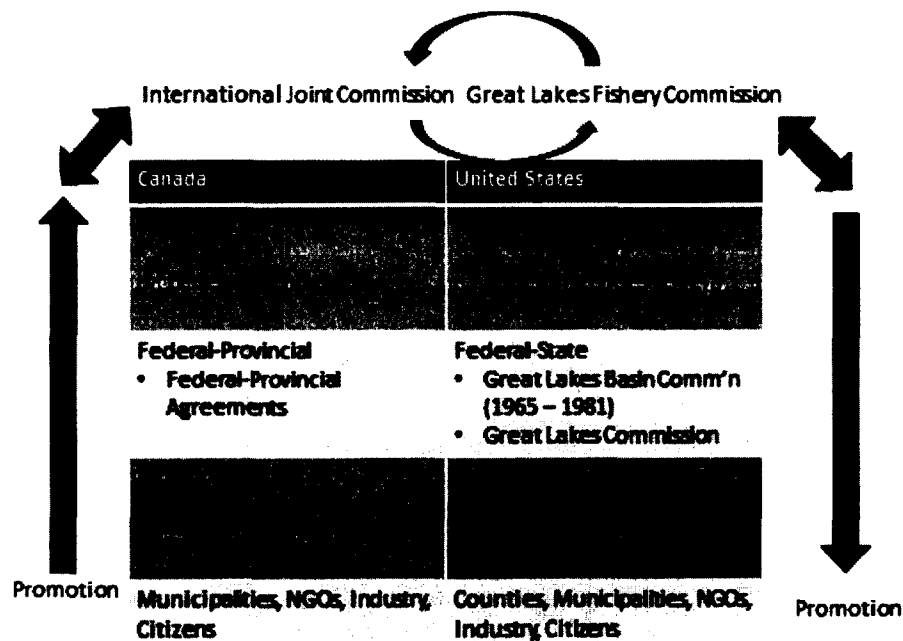


Figure 10 Great Lakes Promotion Paths

The basic concept was that citizens have rights to participate in IJC activities and should be encouraged to do so. The policy stressed that information should be provided while studies and activities were being carried out, not just after decisions were already

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GLWQA by the SAB and the WQB before an audience that, in the early years, often included an interested and actively engaged public that was allowed to pose questions and challenge policy makers, as discussed earlier, added to the transparency and credibility of the GLWQA process. The role of the annual meetings of IAGLR and, beginning in the late 1980s, the public dissemination of Great Lakes related research and events through the Great Lakes Information Network, both fully discussed earlier, also provided valuable promotion-related opportunities.

made. The aim was to increase the IJC's credibility by taking public opinion into account (Becker 1993). Figure 10 summarizes the promotion directions extant in the early years of the GLWQA governance.

Thus the task of promotion in the early years of the Great Lakes Water Quality Agreement approach was broad-based and relied upon citizen participation, problem-solving decision processes that welcomed and examined the views of a wide variety of scientists and other participants. In this fashion, debate was open and transparent and those decision-makers who were either at the IJC or Board-level had access to honest and transparent debate from a wide variety of interested parties. This process stands in stark contrast to traditional promotional activities and provides us with a worthwhile model for honest promotional efforts for use in future problem-solving (Table 36)

Table 36 Promotion

<b>Ecosystem-based Approach</b>	<b>GLWQA Approach</b>
<p>Promotion and politics involve honest debate using policy relevant science, pertinent local information, constructive public involvement, and conflict resolution in order to clarify and secure the common interests (as opposed to special interests) and secure knowledge generation for environmental decision processes. Hard questions are asked and "difficult" data is not neglected. Constructive, honest, debate helps to promote trust and cooperation and equitable outcomes are pursued through the open sharing of knowledge and open debate with broad participation.</p>	<p>By Treaty, Agreement, and Protocol, the governments of the United States and Canada agreed to undertake mutual obligations to protect, restore, and preserve the Great Lakes Basin ecosystem. Promotion efforts are on two levels: 1) the pressure of the public on the IJC and the Parties to preserve, restore and protect the GLB ecosystem, through public involvement (e.g. PLUARG) and biennial meetings, and 2) the ability of the IJC to persuade the Parties to fund and act upon their obligations under the GLWQA. IJC processes demanded that problems, including hard problems and "difficult data," and competing interests be openly debated with full sharing of knowledge, broad participation, and decision principles that put the well-being of the GLB ecosystem ahead of other interests. Open information sharing and debate fostered by mandated public participation. Emphasis on public outreach and education are an integral part of decision process.</p>

Prescription. In the prescription, or *selection*, phase, the data, values, and interests distilled from the intelligence and promotion tasks are used to select appropriate law, policy, or management options appropriate to the targeted challenge. The activities and process used in this phase result in the establishment of new rules or guidelines to solve a problem or deal with an environmental conflict or issue (Clark 2002; Clark 2008). In the case of the Great Lakes Basin, during the 1970s and 1980s the processes created under the Great Lakes Water Quality Agreement gave extensive authority to the policy prescriptions developed by the IJC and its Boards (1972; Valiante 2007)

The problems inherent in the governance and management of the human activities that impact the Great Lakes Basin are many. The GLB is essentially a binational bioregion containing the world's largest fresh water ecosystem and accounting for more than 20% of the world's available surface water (IJC 1973; Donahue 1988; Becker 1993; Caldwell 1993; Valiante 1997; Botts and Muldoon 2005; Valiante 2007). During the years pertinent to this project the IJC and the GLFC shared the leadership role in the development and implementation of governance and prescriptive management through the use of diplomatic and ideological strategies. As has been noted, with no ability to bring formal enforcement actions to compel environmental compliance, there were few realistic alternatives.

The IJC and the GLFC are, as we know, dependent upon the efforts of the Parties, including states and provinces, for implementation of recommendations and policy developed on a binational level. These entities are, of course, bound by formal,

fragmented laws, rules, and regulations created by political systems in both the United States and Canada.

During the 1970s and 1980s, however, the processes called for by the GLWQA seemed at critical times to trump the fragmentation inherent in the binational domestic regulatory scheme. As we have seen, citizens were actively involved and were able to help galvanize the IJC and its Research Advisory Board to take meaningful action.

The initial 1972 Great Lakes Water Quality Agreement (GLWQA) between the United States and Canada was negotiated. It was essentially a water pollution agreement but effectively introduced controls on phosphorous discharges and “an extensive set of broad studies under the Pollution from Land Use Activities Research Group (PLUARG) was initiated” (Colburn, Davidson et al. 1990, xxv). As set forth above in the discussions about goal clarification and trends in the GLB, the goals for the Great Lakes Basin, have largely been articulated by GLWQA and the Clean Water Act. The general goal agreed to by the Parties to the GLWQA for the Great Lakes through the 1987 Protocol is to “restore, and maintain the chemical, physical and biological integrity of the waters of the Great Lakes Basin Ecosystem” (1987, Article II). The ecosystem is defined as “the interacting components of air, land, water and living organisms, including humans, within the drainage basin of the St. Lawrence River” (1987, Article I (g)). As we have seen additional goals called for the protection and maintenance of self-sustaining fish populations and aquatic organisms and for protection and restoration of habitats vital for the support of healthy and diverse communities of plants, fish, and wildlife. Other, more particular goals and objectives have been discussed earlier in this chapter (toxic chemicals, virtual elimination, etc.).

With a strong public outreach effort, an active and informed citizenry, a coordinated NGO community and a Research Advisory Board and IJC personally and professionally committed to the restoration of a healthy GLB ecosystem, bold measures were taken. Striking successes in the reduction of nutrient pollution were achieved through cooperative and collaborative deliberations and efforts and, in 1978, the GLWQA was amended to mandate an ecosystem approach to governance (Caldwell 1993; Prelli and Becker 2001; Botts and Muldoon 2005; Valiante 2007). Working in conjunction with the GLFC, a healthy fish populations were restored to the waters of the basin (Donahue 1988; Prelli and Becker 2001) .

Table 37 Prescription

<b>Ecosystem-based Approach</b>	<b>GLWQA Approach</b>
A transition away from adversarial methods designed to punish violations toward greater emphasis on cooperation and collaboration between private and public entities to prevent pollution, reduce risk, and promote sustainability. New relationships, structures, and roles are fashioned by careful planning with broad-based involvement and implemented on a trial and error basis in order to facilitate learning	IJC and GLFC promote collaboration and cooperation between private and public sectors, NGO's, and federal, state/provincial, and local governments. Key individual and institutional participants put public interest of water quality and ecosystem health in the basin ahead of private interests. Science used to suggest problem-solving strategies and new strategies (e.g. phosphorous ban) implemented and monitored to determine suitability.
Adversarial strategies and deterrence are not the only way to influence behavior. Collaboration and cooperation with partnerships designed to achieve economic goals, can promote eco-efficiency, innovation, and sustainability.	Participants and governance, led by IJC, GLBC, with help from citizen groups (e.g. Great Lakes Tomorrow, League of Women Voters) use diplomacy and negotiation to collaborate on issues and limitations of importance to GLB sustainability. Litigation used sparingly and citizen suits coordinated by NWF.
Community and regional involvement in the development and enforcement of environmental regulations can increase learning, inform the public, and lead to greater progress towards goals.	Citizen outreach and participation (e.g. PLUARG, GLT, Decisions for the Great Lakes, Lake Michigan Federation) creates an informed public capable of monitoring and advocating together to drive change and promote progress toward ecosystem restoration.

Thus, for a time, prescriptions in the form of binational agreements with no intrinsic enforcement authority were instrumental in driving citizens, NGO's, government agencies, industry, and others, to cooperate for the good of the Great Lakes Basin ecosystem (Table 37). Rather than require compliance, the binational agreements relevant to the Great Lakes Basin gave participants the opportunity to collaboratively solve problems. It is apparent that the prescriptions were flexible enough to allow participants devoted to an outcome consistent with the public interest of a ecosystem resilience and sustainability were able to find the will and the authority to implement changes for the good of the system. We will next examine the implementation of these prescriptions and whether implementation aided or blocked restoration efforts.

Implementation. As we have discussed, implementation combines the policy analysis framework categories of invocation and application. Invocation includes the initial actions that communities and institutions to invoke, enforce, or otherwise implement a prescription. Application is the process that a community chooses to ultimately characterize the subject behavior and determine what behavior violates the prescription and how such behavior should be sanctioned(Clark, Willard et al. 2000; Clark 2002) .

Table 38 highlights the some of the “ideal” characteristics of implementation for an ecosystem-based governance approach. With respect to the processes that were developed during the initial years of the GLWQA regime, it is important to remember that the Agreements between the parties provided prescriptions, goals, targets, and monitoring requirements, but left the implementation of the Agreements to the domestic governments and institutions within Canada and the United States. Thus implementation

of water quality initiatives under the GLWQA fell to the EPA and the and their state equivalents in the United States, largely utilizing the provisions of the Clean Water Act, while Canada relied upon Environment Canada and the prescriptions of the Canada Water Act and, to a large part, on the provisions negotiated between the federal government of Canada and the Province of Ontario under Canada Ontario Agreement (COA).

Ecosystem-based Approach	GLWQA Approach
<p>Transition is needed to move implementation toward more community-driven, more voluntary, cooperative systems. Government could assist with the identification and clarification of community goals as well as develop measureable standards. It would be up to regional or community efforts to develop solutions to bring environmental indicators into compliance with those standards</p>	<p>IJC actively promotes public outreach and education. Citizens groups form to demand restoration measures. PLUARG and related citizen group efforts provide critical push resulting in increased monitoring and recommendation of standards and indicators in 1978 amendment and 1987 (zero tolerance for persistent toxic substances, etc.), and results in inclusion of ecosystem approach in 1978 amendment.</p>
<p>Adversarial relationships should give way to cooperative and collaborative ones with the emphasis on interactions designed to solve problems with strategies that are developed and shared with the input of scientists, regulators, the regulated community, and other interested parties. In consultation with industry, citizen groups, and government officials, plans created through collaboration can look beyond “end of pipe” discharges to “identify and change activities that cause pollution in the first place. Command and control could gradually be replaced with incentives and learning through trial and error.</p>	<p>Lacking formal enforcement capabilities, the IJC relied upon diplomacy and the cooperative and collaborative efforts of federal, state, provincial, First Nation, and NGOs, all as an educated and interested public pushed for change. The IJC and its Boards used operating procedures that stressed the good of the Great Lakes Basin over private interests. Participants shared an <i>esprit d’ corps</i> that permitted open sharing of ideas and promoted problem-solving. The public was educated with the assistance and blessing of the IJC and kept informed through transparent hearings and related processes.</p>
<p>More reliance upon facilitation, mediation, and other forms of alternative dispute resolution. If court necessary there should be specialized courts with knowledge of environmental factors.</p>	<p>Diplomatic processes centered around problem-solving, collaboration, and cooperation, were used as the major tool often in lieu of litigation and confrontation.</p>

Table 38 Implementation



It should be pointed out that local governments, at least in the early years, were only marginally included in the implementation process under the GLWQA, an unfortunate issue which has only recently begun to change (Valiante 2007).

In the early years the IJC was keenly aware of the delicate nature of their task. They are charged with overseeing the restoration of a binational ecosystem with no political or policing (i.e. enforcement) authority. The need to use the power of a galvanized and educated public as one way to get beyond the fragmentation inherent in two federal bureaucratic systems and their subdivisions was recognized by the IJC (IJC 1975; Caldwell 1993). Thus the importance of public participation has been highlighted by the IJC from the beginning. It has consistently been cognizant of the need for meaningful participation by the public and the reality that meaningful participation was impossible without education and increased understanding of ecosystem threats. This fact was emphasized by the IJC especially after the results of the PLUARG public consultation panels and public hearings, when it was noted that "...the acceptance and successful implementation of PLUARG's recommendations would be possible only if there were an informed public." The IJC went on to report that "[a]n informed and active public would assist Governments in reaching acceptable solutions to nonpoint pollution problems and should be encouraged for this reason also" (IJC 1980, 69).

As Professor Becker (1993) reminds us:

Direct citizen participation in the work of the IJC under the provisions of the 1972 Agreement was relatively limited between 1972 and 1975. However, public interest in Great Lakes pollution problems continued to be very high, and citizens increasingly demanded access to information and a voice in Agreement work. Pressure for direct access to the Commission's work was exerted by citizen action groups, such as the Lake

Michigan Federation, the United Auto Workers, and the League of Women Voters on the United States side of the Basin. Canadian citizen groups exhibiting an early interest in direct involvement included the Conservation Council of Ontario, the Canadian Environmental Law Research Foundation, and various local organizations, such as cottagers' associations (Becker 1993, 244).

Other names can easily be added to the list. Great Lakes Tomorrow facilitated hearings and public meetings across the basin well into the 1980s. The Lake Michigan Federation provided public outreach in connection with the Great Lakes Basin Commission. Decisions for the Great Lakes trained leaders around the basin. Clearly the early years of the GLWQA governance process demonstrates a marked transition from fragmented top-down command-and-control governance to a more community-driven and collaborative process that involved the public in a meaningful fashion. The accomplishments of PLUARG and other cooperative, problem-solving initiatives have been adequately document above and will not be extensively revisited here. They include, however, the linking through community and public hearings, pollution from land-based activities to water quality in the waters of the Great Lakes Basin. These efforts ultimately triggered the decision by the EPA to recommend the banning of the use of phosphates throughout the basin (USEPA 1977) as were the incorporation of the ecosystem approach in the 1978 amendments to the GLWQA (1987).

There is more, however, to implementation than the involvement of an active and educated public. Our ideal ecosystem governance model requires that there be a move away from fragmentation and adversarial relationships toward more cooperative and collaborative ones with the emphasis on interactions designed to solve problems with

strategies that are developed and shared with the input of scientists, regulators, the regulated community, and other interested parties.

Again we are forced to come back to the point that under the GLWQA scheme the IJC has no jurisdiction to force a Party to act in any particular way. It is chartered with the purpose of resolving disputes and avoiding conflicts. The IJC, and its related Boards and panels, have the ability to investigate only “such subjects related to the Great Lakes Basin Ecosystem as the Parties may from time to time refer to it” (GLWQA 1987, Article VII(1)(g)). Even upon reference, the IJC has only the power to hold hearings, make recommendations and draft reports and comments. They simply lack the power or authority to do anything but attempt through common fact-finding, collaboration and diplomatic efforts, to convince the Parties to act in the best interest of the Great Lakes Basin.

Certainly the IJC’s public outreach and education initiatives played a role in driving the Parties toward processes that resulted in valuable cooperative initiatives. As citizen pressure mounted, the IJC and its Boards began to recognize the need for public support in order to implement the terms of the GLWQA and build infrastructure, it took even more affirmative steps to galvanize citizen involvement (Becker 1993). The meetings between the boards and the IJC began to be made public in 1975 and “...in time presentation of the board reports to the IJC in public meetings became a mechanism for increased public understanding of Great Lakes problems, as well as for citizen activism.” (Botts and Muldoon 2005, 23). The IJC biennial reports and the publication and distribution of documents and other measures also increased credibility and boosted public involvement in agreement-related activities, often in the early stage of

implementation (CUSIS 1991; Botts and Muldoon 2005). To help foster this involvement, the IJC hired a professional public relations staff to augment its Great Lakes Regional Office (Dworsky 1988; Colburn, Davidson et al. 1990; Valiante 1997).

The IJC also fostered collaboration through its operating principles. The IJC's historic insistence on the binationalism of its Commissioners, described in the problem orientation section of this chapter, was certainly relevant to the perspective of activities by the IJC and its Boards and panels. This tradition required independence of IJC members from consideration or interference from national interests is found nowhere in the treaty, yet it was essential to achieving the goals of the GLWQA (Jackson and Sloan 2008). As described earlier, Charles Ross, a Commissioner under five presidents, explained that the IJC acted "as members of a single body," with independence from the United States or Canadian government interference, even though appointed by the heads of each country (Botts and Muldoon 2005, 11). Thus independence and collaboration marked the process followed by the IJC and its boards.

Another operating principle that reflects the perspective of the IJC and its boards and panels was the principle that required each commissioner to operate "in his (or her) own professional capacity and expertise" rather than as a representative of an agency, NGO, or other special interest (IJC 1975; Botts and Muldoon 2005,12). Independent of the constraints that might be placed on individuals who might have to act within their roles as agency employees, this operating principle helped assure that attention and expertise was focused on the challenges of the Great Lakes Basin without worrying about their agency interests and limitations. Thus officials of various agencies crossed over and served on different Boards and panels within the IJC scheme.

It is also worth noting again that those participants who were interviewed for this study credited the tradition of independence and binationalism for creating a strong *esprit de corps* that fostered freedom and an open exchange of ideas, and the participation of experts and citizens in their personal and professional capacities (as opposed to representatives of agencies or institutions), the loyalty all shared for the betterment of the GLB ecosystem, strong public participation, public outreach and education, and education of local and other government officials. These characteristics and more gave participants in the GLWQA the ability to focus on the problems of the Great Lakes and a feeling of loyalty and allegiance to a healthy ecosystem in the GLB, complete with concern for integrity, justice, and democracy. The use of common fact-finding and reliance on transparent and reliable data added credibility to the IJC's efforts (Becker 1993; Botts and Muldoon 2005).

Looking back at the early years of the GLWQA regime it is clear that states and provinces found ample opportunity to cooperate. Some notable achievements include the 1985 Great Lakes Charter and the Great Lakes Toxic Substances Control Agreement of 1986 (GLTSCA). Both are voluntary agreements, initiated by the Council of Great Lakes Governors, designed to facilitate the sharing of information and to take a unified stance to protect Great Lakes resources. The Charter was motivated chiefly by threats of massive water transfers out of the Great Lakes Basin and prevents any diversions that would have a significant, adverse impact on lake levels, in-basin uses, or the Great Lakes ecosystem (Colburn, Davidson et al. 1990). It "commits the parties to develop a common data base on water resource use and a cooperative management program that includes an inventory of surface water and groundwater resources" (Botts and Muldoon 2005, 213) By the late

1980s eight states and the provinces of Ontario and Quebec had signed the Charter. The data base was established by the Great Lakes Commission by 1988 (Colburn, Davidson et al. 1990; Sproule-Jones 2002; Botts and Muldoon 2005).

The Governors and Premiers went further the following year by signing the 1986 Great Lakes Toxic Substances Control Agreement (GLTSCA). As noted previously, the GLTSCA has been described as an "...extremely ambitious document that commits the signatories to reducing toxic substances in the Great Lakes basin (Colburn, Davidson et al. 1990). Signed by the Great Lakes Governors in 1986, and endorsed by the Premiers of Ontario and Quebec via a memorandum of understanding in 1988, the GLTSCA called for the integration of permitting process for discharges to different media, interstate cooperation in hazardous waste management planning, development of common health advisories on fish contamination, and in general provide for greater consistency between the provinces and the states in the GLB (CGLG 1986; Colburn, Davidson et al. 1990).

We have now seen that implementation during the early years of the IJC's GLWQA regime was guided by broad and flexible prescriptions and driven by an increasingly active public to employ diplomatic efforts, including operational protocols to cajole and pressure the Parties, including states and provinces, often guided by the Great Lakes Basin Commission and, later, the Great Lakes Commission, to take bold measures in order to achieve the goals set forth by the GLWQA. Two other categories of collaboration and cooperation that emerged during these early years merit comment. The first is the emergence of the Great Lakes Fishery Commission as a binational force and the second is the coalescence of NGOs in the basin around common goals and strategies.

As we have noted previously, the Great Lakes Fisheries Commission (GLFC) was formed through the ratification of a Convention between Canada and the U.S. in 1955. Its charter expressly recognized the value of 'joint and coordinated efforts' to address fisheries conservation (Convention 1955; Dempsey 2004). The convention was implemented through passage of the Great Lakes Fisheries Act of 1956 (GLFA 1956). While the job of the GLFC was initially to formulate a plan to combat the invasive lampreys, by the 1980s the Commissioners from both sides of the border, and their staffs, had cultivated and begun to practice a protective ecosystem policy by working closely with the IJC and its Science Advisory Board (SAB).

Like the IJC, the GLFC has no formal enforcement authority. Given that state borders for state and provincial borders extend to the middle of the border lakes they are able to assert their authority over federal jurisdiction and control the lake beds, waters, and fish of the waters of the Great Lakes (Piper 1967; Gaden, Krueger et al. 2008). Thus the GLFC is the binational entity that attempts to integrate and coalesce the separate but complementary sectors of the non-federal governments (states, provinces, and two U.S. intertribal agencies) and the federal governments, and the GLWQA entities to integrate and take a coherent approach to what would otherwise be a hopelessly fragmented Great Lakes fishery (Prelli and Becker 2001; Gaden, Krueger et al. 2008). They are able to manage this by facilitating Joint Strategic Plans between all involved entities that include cooperation, consensus, accountability, information sharing, and ecosystem management (Gaden, Krueger et al. 2008). Once again, the prescription provided by the Joint Strategic Plans must be enforced through diplomatic collaboration and cooperation.

The last form of collaboration and cooperation that strongly influenced governance and enforcement in the Great Lakes Basin during the early years of the GLWQA era was the relationship that coalesced between and among NGO's. One of the many ways that a growing regional consciousness in the early years of the GLWQA regime was reflected was in the activities of nongovernmental organizations. Unlike some areas, where a seemingly endless list of NGOs attack problems in a fragmented and uncoordinated cacophony of disjointed effort, groups in the Great Lakes began to coordinate their activities. There has already been some discussion of the role of environmental organizations like the League of Women Voters, the Lake Michigan Federation, and Great Lakes Tomorrow. In addition, however, it is important to note the efforts of a group of non-profits that banded together under the Michigan United Conservation Clubs (MUCC). It was largely the MUCC that consolidated these diverse constituencies and led the lobbying effort that resulted in a phosphate detergent ban in that state (Botts and Muldoon 2005). But more was needed, and citizens needed a basin-wide organization. It was the joint effort of MUCC and the New York NGO Save the River, a combination that had led the fight against an Army Corps of Engineers proposal to allow winter navigation on the Great Lakes, that finally got together to form a basin-wide organization. After lengthy confrontations and spirited meetings discussed earlier, Great Lakes United (GLU), emerged. GLU became a united voice for hundreds of organizations throughout the Great Lakes in both the United States and Canada dedicated to preserving and restoring the Great Lakes and St. Lawrence River ecosystem (Colburn, Davidson et al. 1990). The organizations that were included under the umbrella of GLU when it was formed in 1982 included labor unions, environmental groups, hunters,



fishers, community groups, and citizens of the United States, Canada, and First Nations (Jackson and Sloan 2008). GLU holds annual meetings that seek the advice of these groups to develop by consensus an agenda to pressure Congress, the IJC, and other policy makers to collaborate and put the common good of a healthy Great Lakes Basin (Dempsey 2004; Jackson 2005).

One other unique aspect of the way that NGOs coordinated their activities should not go unmentioned – the role played by the National Wildlife Federation (NWF). As was related in more detail earlier in this chapter, the NWF provided the legal resources and coordinated much of the litigation under the GLWQA regime. In this manner, litigation was designed and utilized in a manner that was consistent with the overall goals of the GLWQA. This is in stark contrast to the manner in which environmental groups in other regions file piecemeal lawsuits involving various components of environmental compliance – often resulting in inconsistent judicial rulings and regulatory confusion.

Thus we see that the enforcement activities under the IJC in the critical early years, though lacking formal jurisdiction, proceeded through the coordinated and dedicated diplomatic activities of a variety of active participants – including federal, state, provincial, First Nation, and NGO representatives. What might be considered a weakness, therefore, was turned into strength as the GLWQA prescriptions were pursued by an active and informed public and implementation and enforcement efforts coalesced through collaborative and cooperative efforts at many levels.

Appraisal. As discussed more fully in Chapter III, appraisal involves the task of assessing whether relevant prescriptions and their implementation have effectively met

the goals set by the community and who is responsible and accountable (Lasswell 1971; Ascher, Steelman et al. 2010).

Table 39 GLWQA Appraisal

Ecosystem-based Approach	GLWQA Approach
Appraisal provides a major opportunity for learning and course correction, for using the lessons of experience to adapt failing practices into future changes. The main criteria for appraisals are dependability, comprehensiveness, continuity and independence	Despite no formal enforcement authority IJC and GLFC able to use operational protocols, diplomacy, collaboration, and cooperation to conduct reliable appraisals. Appraisals made public through biennial reports to the Parties, special reports, biennial public, GLIN and annual meetings of IAGLR.
Trend data from relevant scales must be available and transparent. Local knowledge and scientific efforts need to be combined and included in a periodic public assessment of the state of the ecosystem.	Adaptable and inclusive Monitoring Plans began in the late 1960s by IJC. Data collected from broad range of sources and coordinated by IJC and Boards. Data easily available to public through GLIN, Annual Reports and Meetings, and IAGLR.
It is critical that appraisals be carried out by third parties, i.e. not the agencies that are charged with programmatic responsibilities.	IJC and its Boards provide independent appraisal of the Parties' progress toward goals and report biennially.
Existence of a collaborative entity or single overarching body that can, formally or informally, accumulate the knowledge accumulated through appraisals and implement change to reverse adverse trends.	IJC, its Boards, and the GLFC collaboratively accumulate knowledge and through biennial and other reports (as needed) give recommendations to Parties on ways to reverse adverse trends. Trial and error efforts not uncommon in early years.

Table 39 sets forth the characteristics for appraisal under an “ideal” ecosystem-based approach to governance. At its most basic, the ideal model requires that there simply be a mechanism for appraisal of policies and actions to determine whether progress is being made toward the prescribed goals. Further, appraisal should utilize

trend data appropriate to the task and include a periodic public assessment of the state of the ecosystem. It is important that appraisal be performed by third parties to enhance the dependability and creditability of the conclusions. Finally, appraisal should be undertaken by an overarching body with the ability to use the knowledge gained to implement change in order to reverse adverse trends.

As has been discussed in earlier sections of this chapter, particularly in the section discussing Intelligence, it is clear that the process set forth under the GLWQA requires appraisal. Any appraisal under the GLWQA provisions necessarily involves an assessment of the actions of the Parties and whether or not those actions are resulting in progress toward the goals of the prescription.

As we know, the original GLWQA was essentially a water quality initiative. The purpose set forth in the GLWQA is for the Parties “to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem.” To achieve this purpose the Agreement provides that the Parties, defined as the Government of Canada and the Government of the United States, “...agree to make a maximum effort to develop programs, practices, and technology necessary for a better understanding of the Great Lakes Basin Ecosystem and to eliminate or reduce to the maximum extent practicable the discharge of pollutants into the Great Lakes System” (1987, Art. II). Clearly water quality monitoring is pivotal to any effort designed to accomplish the goals of the GLWQA. Indeed, as data has been accumulated by the IJC, the scope of the GLWQA has had to be expanded.

Annex 1 of the original agreement, as we know, set forth specific water quality objectives covering a broad range of conditions and constituents, including targets for dissolved oxygen, total dissolved solids, pH, Iron, phosphorous, radioactivity, along with interim objectives for temperature, mercury (and other heavy metals), and persistent organic contaminants. Following monitoring in accordance with the IJC's monitoring plan, 1978 Amendments to the GLWQA expanded on the elimination of the targeted compounds and pollutants (more fully explained in the Intelligence section of this chapter). Evolving appraisal led to the 1987 protocol which again expanded the scope of the initiatives under the GLWQA.

There is no need to look beyond the four corners of the GLWQA to see that the IJC is an appropriate body for the appraisal of the progress being made toward the goals of the GLWQA. Under the GLWQA, the primary role of the IJC is to "assist in the implementation of this Agreement." In doing so, it may *inter alia* collate, analyze, and disseminate data and information supplied by the Parties and State and Provincial Governments "relating to the quality of the boundary waters of the Great Lakes System..." It may also "...tender advice and recommendations to the Parties and to the State and Provincial Governments on problems of and matters related to the quality of the boundary waters...including specific recommendations concerning the General and Specific Objectives, legislation, standards and other regulatory requirements, programs and other measures, and intergovernmental agreements relating to the quality of these waters."

The role of the IJC under the GLWQA, therefore, is to continually assess progress and recommend policy and action. This role includes the ability and discretion to

publish any report or statement related to its reference, the ability to conduct investigations on subjects related to the Great Lakes Basin Ecosystem when referred to it by the Parties, the *requirement* to make a “full report to the Parties and to the State and Provincial Governments no less frequently than biennially concerning progress toward the achievement of the ...objectives...This report shall include an assessment of the effectiveness of the programs and other measures undertaken pursuant to this Agreement, and advice and recommendations.” Significantly, the IJC may “at any time make special reports to the Parties, to the State and Provincial Governments and to the public concerning any problem of water quality in the Great Lakes System” (1987, Art. VII).

Thus the IJC uses its powers to assess the state of the ecosystem in the Great Lakes Basin to hold the Parties accountable through biennial reports and public meetings. Other reports and investigations deemed a part of their role are also published and challenge the Parties to remedy or further investigate perceived threats to ecosystem resilience (Colburn, Davidson et al. 1990; Becker 1993; Prelli and Becker 2001; Botts and Muldoon 2005). The IJC, therefore, is tasked not only with monitoring the progress of the Parties and making recommendations, it is also obligated to biennially report to the public through reports and biennial public meetings and reveal the extent or lack of progress made by Parties pursuant to such recommendations. Further, the IJC, at least in the early GLWQA years, was an independent body that, as has been discussed, held themselves to operational protocols that required them to put the interests of the ecosystem of the Great Lakes ahead of national or special interests.

In sum, the IJC Appraisal process during the early GLWQA years met the requirements for ecosystem-based governance. For the first two decades, progress

towards limiting nutrient overloads was made and, as we have seen, the waters of the Great Lakes showed marked improvement. Further, the monitoring schemes adopted by the IJC were able to detect the increasing threats posed by persistent organic pollutants and other environmental factors that require attention by the parties. We will now turn briefly to the last decision process function: Termination.

Termination. This is the final activity of the decision process and occurs when a problem is either solved by a previously selected prescription or course of conduct or data analysis reveals that the prescription or course of conduct has been unsuccessful at moving the toward the goals of the community (Clark 1997; Clark 2008). As we noted in Chapter III, termination, like appraisal, relies upon the dependable conveyance of knowledge from intelligence generation through transmission, including thorough monitoring to assess whether the knowledge has proved that the original problem has been resolved (Ascher, Steelman et al. 2010). Thus much of the discussion of the Intelligence, Strategies, and Outcome functions earlier in this chapter is relevant to the termination task.

The termination function in an ecosystem-based governance regime requires that there be an independent bridging entity with overall knowledge of trend data that provides periodic public assessments of the status, progress, and need (or not) for the addition or elimination of policies and prescriptions intended to facilitate progress toward the goals specified by prescription (Table 40).

Table 40 GLWQA Termination

<b>Ecosystem-based Approach</b>	<b>GLWQA Approach</b>
<p>Ecosystem-based governance requires the periodic public assessment of the progress, status, and continued need for any environmental policy prescription or implementation scheme. The decision to terminate should be made by a bridging entity with knowledge of trend data.</p>	<p>The GLWQA gives the IJC, as the coordinating body, the ability to monitor and disseminate data received pertaining to the Great Lakes Basin ecosystem and recommend Termination by the Parties of failed programs and/or prescriptions. The Agreement also requires the parties to use maximum effort to adhere to measures that promote progress toward GLWQA goals.</p>

As we have seen, the GLWQA prescription articulates a broad goal to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem (1972; 1987). The powers and responsibilities of the IJC are set forth in the Agreement. As we set forth in the Strategies section of this chapter, the IJC’s primary role is to “assist in the implementation of this Agreement.” In doing so, it is required to collate, analyze, and disseminate data and information supplied by the Parties and State and Provincial Governments “relating to the quality of the boundary waters of the Great Lakes System...” Importantly, the IJC must also “...tender advice and recommendations to the Parties and to the State and Provincial Governments on problems of and matters related to the quality of the boundary waters...including specific recommendations concerning the General and Specific Objectives, legislation, standards and other regulatory requirements, programs and other measures, and intergovernmental agreements relating to the quality of these waters.” There are a variety of other responsibilities that are crucial to the function of the IJC, including the ability and discretion to publish any report or statement related to its reference, the ability to conduct

investigations on subjects related to the Great Lakes Basin Ecosystem when referred to it by the Parties, the *requirement* to make a “full report to the Parties and to the State and Provincial Governments no less frequently than biennially concerning progress toward the achievement of the ...objectives...This report shall *include an assessment of the effectiveness* of the programs and other measures undertaken pursuant to this Agreement, and advice and recommendations” [emphasis added].

The IJC may also “at any time make special reports to the Parties, to the State and Provincial Governments and to the public concerning any problem of water quality in the Great Lakes System” (1987, Art. VII). Thus the IJC uses its powers to assess the state of the ecosystem in the Great Lakes Basin to hold the Parties accountable through biennial reports and public meetings. Other reports and investigations deemed a part of their role are also published and challenge the Parties to remedy or further investigate perceived threats to ecosystem resilience (Colburn, Davidson et al. 1990; Becker 1993; Prelli and Becker 2001; Botts and Muldoon 2005). Implicit in this mandate is the role of recommending termination of domestic programs or prescriptions when the IJC concludes from the data that a program or prescription has failed to reverse or moderate negative environmental trends.

It should be noted, that while the GLWQA requires the IJC to act as the bridging authority that recommends measures to the Parties, the Agreement conversely requires the Parties to respond. Thus in order to achieve purpose of the Agreement, the Government of Canada and the Government of the United States made a commitment to “...agree to make a maximum effort to develop programs, practices, and technology necessary for a better understanding of the Great Lakes Basin Ecosystem and to eliminate



or reduce to the maximum extent practicable the discharge of pollutants into the Great Lakes System” (1987, Art. II). The Agreement, therefore, is a two-way street with duties and obligations flowing two ways between the Parties and the IJC. Clearly, therefore, the IJC has the ability and the authority to recommend termination of programs or prescriptions that it deems have failed to produce results. The Parties, on the other hand, have committed to use maximum effort to create and, where appropriate, terminate programs in order to achieve the goals of the GLWQA.

It would therefore appear that the prescriptive language of the GLWQA expressly gives the IJC the authority to recommend termination of a plan or prescription that it deems unnecessary or unsuccessful and that the Parties are obligated to pay attention and take measures to terminate programs in accordance with the recommendations of the IJC. The failure of the Parties to do so would be addressed by the IJC in a diplomatic fashion and any recalcitrance by the Parties would be drawn to the attention of the public and other interested participants via the IJC’s biennial report, public meetings, annual IAGLR meetings, etc. The role of the IJC, and the measures and accountability afforded by the GLWQA process, appear to be consistent with the characteristics for Termination under the ideal ecosystem-based approach.

### **Conclusion**

Chapter IV has attempted to compare the governance regime in the Great Lakes Basin in the early years of the Great Lakes Water Quality Agreement regime with the characteristics of an ideal ecosystem-based approach to governance using the framework provided by the Policy Sciences. The case study provides some insight into the difficulty

posed by implementing enforceable controls over an ecosystem bounded by two sovereign nations and their various bureaucracies and administrative subdivisions.

Policy development and implementation in transboundary regions are generally affected by national political considerations and by problems impacting different regions in diverse ways. The interests and concerns of national sovereignty, jurisdictionally fragmented state and provincial governments, and the bureaucratic interests of federal agencies have historically limited the effectiveness of transboundary institutions. Therein lies the fundamental paradox of binational policy in any boundary water situation in general and in the case of boundary waters shared by the United States and Canada in particular: The goals of policy that may be best for the health and resilience of the ecosystem are only achievable through a significant degree of coordinated action that is typically absent in existing institutional arrangements (Regier and Baskerville 1986; Becker 1993; Caldwell 1993; Young 1998; Prelli and Becker 2001).

By using the Policy Sciences framework it is possible to track some of the characteristics of the GLWQA governance to help shed light on whether the process that emerged from the Agreement has helped the governments, institutions, and residents of the region begin to overcome the nationalistic and bureaucratic limitations that tend to impede cooperation. Thus this chapter has looked at the problem orientation, social process, and decision process in order to better understand the overall context of the situation in the Great Lakes Basin ecosystem.

An examination of the problem orientation function highlighted the deterioration of water quality and fisheries in the Great Lakes Basin under the legal scheme prior to the passage of the 1972 amendments to the Clean Water Act (1972) in the United States and

the Canada Water Act (1970) in Canada. With Lake Erie declared “dead” and fires breaking out on the Cuyahoga River in Ohio, the governments responded to the explosion of demonstrations and the demands of an angry public. The GLWQA (1972) was negotiated by the parties, and the IJC and its boards responded. The IJC recognized the importance of capitalizing on public anger and took compelling measures to assure that the public was educated and included in a meaningful fashion in investigations and remedies promoted through the GLWQA.

An examination of the social process reveals the significance of the inclusion of a broad range of participants, their values, perspectives, and strategies. It makes abundantly clear how important the significant participation of the public was to the efforts of the IJC and the Parties under the GLWQA. It also shows the importance of meaningful public participation, including the pivotal role of PLUARG, as well as aggressive public outreach guided by such entities as Great Lakes Tomorrow and the Lake Michigan Federation. Further, collaboration and cooperation facilitated initially by the Great Lakes Basin Commission caused state and federal agencies in the U.S. to work together to achieve water quality goals prescribed by the GLWQA. Finally, it reveals the importance of strategies and perspectives by highlighting the courageous efforts of individuals who put the public interest and health of the Great Lakes ecosystem ahead of special and financial interests.

Finally, an evaluation of the decision process shows the importance of the IJC and how its operating protocols and traditions of the IJC in the 1970s and 1980s perpetuated an *esprit d' corps* that promoted a primary allegiance to the health and resilience of the ecosystem over and above nationalistic or bureaucratic agency self-interest. This freed

participants to adopt a problem-solving approach with a free and open flow of ideas. It also highlights how problem-solving efforts were implemented on a trial-and-error basis with participants learning from both their successes and their failures.

The unique series of factors that coalesced in the early years of the GLWQA approach resulted in a wave of reform and innovation. There are few parallels. Unfortunately this chapter has also showed that the “Camelot” era began to unravel as conservative governments on both sides of the border began to systematically dismantle the delicate balance of courageous leadership, public education and involvement, and collaboration at all levels.

As a final, and perhaps personal note, it must be stressed that the success of governance under the GLWQA in the early years turned on a relatively few number of critical factors. First, despite the fact that the IJC had no jurisdiction to enforce the mandates of the GLWQA, it was able to get positive results due to the courage and leadership of individuals who, buttressed by IJC operating principles, were willing to put the public good ahead of special or national interests. As the quotes of those interviewed for this study reveal, these individuals believed that human dignity and integrity deserved equal billing with ecosystem resilience. Further, the IJC recognized the importance of an educated public and capitalized on that concept by funding outreach and education and then including the public in a meaningful manner (e.g. PLUARG). It was this kind of leadership and courage that translated prescription into action in the early years and it is unfortunate that the contribution of the many individuals who played pivotal roles in the GLWQA scheme in the early years have largely been ignored. We now turn to another

ecosystem shared between Canada and the U.S. – the Bay of Fundy/Gulf of Maine watershed.

## V. THE BAY OF FUNDY/GULF OF MAINE WATERSHED

### **Introduction and Background**

There is no way to distill the story of the Bay of Fundy/Gulf of Maine region into one chapter of a dissertation. There are too many stories. Within the pear-shaped bowl that is the Bay of Fundy/Gulf of Maine there are multiple habitats with deep basins, calm estuaries, rocky coves, and numerous banks and shoals. Shoals and underwater features with names like Seal Island Grounds, Browns Bank, and smaller areas like Grand Manan Bank, German Bank, Jeffreys Bank, Cashes Bank, Fippenies Bank, Stellwagen Bank give hints as to the many cultures and experiences that passed through this region and recorded their early presence by filling in the blanks on the charts of their time. These banks and ledges also provided the breeding grounds for valuable commercial fish species – cod, haddock, cusk, hake, pollock, halibut, and others. “A very striking and peculiar body of water is this Gulf of Maine, markedly different in character from any other of the bays on the coast line of the eastern United States (Rich 1994, 1).

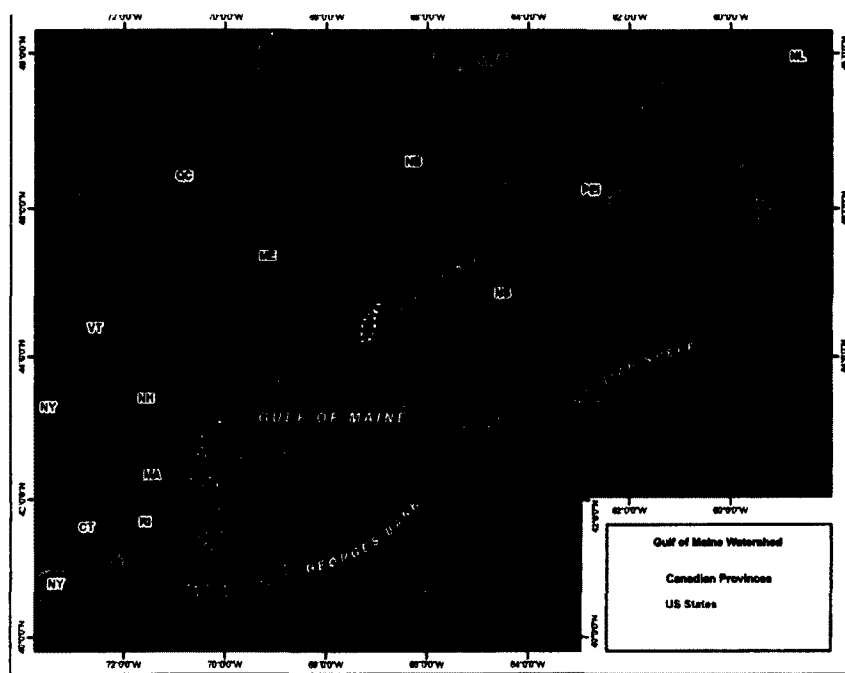
The Bay of Fundy/Gulf of Maine region (BoF/GoM) is known as one of the most biologically productive marine regions on earth. Within the watershed there are an extraordinary variety of ecological features that offer habitat diversity for a broad spectrum of flora and fauna. The geologic history of the region is rich with mountain-

building episodes stemming from volcanic activity, tectonic collisions, and the constant force of erosion as molten masses cooled and the region was scoured by wave after wave of glacial activity (Conkling 1995).

The present BoF/GoM is a product of the sand, mud, clay, and other sediments that made their way toward the ocean as tall coastal mountains fractured and eroded. The temporal scale of tectonic collisions, mountain building, and erosion takes us back between 600 to about 350 million years ago with the creation of the supercontinent of Pangea. The breakup of Pangea left a layer of metamorphic rocks that are considered the foundation of much of the present structure of the Gulf of Maine. The finishing touches to the current day structure of the basin were provided some 13,000 years ago as rising seas from glacial ice melting flooded into the Gulf of Maine basin. These complex processes worked in a variety of ways depending on the properties of the bedrock ultimately forming an incredible diversity of bays, headlands, islands, and ledges, shoals, and basins (Kelley, Kelley et al. 1995).

This tumultuous geologic history resulted in the formation of a sea within a sea. The Bay of Fundy/Gulf of Maine itself is some 36,000 square miles (90,700 square kilometers). Within the Gulf there are 21 deep basins, the deepest being Georges Basin at a depth of 1,236 feet (377 meters) The Northeast Channel, a deep trough 38 miles (61 kilometers) long and 22 miles (35 kilometers) wide running between Georges and Brown banks, is the only deep-water connection between the Gulf and the open waters of the Northwest Atlantic.

Figure 11 The Bay of Fundy/Gulf of Maine Watershed (USGS)



It is Georges and Browns Bank that nearly isolates the BoF/GoM from the Atlantic Ocean (Figure 11). Georges Bank is less than 200 feet (60 meters) deep in over most of its structure. In some places it rises to within 13 feet (4 meters) of the surface (Kelley, Kelley et al. 1995). These prominent banks are thought to serve as nutrient trapping barriers. The shape of the basin, narrow in the north and wider in the south, drives fast tidal currents (Richert and Incze 2003). The tides combine with upwelling currents, strong lunar tides, stable water temperatures and storm activity to create ocean circulation patterns that constantly mix deep-water nutrients into the photosynthetic zone, resulting in high primary productivity (Jennings, et al. 2001).

The high tides and cold, nutrient rich waters of the Gulf of Maine support several thriving ecosystems which are both complex and diverse (Conkling 1995). The near-shore ecosystem is characterized by variety: rocky coasts, salt marshes, fjords, estuarine regions, greater temperature extremes, and salinity changes. The near shore coastal



system also includes the shallow (< 50 m) coastal waters and well mixed embayments found in the U.S. and Canada (Smith 1997).

The region on the terrestrial side of the land/water interface provides inhabitants with a watershed overlaid with soil capable of sustaining lush forests and, in many places, agriculture, combined with a coastal sea within a sea. This semi-enclosed body of water and its surrounding watershed have nurtured a complex array of valuable hardwoods and softwoods and produced a supply of fish that has nourished populations on both sides of the Atlantic as well as the Caribbean for centuries (Kelley, Kelley et al. 1995).

Of course, no study of this region would be complete without mention, however brief, of the historic richness of the fishery in the BoF/GoM. From early times adventurers from the nations of western Europe have visited the region – Basques, Bretons, Northman, Spaniard, French, and English have fished these waters and there is no question that the marine resources of the region have played a large part in feeding the nations bordering the western Atlantic as well as providing a powerful inducement for the exploration of the New World (Rich 1994).

Cod has been the primary target of fishers and adventures since the first days of exploration. John Smith's early reports helped to establish the early fishing pressure in Massachusetts Bay and, upon his return to Europe following his first exploration trip, he took with him some seven thousand salted cod and forty thousand dried cod that his crew had caught off Monhegan Island. The popularity of cod grew and for a period in the age before refrigeration sixty percent of the fish eaten in Europe was salt-cured cod (Kurlansky 2008). Walter H. Rich, the Commissioner of the U.S. Bureau of Fisheries in the early 20<sup>th</sup> century, recorded in 1929 that the banks that border the Gulf of Maine

annually produced 400,000,000 pounds of fishery products landed in the United States and, that annually “about 1,000,000,000 pounds of cod are taken on these banks and landed in the United States, Canada, Newfoundland, France, and Portugal” (Rich 1994, intro). One study that examined 19<sup>th</sup> century ships logs from downeast Maine and other Gulf of Maine ports speaks of steady catches of cod in the 50 – 60 pound range and of halibut the size of men. (Alexander, Leavenworth et al. 2009). Of course, cod stocks have collapsed repeatedly from fishing pressure, most recently in the early 1990s (Dobbs 2000; Weber 2002). After various closures and measures designed to rebuild the stocks, cod populations have never recovered in the northern gulf and Bay of Fundy, and on the U.S. side of the Gulf cod are still overfished as overfishing continues (NMFS 2011).

While cod may have been king, the stocks of other species were routinely exploited. Haddock, cousin to the cod, were fished hard and their population halved in the early 1930s when demand exploded due to pressure from a burgeoning market for frozen fish. Halibut, the largest flatfish, were abundant in the region until the mid-1800s. Full-grown halibut ran 4 – 5 feet long and weighed 200 – 300 pounds. Their populations collapsed after demand for the fish developed in Boston and New York in the 1830s. In the first years four men with hand lines could catch 400 fish in two days. By 1850 halibut near the shore or in the nearer parts of Georges were all but gone. By 1890 practically all of the halibut landed at Gloucester were coming from Ireland (Kurlansky 2008).

While for centuries the resources of the BoF/GoM watershed appeared inexhaustible, the saga of their exploitation is well known. The human population of the watershed increased rapidly. Fish populations have collapsed time after time. The

expanding population increased stress on the ecosystem in a variety of ways. To put this into perspective, consider that as of 2007 nearly 10.8 million people lived in the Bay of Fundy/Gulf of Maine watershed. This can be broken down between states and provinces. In the United States, populations within the watershed can be summarized as of 2007 with Massachusetts at 6.45 million, Maine with 1.32 million, and New Hampshire with 1.32 million. On the Canadian side, the population of New Brunswick within the watershed is .94 million people and, in Nova Scotia, .75 million (CoML 2012).

Chapter IV provided an exploration of the governance regime encompassed under the International Joint Commission's oversight and coordination of the GLWQA, in collaboration with the Great Lakes Fisheries Commission, during the early years under that regime. In Chapter V we will attempt to gain some insight into the manner in which two sovereign nations, three states and two provinces attempt to govern the human activities that impact the binational ecosystem of the Bay of Fundy/Gulf of Maine region. Thus we move from an examination of a governance system in a different location and during an earlier time to the analysis of the present-day, real world regime in the Bay of Fundy/Gulf of Maine watershed.

It must be cautioned that this investigation is the product of one person. It is simply not possible for one individual to thoroughly examine the social and decision processes that include literally thousands of individual actors, most of whom are carrying out their functions within well-defined government structures. Thus programs that exist and may in fact be valuable to governance are likely to have been overlooked. In addition, the last of the interviews that were conducted for this research occurred more than four years ago. Although some effort has been made to stay up to date on the

programs and processes that have occurred or changed since that time, there have almost certainly been advances and retreats in efforts to make governance more responsive to the needs of the ecosystem since that time. Finally, the author has been an attorney in the United States for over 30 years. Thus in matters of law and prescriptions there is more detail about the laws and prescriptions in the U.S. than in Canada. This is because I simply have not learned as much about the Canadian legal framework as I have through my career about U.S. law and precedent.

Thus the value of this research should be seen as an effort to raise some general questions about the capacity of the governance regime in the Bay of Fundy/Gulf of Maine region and provide some insight into the direction that governance needs to take in order to foster a more sustainable future for the region's ecosystem and, by extension, its residents. Like the process used in Chapter IV, I will analyze the governance regime in the region through the lens provided by the Policy Sciences analytical framework. Using the framework, however, in this chapter results in a bit of front-end loading, meaning much of the story is told through the tasks in the first section for Problem Orientation. In order to provide context necessary in the first section, much will be said about participants, prescriptions, perspectives, and other issues usually set forth in later sections devoted to the Social and Decision Processes. I will therefore not try and repeat what is said in Problem Orientation in the latter sections but may instead often ask the reader to refer back to the Problem Orientation section for information that overlaps with the Social and Decision Processes.

With those caveats we may now proceed to view examine the BoF/GoM region to attempt to determine whether there is the capacity to move to a more ecosystem-based approach to governance of this precious shared watershed.

### **Problem Orientation**

As a reminder, problem orientation serves as a guide to the learning process fostered by the decision and social process inquiries. As such the five tasks within problem orientation serve as an overall “strategy to address problems and invent solutions (Lasswell 1971; Clark and Willard 2000, 9). To begin the examination using the framework approach we will look at the characteristics of goal clarification under our “ideal” ecosystem-based approach to governance.

Goal Clarification. Goal clarification involves the process by which goals are determined for a given community. The emphasis on the protection and advancement of human dignity has historically been a fundamental quest of the policy sciences approach (deLeon 1988). When we consider that we are examining the effects of human decisions on human lives, which require a healthy, resilient environment capable of sustaining human life, commencing any investigation with a goal of human dignity begins to make sense. As to the goal of democracy, it is “well-rooted in many cultural traditions throughout history...for all people to have full opportunity to shape and share power, wealth, enlightenment, well-being, skill, affection, rectitude, and respect” (Lasswell and MacDougal 1992; Clark 2002, 89). Further it should be clarified that the policy sciences strives to achieve an overriding goal of the realization of human dignity for the many, not the dignity of the few at a cost of indignity for the many. Since the goal is dignity for the

many, decision outcomes must aim at achieving equal opportunity for participation in power, wealth, well-being, and the other important values (Lasswell 1971).

As discussed in chapter III the key goal clarification characteristics of an ecosystem-based approach to governance are:

- 1) Meaningful community participation in the goal clarification process;
- 2) Strong public outreach and education efforts devoted to raising awareness and understanding of ecosystem issues and governance options, and
- 3) Multiple goals that overall embrace human dignity and equal access to governance with a premium placed on maintenance of the integrity and resilience of ecosystem functions (Table 41).

Table 41 Goal Clarification

<b>Ecosystem-based Approach</b>	<b>BoF/GoM Approach</b>
Meaningful public and/or community participation and input in the goal clarification process. National goals may provide guidance but community has broad input into how to achieve goals. Goal choices have broad community acceptance	No meaningful public or community participation in goal clarification for BoF/GoM. Some watershed groups and citizen organizations are making inroads into defining community environmental and/or economic goals, e.g. Annapolis River Watershed Alliance, ACAP. Nova Scotia seeking public input after publication of 2009 State of the Coast Report
Strong public outreach and education provide ability to establish community goals inclusive of human dignity and democracy and provide basis for clarifying common interests. Human dignity includes economic fairness and sustainability.	There are some public education efforts in the region – cod tagging programs through NEFMC, EPA’s National Estuary Program, NOAA’s Coastal Program, etc. Human dignity and democracy are not stressed in any government program, but appear to be factors in Saltwater Network and ACAP.
Multiple goals may be integrated that embrace human dignity, economic fairness for the many, and equal access to governance with a focus on maintenance and preservation of the integrity and resilience of ecosystem functions.	There is no collaborative or cooperative mechanism or entity capable of embracing the multiple goals of human dignity, economic fairness for the many, and equal access to governance.

The governance regime in the Bay of Fundy/Gulf of Maine region has no accountable overarching entity coordinating the goals, promotion, implementation and evaluation of regulatory efforts (Hildebrand, Pebbles et al. 2002; Pesch and Wells 2004). As a result, policy, including the task of goal clarification, is left to traditional, fragmented, bureaucratic regulation by two federal governments, three state and two provincial governments, and a legion of local jurisdictions. Indeed it has been noted that to say that authority is fragmented understates the enormity of the challenge to creating a coherent policy in the Bay of Fundy/Gulf of Maine region (Pesch and Wells 2004).

This means that policy, including goal clarification, by-passes or ignores the first requirement for goal clarification: meaningful public and/or community participation and input into the goal process. Goal clarification is determined piecemeal by legislation or rulemaking by the relevant regulatory bodies and agencies with jurisdiction over those human activities that impact some component of the ecosystem. In the United States for example:

Congress passes laws and oversees their implementation by agencies, which in turn prescribe rules and oversee the behavior of regulated firms. Agencies are highly specialized, with engineers, biologists, chemists, toxicologists, lawyers, economists, and statisticians, among others, in their ranks. Elaborate rules, applied as uniformly as possible, define the technology, monitoring, and other requirements that regulated entities must meet (Fiorino 2006, 39).

Thus the only way that goal clarification can be analyzed for the BoF/GoM watershed is to somehow examine the goals and actions of the agencies that are given jurisdiction under law and statute to manage the various human activities that impact the ecosystem. While an examination of the missions and goals of each and every agency

involved in some management aspect related to the BoF/GoM would be out of the question, we can highlight the goals and missions of some of the more important governance institutions.

One example of legislation and rules that supply goals in the region are those in prescriptions related to water quality. It would be difficult to deny that water quality sufficient to support the goods and services upon which humans and other organisms rely is an important goal. National water quality standards in the U.S. are set out in the 1972 amendments to the Clean Water Act. The CWA institutes uniform technology-based standards with the objective to "...restore and maintain the chemical, physical, and biological integrity of the nation's waters" (1972, Section 101(a)).<sup>29</sup> The U.S. Environmental Protection Administration is the principle agency responsible, in conjunction with state environmental agencies, responsible for the administration and oversight of efforts to achieve this goal (Adler, Landman et al. 1993; Plater, Abrams et al. 2004).

On the Canadian side, the goals for water quality are generally set forth in the Canadian Environmental Protection Act, 1999 (1999) ("CEPA"). The goal of CEPA is to contribute to sustainable development - development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. Environment Canada is the agency responsible for the coordination and

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<sup>29</sup> It has been argued that the standards under the CWA are better defined in relation to human use by Section 101(a)(2): "...it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and provides for recreation in and on the water..." This is the so-called "fishable-swimmable" rule. (1972). Federal Water Pollution Control Act Amendments of 1972. U.S.C. 33 U.S.C. §§1251 - 1387, Hughes, E., A. R. Lucas, et al. (2003). Environmental Law and Policy. Toronto, Emond Montgomery Publications Ltd.



enforcement of the CEPA, but their responsibilities go far beyond the CEPA mandates as new frameworks have been adopted by the agency:

Q: Are there goals or objectives that are somewhere within your department on how deal with these threats or how to deal with the ecosystem threats...

A: The goals that we have or the desired outcomes at the government level are pretty large scale.

Q: For instance...

A... protecting an enhanced biodiversity, improve water quality so it's safe, healthy and enables competitive industry.

Q: Is this Environment Canada-wide?

A: Yes. Actually Environment Canada is going through, I mean we've been around since 1971, in the last two years we've got this new results framework called Competitiveness and Environmental Sustainability Framework. This for the first time is really articulating much more clearly the desired outcomes. Before it's kind of been like, we control pollution, protect habitats, look out for species, and so on. It was admittedly quite vague. We had legislative and policy instruments to do that, but we'd been lacking and what we're almost finished putting in place now, is this clear results framework. So, at the top, let me just refer to it. This is kind of an example of the results. We have...

JRC: (Looking at a chart)...so this would be a goal at the top...and I'm reading "Canada's Natural Capital is Restored Conservation?"

A: Yes, we have....there are like six outcomes at the highest level. There's a highest order one for the Competitiveness Environmental Sustainability Framework, to maintain and enhance environmental quality is sort of the basis for "...to protect of human health, well-being, environmental assets, and competitiveness in the Canadian economy." So, below that, there's about five or six levels of outcome that all relate. So, for instance, under that one of the goals under "natural capital is restored, protected and enhanced" down below that one of the components is "...biodiversity is conserved and protected," another would be "...water is clean, safe, and secure," and "...Canadians adopt approaches that ensures sustainable use in management of natural capital in the working landscapes." Then you can drill down further: wildlife, land and landscapes, and then getting down further: species at risk, protection,

regulation, and so on. So, this is our new framework in terms of what we do and the kind of results that we want to achieve. Now while this is still Environment Canada framework, the objective is it'll be national. And when we say national I mean throughout the federal government and the provinces with the territories... (Canadian Federal Employee 2)

So the goals of the federal agencies responsible for water quality in the watershed of the Bay of Fundy/Gulf of Maine are relatively comprehensive on both sides of the Hague Line. Both have objectives consistent with ecosystem resilience and integrity. The fact remains, however, that the goals and objectives have been shaped for the most part by Congressional or Parliamentary bodies and federal agencies, with little if any meaningful public input. Further, their mandates are pretty much confined to end-of-pipe discharges – nutrient and other pollution that run-off from land-based activities are generally not controlled by federal regulatory authorities.

Water quality is but one aspect of the ecosystem in the BoF/GoM region. There are many more. There will be increasing pressure on the coastal margin, with resulting pressures on the ecosystem. In the United States there has been more than a decade of work to develop an Ocean Policy. There has been no lack of high-profile and headline-grabbing attempts to explore and develop such a policy. Two separate efforts (Pew Ocean Commission and the U.S. Commission on Ocean Policy) waded into the ocean policy debate. The Pew Ocean Commission's report, *America's Living Oceans: Charting Course for Sea Change* (Pew 2003) was released in 2003. The U.S. Commission on Ocean Policy released its "Ocean Blueprint for the 21<sup>st</sup> Century in 2004 (USCOP 2004). Six years later the President issued Executive Order 13547, establishing the ocean policy for the nation (2010).

With the issuance of Executive Order 13547, the U.S. had an ocean policy. That policy is set forth, in part, as:

**Sec. 2. Policy. (a) To achieve an America whose stewardship ensures that the ocean, our coasts, and the Great Lakes are healthy and resilient, safe and productive, and understood and treasured so as to promote the well-being, prosperity, and security of present and future generations, it is the policy of the United States to: (i) protect, maintain, and restore the health and biological diversity of ocean, coastal, and Great Lakes ecosystems and resources; (ii) improve the resiliency of ocean, coastal, and Great Lakes ecosystems, communities, and economies; (iii) bolster the conservation and sustainable uses of land in ways that will improve the health of ocean, coastal, and Great Lakes ecosystems; (iv) use the best available science and knowledge to inform decisions affecting the ocean, our coasts, and the Great Lakes, and enhance humanity's capacity to understand, respond, and adapt to a changing global environment; (v) support sustainable, safe, secure, and productive access to, and uses of the ocean, our coasts, and the Great Lakes; (vi) respect and preserve our Nation's maritime heritage, including our social, cultural, recreational, and historical values; (vii) exercise rights and jurisdiction and perform duties in accordance with applicable international law, including respect for and preservation of navigational rights and freedoms, which are essential for the global economy and international peace and security; (viii) increase scientific understanding of ocean, coastal, and Great Lakes ecosystems as part of the global interconnected systems of air, land, ice, and water, including their relationships to humans and their activities; (ix) improve our understanding and awareness of changing environmental conditions, trends, and their causes, and of human activities taking place in ocean, coastal, and Great Lakes waters; and (x) foster a public understanding of the value of the ocean, our coasts, and the Great Lakes to build a foundation for improved stewardship.**

**(b) The United States shall promote this policy by: (i) ensuring a comprehensive and collaborative framework for the stewardship of the ocean, our coasts, and the Great Lakes that facilitates cohesive actions across the Federal Government, as well as participation of State, tribal, and local authorities, regional governance structures, nongovernmental organizations, the public, and the private sector; (ii) cooperating and exercising leadership at the international level; (iii) pursuing the United States' accession to the Law of the Sea Convention; and (iv) supporting ocean stewardship in a fiscally responsible manner (2010).**

Thus the U.S. now has an oceans policy with impressive goals and objectives. It has yet to take effect, however, as the Draft National Ocean Policy Implementation Plan is out for public comment (NOC 2011). In the meantime, existing law and policy march on to attempt to manage the many issues confronting the sustainable use of ecosystem goods and services, including those in the Bay of Fundy/Gulf of Maine watershed.

An example of a pressing problem in the region is the overall issue of biodiversity – or how many organisms and what types inhabit and contribute to a healthy ecosystem in the Bay of Fundy/Gulf of Maine. Biodiversity is dependent on a number of factors including water quality, harvest pressure, habitat, water temperature, and water chemistry. What are the goals? To a large degree the management of the ocean and coastal issues in the U.S. falls to the National Oceanic and Atmospheric Administration (“NOAA”) and, in Canada, to Fisheries and Oceans Canada (“DFO”). Goals for the moment are left to them and their state and, to some degree, provincial partners.

The mission of NOAA is to “understand and predict changes in the Earth’s environment and to conserve and manage ocean and coastal resources to meet the nation’s economic, social and environmental needs” (USCOP 2004, 75). While NOAA’s duties are spread across five line offices, the two that are most relevant to this study are the National Ocean Service and the National Marine Fisheries Service (“NMFS”).

The National Ocean Service is the home of NOAA’s Coastal Services Center (“CSC”). The vision of the CSC is for coastal communities to become more resilient through informed decision-making. The objective is that “[t]hrough collaborative efforts and the partnerships that the Center cultivates, managers of the nation’s local and regional coastal ecosystems are enabled and empowered with the knowledge, tools, and

skills needed to make informed and balanced planning and conservation choices, and decisions to enhance resilience and adapt to changing climate” (NOAA 2010, 5). As one participant familiar with the CSC put it, however, NOAA suffers from a lack of funding and, further, there may be a need for the science and knowledge developed through CSC and other sources to become more practical and relevant to management needs:

I’d like to see that whole thing switched so that management is driving the science that needs to be done, because we can be doing science until the cows can come home and we don’t have the resources right now to really do a comprehensive job anyways. So that’s been my major frustration is for NOAA to actually get serious about management driving science. (US Federal Employee 4)

The second NOAA division that has goals particularly relevant to this study is the National Marine Fisheries Service. NMFS is responsible for the stewardship of the nation's living marine resources and their habitat. It is the responsibility of NMFS to manage, conserve, and protect the living marine resources within the United States' Exclusive Economic Zone (the maritime zone from three to 200 miles offshore). It’s goal, to the extent relevant to this study, is set forth in the Magnuson-Stevens Fishery Conservation and Management Act, as amended (1996). The Magnuson-Stevens Act requires that fishery management plans (“FMP’s”) be developed by regional fishery management councils established under the Act. For the U.S. portion of the Bay of Fundy/Gulf of Maine, the New England Fishery Management Council was established (1996, Section 302). The Act also sets out goals in the form of “National Standards” for FMP’s adopted by the Council. Perhaps the most significant for our quest for goals is the first requirement that “Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the

United States fishing industry” (1996, Section 301(a)(1).) As one individual involved with the New England Fishery Management Council commented with respect to the seemingly conflicting goals of conserving fish stocks while promoting industry to obtain an optimum yield from the fishery:

What’s the goal? To make sure that we make good decisions to rebuild stocks and have a sustainable fishery. My personal opinion is that the Magnuson is both economic and conservation of biological. I’d like to keep it that way. I think it’s important to have healthy fisheries from an economic standpoint. We shouldn’t just do away with that. I don’t think that’s a bad thing to look at the economic and social aspects of the business. But I think that we paid too much attention to that over the years and now we’re moving toward the biological conservation part of it. I think we need to strike a balance. Once we have the stocks rebuilt we need to keep them there. I don’t want to see an all-biological act. I like this balance rebuilding stocks, healthy stocks and a healthy fishery. (US Federal Employee 3).

Thus the one of the key goals of the NEFMC under its mandate from Magnuson-Stevens is to balance the needs of the fishing industry to harvest an “optimum yield” from the territorial waters of the United States with the need to sustain fish populations.

In Canada, with the passage of the Oceans Act in 1996, the nation made a legal commitment to conserve, protect and develop the oceans in a sustainable manner (1996). Canada’s Oceans Act provides a unified national oceans policy and relies upon three important principles: sustainable development, integrated management, and the precautionary approach (1996, Section II). Canada’s Oceans Strategy (DFO 2002) and, later, the Ocean Action Plan (DFO 2005), translated the government’s vision and direction for modern oceans governance into a tangible approach. The overarching goal of the strategy is ensuring healthy, safe and prosperous oceans for the benefit of current and future generations of Canadians (DFO 2002).

Discussing the balance between the economics of exploitation and extraction and the value of conservation within the terms of the Oceans Act and the subsequent plans and strategies, one person familiar with the practical implications commented:

**Q:** The goals that are in the ESM draft plan, and for that matter in ... Oceans Act, are they pretty much reflective of the goals that you've heard that the community wants? Or are there additions that you've discovered in your field?

**A:** There's been some tweaking. It's useful for you to reference the report proceedings of a workshop we had in December 2004, Human Use Objectives Workshop, and unfortunately I don't have it in front of me right now, but we can get it later. Basically, there's an overarching...there's almost a vision really that we set out at that workshop. It introduced the notion of cultural, social, economic sustainability that is not really reflective... those notions are not really strongly reflective in the goals that were derived from the Preamble of the Oceans Act. The Oceans Act really kind of talks about the integrated management plans within measures or the activities in the area, or for activities occurring outside the area. And then the second one talks about responsible sustainable use or conservation of resources, and also ocean space. The third goal relates to maintenance of productivity and protection of biodiversity. And then the fourth goal is more the economic development side of the Ocean's Act. The first three are kind of the green part of the act, if you can imagine conservation, biodiversity, that kind of thing...but then you've got the fourth one that talks about the sustainable wealth generation, economic diversification, as being the primary drivers of the act. That's the balance, I guess, of environment and economics and economy that are in the Act set out in those four goals, and it's a great challenge to achieve that balance. What we're trying to do...the plan is an objectives-based plan and with conservation objectives to protect the ecosystem, but also as users of that ecosystem, human use objectives that relate to community well-being, economic well-being, and then development of industrial capacity and an aspect that provides the economic well-being in a sustainable way. (Canadian Federal Employee 1)

The goals, again, are completely provided by parliament or DFO. It is noteworthy that the balance between economic interests and conservation seems, valid or not, to provide significant tension in efforts to govern the human and economic activities that

impact the BoF/GoM ecosystem. Further, both nations sharing the ecosystem are federal political systems – the United States more so than Canada as we shall see later. Thus while the prerogatives set forth in Canadian federal legislation are valuable, there still exists a great deal of reliance upon collaboration with provincial governments for consistency with goals and implementation. In addition to the goals and objectives expressed at the federal level in Canada and the United States, other goals and objectives abound at the state and provincial levels. No attempt will be made to extract the goals of every agency at the state/provincial level with management authority over some component of the ecosystem. There are a few that deserve attention, however.

In the U.S. the goals and policies of NOAA Coastal Services Center include activities in support of state coastal management plans under the Coastal Zone Management Act (1972). The Maine State Planning Office, for example, coordinates coastal and environmental policy in that state, including activities funded by the federal CZMA. When queried about the goals, one person familiar with the function of the Planning Office described both goals and practical limitations:

Q: So, what's the goal?

A: The goal of Coastal Zone Management in Maine to...it's balance. It's really hard to explain to people and it's even harder to measure. How do you conserve important coastal resources while having a vibrant, healthy, lively coastal zone for people to live in? It's to balance the conservation development of the coast and its resources.

Q: But, primarily, that responsibility falls to the towns?

A: In Maine, yes. (US State Employee 2)



Planning involving one state, however, can only do so much in terms of the larger ecosystem. Further, as the above demonstrates, there is a great deal of regulatory responsibility that devolves to municipalities and other local government entities.

In Canada, provinces similarly work with the federal government to develop policy consistent with national goals and legislation. New Brunswick, with its newly combined Department of Agriculture, Aquaculture, and Fisheries, has a mandate to deliver "... public policies and programs to optimize the value of aquatic resources while strategically promoting sustainable growth of the fish and seafood industry" (New\_Brunswick 2010). Similarly, in Nova Scotia a Department of Fisheries and Aquaculture, a management official described the department's goals in terms of promoting development for the good of the province:

In general the bottom line is that we provide services to industry for the betterment for coastal rural communities in all of Nova Scotia. So we actually look at development in a practical way. We're trying to encourage development, but we want it to be obviously ecologically sustainable, but also sustainable in the sense that this is good for Nova Scotia. (Canadian Provincial Employee 1)

With respect to the possibility of conflicts in goals even between departments within Nova Scotia, apparently there the potential exists:

Q: So, there was an issue that each department maybe had different goals?

A: Oh, yeah. Think about like tourism, right? That is a really good concrete example. Tourism is actually led by the Tourism Industry Association of Nova Scotia, partnered with our Department of Tourism Culture and Heritage. They're developing a coastal tourism strategy which is essentially aiming for a goal of doubling tourism in the next ten years, most of that focus is coastal, because Nova Scotia is Canada's ocean playground. We have to be careful how we develop it because you don't want to harm the very thing that people are coming to tour. So they're developing this strategy, and I don't really know the details of it,

but clearly there is a tourism focus. At the same time, my office, my department, is coming up with the aquaculture framework, promoting and developing aquaculture, which I assume, and I don't know the details of it, will be to grow aquaculture and increase aquaculture. (Canadian Provincial Employee 1)

So conflicts in goals between departments and agencies are real. Still, it seems, the scale is tipped toward viewing the ecosystem as a vehicle for economic gain, i.e. extraction and harvest for human needs and economic gain. This would run counter to the ecosystem-based governance characteristic which requires management with the resilience and health of the ecosystem, not human-set economic targets, guide the governance of human activities that impact the environment:

Q: But, again, your chief goal is to help folks get into the [fishery and aquaculture] business and do it right.

A: That's exactly right. (Canadian Provincial Employee 1)

It would appear that from the governance side, there is federal and state/provincial legislation and rules that require regulators to balance the demands of industry against the goals of ecosystem health, resilience, and integrity. The fact that the goals set forth in the law of both nations requires such balancing means quite simply that decisions on how proposed activities are balanced are open to influence from industry interests and political persuasion that favor activities that benefit business and industry to the detriment of ecosystem integrity.

In addition to the governmental players in the region, it is worth noting that there are numerous NGOs operating within the Bay of Fundy/Gulf of Maine watershed. Casual observation of their activities over the last several years would seem indicate that there is no coordination of the goals or actions of the NGO community. One employee of

the local office of a national NGO was asked in October, 2007, about their goals as part of this study:

Q: Are there goals that you have been able to articulate for the ecosystem or for the region?

A: Short answer is no. Part of the purpose of our eco-regional assessment is to define conservation goals such as that, including ecosystem-based management principles. So, right now we are doing our eco-regional assessment for the Gulf of Maine, actually for the whole east coast, and so we will be developing more concrete conservation and ecosystem goals through that process, which is expected to take another year. So the short answer, no. (US NGO 3)

When asked about the impact of NGOs and Foundations on governance in the region, another state employee familiar with the BoF/GoM governance regime has an interesting take on the role they play in the region:

A: The difficulty is that long term governance has to have a long term stable funding source. I would say that the NGOs and the Foundations are as much a special interest as anybody else involved in this process. I mean they have their goals. They have their milestones.

Q: And why can't they work together?

A: Because they compete as much as we do. I have a colleague who was in an intern position and he was in a room, this was a long, long time ago, where a number of the leaders of the major ocean groups were getting together, the proverbial smoke-filled back room although I doubt they smoked, where they divided issues up based on income generation and member retention. That's their return for unit effort. (U.S. State Employee 1)

There are numerous other players in the BoF/GoM region. There are watershed groups and citizen alliances. There are organizations of agencies like NROC and the Gulf of Maine Council on the Marine Environment, which will be discussed later. The point is, however, that the goals that drive the various governance participants in the

region are fragmented and, at times, conflicting. From the vantage point of a casual observer, there is a certain amount of distrust between the players in the region. One of the reasons may be that all are competing for increasingly scarce dollars – whether from members or donors as in the case of NGOs, or from government budgets, which are increasingly trimming the agencies and functions that are discretionary in nature. Regardless of the reason, however, there are too many goals that drive regulators and the public in different directions. This is not conducive to the kind of collaborative and cooperative effort required of ecosystem-based governance.

It would appear that governance in the Bay of Fundy/Gulf of Maine is based on a series of acts and regulations promulgated by lawmakers and regulators that share the purpose of compromising between resource conservation and economic interests. Our ecosystem-based goals clarification characteristics call for meaningful public and/or community participation in the goal clarification process. There appears to be little attention paid to public or community participation in the region. Further, our ideal model calls for strong public outreach and education efforts devoted to raising awareness and understanding of ecosystem issues and governance options. Other than some of the examples discussed later in this chapter, there is little indication that there is either the desire or the funding for truly strong public outreach or education. Finally, our model calls for multiple goals that overall embrace human dignity and equal access to governance with a premium placed on maintenance of the integrity and resilience of ecosystem functions. In the BoF/GoM there is certainly evidence of multiple goals. Unfortunately they are agency-by-agency goals and may or may not be related to the maintenance of the integrity and resilience of ecosystem functions. As we have seen,

often the language of the legislation or regulation speaks to “sustainability” or “restoration” but, in practice, are often interpreted or implemented to promote economic or private interests to the detriment of the integrity and resilience of ecosystem function.

Having examined at least some of the goals in the region, we will now move to look at the trends.

Describing Trends. The trends task in an ideal ecosystem-based approach to governance has been discussed and may be characterized by:

- 1) Collaboration and the use of reliable methods and data in order to measure whether socioecological variables are moving closer to, not away from, goals, and
- 2) The open and transparent communication of the progress and trends data to policy makers and to an informed public with significant opportunities for community members to be involved with scientists in the assessment of trends using local knowledge and local preferences (Table 42).

In other words, trends are examined in terms of the movement of governance toward a more participatory and holistic ecosystem-approach; and whether the socioecological trends are moving toward more sustainable and resilient ecosystem functions. With this in mind, therefore, this section must explore collaboration and the reliability of methods being used to determine trends. It must also examine at least some of the important ecosystem processes or components and determine whether they are trending toward or away from the goals. Finally we will examine whether there is a process in place to openly and transparently communicate the trend information to the public and policy makers and if such communication opens the door to significant opportunities for community members to be involved with scientists in order to assess trends with local knowledge and preferences (Table 42).

Table 42 Trends

<b>Ecosystem-based Approach</b>	<b>BoF/GoM Approach</b>
The use of reliable methods to measure whether a suite of socioecological variables are moving closer to, not away from, goals established with significant input from community.	Goals are fragmented. The methods used to measure whether variables are moving closer to or away from goals are difficult to determine because there is no overarching authority or uniform reporting process. Evaluations of trends, to the extent they are performed, are generally done by separate agencies and involve only matters in their jurisdiction. Ecosystem processes and components appear to be trending away from the various goals set by responsible agencies.
Open and transparent communication of the progress and trend data to policy makers and to an informed public through frequent meetings, accessible information, and other techniques.	There are a variety of separate, often fragmented, sources of information. There are no annual or regular meetings designed to inform the public and policy makers about trend data. There is no accessible website or source of information available to the public and policy makers that contains comprehensive trend data or opportunities for input or participation. GoMC and BoFEP websites are helpful but not comprehensive.

The first issue in the examination of trends is the characteristic that an ecosystem-based governance regime needs to use reliable methods to measure whether a suite of socioecological variables are moving closer to, not away from, goals established with significant input from community. This issue presents problems in the Bay of Fundy/Gulf of Maine watershed for a variety of reasons. It might be recalled from the Goal Clarification discussion above, for example, that there are no overriding goals for the region and certainly none that were established with significant input from community. The goals in the region are largely set forth in the missions, goals, and

objectives of a variety of federal, state/provincial and local governments and agencies.

Similarly, the methods used to accumulate data are generally department or agency-specific. There is no universal, standardized, monitoring or surveillance plan. There is no annual conference where scientists, regulators, policy makers, and members of the public could share information and data. Indeed, data and information relevant to trends in the BoF/GoM region are often stove-piped in agencies or published in peer-reviewed journals safe from the eyes of the general public. As one author lamented:

The situation in the Gulf of Maine is further complicated because the region is controlled by hundreds of municipalities, dozens of counties and metropolitan regions in two countries. To say that authority is fragmented understates the enormity of the challenge to creating a coherent ...policy. The difficulty inherent in collecting Gulfwide data for this report, alone, is an illustration of the complexity of the task without taking into consideration differences in land use law, culture, and traditional use (Pesch and Wells 2004).

The only entity that has the potential capacity to provide a consistent and reliable platform for collaborative work between and among the fragmented array of geographic and subject-matter jurisdictions in the region is the Gulf of Maine Council on the Marine Environment (“GOMC”). The GOMC was formed by a small group of middle-level state planners and provincial resource managers who had, essentially, become frustrated at the slow pace of federal response to regional threats during the Reagan administration in the U.S. and the Mulroney Government in Canada. This group morphed into the first Gulf of Maine Council Working Group and meets were held around the basin beginning in Portland in June, 1988, to negotiate a binational agreement (Springer 2002).

Drafted largely by members of the Maine State Planning Office and negotiated in working group meetings, the “Agreement on the Conservation of the Marine

Environment of the Gulf of Maine” was signed by the premiers of New Brunswick and Nova Scotia and the governors of New Hampshire, Massachusetts, and Maine in 1989 (Young 1998; Springer 2002; Ricketts and Hildebrand 2011). Since both Canada and the United States have constitutional prohibitions that prevent provinces or states from entering into international agreements, the 1989 agreement is in essence a compact to cooperate. But it is a political agreement that requires little of the parties (Ricketts and Hildebrand 2011). Indeed, there is consensus within the Council that “whatever authority the Council currently has flows from the powers of the individual agencies which participate in it” (Springer 2002, 29).

The Council’s ability to serve as the principle forum to employ reliable science to credibly inform the public, regulators, scientists, and regulators is not without limitation. The original agreement, while employing phrases like “sustainable development” and “ecological integrity” ended where the water hit the shore – land masses and the land-based ecological systems were beyond the scope of the agreement. Further, there is no mention of fish or fisheries in the original agreement. Despite the fact that fishing is the economic center of the regional economy and overfishing and regulatory conflict are hallmarks of life in the Bay of Fundy/Gulf of Maine, political reality has forced the Council to generally avoid issues related to the “f-word” (Springer 2002).

The Council is now working under its recently adopted its 5<sup>th</sup> Action Plan. It is at first blush very similar to its 4<sup>th</sup> Action Plan. An excellent summary of the development of the Council from the 1990s to the current 2007 – 2012 Action Plan may found elsewhere and will not be repeated here (See Ricketts and Hildebrand 2011). Pursuant to



its 4<sup>th</sup>, and carried through with the 5<sup>th</sup> Action Plan, the GOMC has essentially articulated three goals:

1. Coastal and marine habitats are in a healthy, productive, and resilient condition.
2. Environmental conditions in the Gulf of Maine support ecosystem and human health.
3. Gulf of Maine coastal communities are vibrant and have marine-dependent industries that are healthy and globally competitive (GOMCc 2007, 17; GOMC 2012).

The Action Plans also set forth the four principles that the Council and participating agencies adhere to in their decisions involving the Gulf of Maine ecosystem:

1. Ecologically sustainable development

The Council seeks to meet the region's current social, cultural, and environmental needs without compromising the needs of future generations. Working in partnership with others, it strives to sustain ecological processes and enhance the region's quality of life.

2. Ecosystem-based planning and management

The Council supports collaborative management that integrates economic, social, and ecological values and objectives, emphasizing natural rather than political boundaries.

3. Environmental protection through precaution

The Council supports conservation of the coastal and marine environment, and urges its members to proceed with caution to avoid environmental degradation.

4. Public information and participation

The Council is committed to a participatory process that informs and engages the public in setting priorities. (GOMCc 2007, 5; GOMC 2012)

Thus the language of the 4<sup>th</sup> and 5<sup>th</sup> Action Plans articulate goals and principles consistent with ecosystem-based governance. The issue, though, is whether there are reliable methods to measure whether a suite of socioecological variables are moving closer to, not away from, goals established with significant input from community. Often indicators of ecosystem resilience and integrity are helpful. Since at least 2003 the GoMC, through its Ecosystem Indicator Partnership (“ESIP”), has been working on establishing indicators that would provide a web-based reporting system encompassing coastal development, contaminants, eutrophication, aquatic habitat, fisheries and aquaculture, and climate change (Ricketts and Hildebrand 2011). ESIP’s core principles are set forth below:

The core principles established for the gulf-wide indicators and reporting program ensure the production of a high-quality product that is relevant for its users and is developed through a transparent, science-based process that engages a wide group of partners.

**Partnerships.** This effort will build on existing monitoring, indicator, and reporting programs within and encompassing the Gulf of Maine. Strong, robust partnerships between these programs and other organizations will be vital for a region-wide indicators and reporting program to succeed.

**Science-based.** Indicators will be selected based on the best natural and social scientific understandings of the structure and functions of the ecosystem, including its human components.

**Audience-relevant.** Indicators will be responsive to audience needs, and information will be presented in formats that are clearly understood by the target audiences.

**Necessary and sufficient.** This effort will track the minimum set of indicators necessary to determine whether ecosystem goals and objectives associated with specific management issues are being achieved.

**Transparent.** The selection, development, and interpretation of the indicators will be conducted and documented in a manner that ensures transparency such that each indicator can be evaluated by users and

replicated by other programs or in future iterations of this initiative.  
(GOMC 2011)

Thus there is adequate language within the mandate of ESIP in particular and GOMC in general to use reliable methods to gather data by way of meaningful monitoring and evaluation and, once the data is obtained, to have processes whereby the results are transparent and shared with the public. While the language may be adequate to permit these activities, it is unclear how much the structure of the GOMC, once described as “fragmented incrementalism” (Springer 2002, 29), acts as a practical barrier to credible, comprehensive, and collaborative measurement. There may also be nagging questions of funding that prevents monitoring and the evaluation of the data gleaned from monitoring effort. Funding, which has been “a serious and perennial challenge for the Council” (Ricketts and Hildebrand 2011, 371) may also prevent the creation and implementation of a reliable monitoring program:

The lack of long-term funding and consequent budgetary uncertainty has made life difficult for Council committees, who are unsure whether to plan for a worst-case situation or to continue generating new and potentially costly ideas... Overall ... the tight budget has forced member governments and agencies to re-examine Council priorities and recommit themselves to the work of the organization... The tight budget has also encouraged greater emphasis on the development of inexpensive, cost effective approaches to both monitoring and management, which may be crucial to the organization’s long-term success. In addition, it has reminded the Council of the need to remain sensitive to the priorities of state and provincial agencies in the way it defines problems to be addressed in the action plan. (Ricketts and Hildebrand 2011, 372-73)

Put another way, a participant familiar with regulatory efforts in the BoF/GoM interjected a bit of practical experience into the relationship between funding and monitoring in the region:

A: ... when there are budget cuts, historically, monitoring is often among the first things to go. It's viewed as somewhat of a luxury. Considering how much emphasis there is on accountability and getting environmental results, it doesn't make sense. But, it's...if you're a regulating agency, you're regulating. If you have money to monitor, great, but if you don't, well you're still going to regulate and assume that you're doing some good. But, you can see all the things that we do, but hardly any of them do we do entirely by ourselves, in fact, none of them. (US Federal Employee 1)

It appears, therefore, that there may be real obstacles along the way to a reliable and credible monitoring scheme for the Bay of Fundy/Gulf of Maine region. First there is a problem with the fragmented nature of the Council and, second, there are funding issues. This may explain why the Council has been operating for some two decades and there is still no basin-wide monitoring or surveillance plan. Then again, ESIP is progressing and there may be sufficient collaboration such that, even without funding, member agencies will cooperate on a region-wide surveillance plan with costs being absorbed within each agency and results shared and communicated to the public and policy makers. Overall, however, governance presently falls short of the goal of collaboration and use of reliable methods and data in order to measure whether there has been progress in moving toward goals.

We have seen that there is an overall lack of cooperation and collaboration in the governance regime in the region. But are trends in the BoF/GoM moving toward the goals of the agencies that govern the various components of the ecosystem? Without going into great detail, the trends can be summarized.

Trends are by definition driven by the threats to the regional ecosystem. To help put threats into context we must remember that the Bay of Fundy/Gulf of Maine provides valuable services and resources to the region. Some of these services are visible, others

are not so apparent. Commercial and recreational fishing industries in the Gulf of Maine employ many thousands and provide the social and economic lifeblood for a significant number of towns and villages along the Gulf coast of Canada and the United States. The Gulf also provides an outlet for tourism and recreation, shellfish harvesting, marine transportation, cultural identity, coastal economic development and other important and tangible products. The land around the Gulf is sought after for valuable agriculture as well as for residential, commercial and industrial value. There is abundant evidence that human population will continue its migration to the coast for a host of reasons, not the least of which is the intrinsic appeal of many coastal landscapes and habitats (NHEP 2000; M.S.P.O. 2001). Further, as climate change impacts make life in urban centers south of the Gulf less and less pleasant, the Gulf region will come under increasing stress from those desiring to “escape” from those densely populated regions.

**Q:** But, going back to the four threats that we mentioned earlier, what are the trends? Are we getting better or are we moving further away from our goals?

**A:** Well, that depends on how good your indicator systems are and that’s an issue. I think you have a lot of different groups that are trying to understand the state of the environment and Gulf of Maine Council is one through their Ecosystem Indicator Partnership. Every office, again, looks at its own indicators. I don’t think that anyone...I know that NOAA doesn’t have a system in place where we actually understand a whole suite of indicators. So, for instance, coastal development wise, we know that the Northeast is the most highly populated region of the US and it’s getting more populated, so that trend is going up. The non-point source pollution is getting worse due in large part to increased development. Now fisheries has their set of indicators where they’re measuring fishery stocks and it’s very difficult to put that picture together in terms of an ecosystem where some stocks are going up, some stocks are going down, and where you have trophic cascades going on. You might not be able to speak for the entire ecosystem but they’re trying to put that picture

through individual stocks or suites of stocks. Again, that's not in an ecosystem context. (US Federal Employee 4)

It seems we know trends are moving away from the goals, but we really don't know a lot of specifics in terms of the health of the overall ecosystem. If, however, environmental trends are not moving toward the goals of the agencies that manage the various components over which they have jurisdiction, then all of these valuable services are in peril. We should first recall the primary threats to the health and resiliency of the GoF/GoM ecosystem. Those threats appear to be posed by overharvesting, pollution, shoreland development, invasive species, and global climate change (Steneck 2001; Clark 2002; Steneck, Vavrinec et al. 2004).

With respect to the harvesting of living marine resources, decades, some say centuries, of resource extraction and exploitation by humans has taken a toll on Gulf of Maine (Pauly, Christensen et al. 1998; Jackson, Kirby et al. 2001; Steneck 2001). While there was marginal improvement with rebuilding some stocks, continued harvest pressure stocks are again down<sup>30</sup>, and landings of key commercial species generally continue to suffer and continued overcapacity perpetuates the paradigm of too many fishers chasing too few fish (Hanna, Blough et al. 2000). Diversity in the Gulf's marine ecosystem has been markedly reduced over millennia and historic food webs have been transformed into food chains due to the serial targeting and depletion of finfish and other top consumers. Some commentators have asserted that the cascading consequences of overfishing have

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<sup>30</sup>Data and conclusions from the 2005 Groundfish Assessment Review Committee ("GARM"), a regional review peer-review process designed to provide stock assessment updates for the 19 stocks managed under the Northeast Multispecies Fishery Management Plan ("Multispecies FMP") demonstrate the mixed results of multispecies management efforts since 2001. Of the 19 stocks assessed, for instance, only 6 showed an increase in stock biomass over the last four years. GARM (2005). More recent data from the *Study of 19 Northeast Groundfish Stocks through 2007* shows further stock deterioration with 13 of the 19 groundfish stocks overfished, with overfishing occurring in 11 of those stocks. NEFMC (2008). Report of the Groundfish Assessment Review Meetings (GARM III). Gloucester, NMFS.

resulted in a phase shift that has replaced cod with European green crab as the apex predator in the Gulf of Maine (Steneck, Vavrinec et al. 2004). Others warn that without the restoration of ecosystem food webs and improved water quality marine ecosystems will lose resilience and become increasingly vulnerable to global climate change and other unforeseen future threats (Pandolfi, Jackson et al. 2005). Despite the continued threat of overfishing, stock rebuilding timetables and restoration efforts are under siege from both Congress and the judiciary (Safina, Rosenberg et al. 2005). Recent evidence reveals that populations of cod, a keystone species in the gulf ecosystem, are again overfished, that overfishing is continuing<sup>31</sup>, and that the populations are perilously low: “Currently, the Gulf of Maine cod stock appears to be at a very low biomass, which will likely affect harvests of other groundfish stocks from the nearshore Gulf of Maine” (NMFS 2011, 1).

All is not bad news, however. Viewed from the perspective of someone involved with the New England Fishery Management Commission, and looking at the full suite of stocks managed by the NEFMC, there have been positive trend indications:

Q: How are we doing? What are the trends?

A: We’re doing better. The trends are all up. Scallops are doing very well. Monkfish and herring are doing very well. Groundfish, of the 19 stocks, 13 are rebuilding, 3 are staying the same, and 3 are declining. Overall, if you look in aggregate there’s definitely an increase in the groundfish complex stocks. For the first time probably in New England history in 2005 we stayed under our TACs. And I think in 2006 we were

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<sup>31</sup> An *overfished stock or stock complex* is one whose size is sufficiently small that a change in management rules is required in order to achieve an appropriate level and rate of rebuilding. The Magnuson-Stevens Fishery Conservation and Management Act currently mandates that overfished stocks be rebuilt as soon as possible and within a timeframe not longer than 10 years.

*Overfishing* relates to the rate at which a stock of fish is harvested and occurs when that rate exceeds an acceptable level, eventually resulting in the stock becoming overfished.

under on all of them except one, and I think that was Gulf of Maine cod. So things are moving in the right direction on ground fish and there are a number of success stories in other stocks. So we're doing better. (US Federal Employee 3)

It should be noted that this interview occurred before more recent data on groundfish stock rebuilding became available. The conclusions of GARM III report published in 2008 entitled *Assessment of 19 Northeast Groundfish Stocks through 2007* paints a bleaker picture:

- Four stocks were classified as not overfished and not experiencing overfishing.
- Thirteen stocks were overfished and six were not.
- Eleven groundfish stocks were both overfished and experiencing overfishing. (NEFMC 2008)

Thus more recent trend information indicates that there may be as many as 13 of the 19 groundfish subject to the regulation via the New England Fishery Management Council's Northeast Multispecies or Groundfish Plan are showing significant signs of decline – 11 of those so seriously that action must be taken to rebuild stocks immediately (1976; NEFMC 2008).

Stresses impacting the Gulf of Maine extend beyond the pressure put on it by the fishing industry. Toxic contaminants found in the waters of the Gulf region, for instance, have been linked to endocrine system harm in humans and wildlife (De Guise, Shaw et al. 2001). Commercial fish that are harvested from the Gulf are increasingly subject to Fish Consumption Health Advisories because of their high burdens of mercury, PCBs, dioxins, and other toxins (Rich 1994). Trends in some of the persistent organic pollutants, endocrine disruptors, pharmaceuticals, are unknown because there is no monitoring for



the presence of these types of constituents (Wells 2010). This was driven home by an employee familiar with existing monitoring efforts for pollutants on the U.S. side of the gulf region:

**Q:** One of the concerns also is that we don't know about this next generation of pollutants—endocrine disruptors, the pharmaceuticals, the things that might be out there—but right now are posing problems in the Great Lakes because they're being looked at. We don't know what's out there. Is that a fair statement?

**A:** I think that's a fair statement. On the other hand I think that at the ORD sort of level, at Offshore Research and Development, that those things are being looked at, but the information generated by this research hasn't reached a point yet that it can be used to guide management decisions...regulatory decisions. We still are having a hard...with the resources we have at our disposal having a hard enough time controlling sources of pollution that we know about, like nutrients, never mind worrying about...I mean yea, we think about it, we're concerned about it, do we do anything about it? No. But, like I said, we barely have the resources to deal with the problems we know about, never mind the ones we don't really know about. (U.S. Federal Employee 1)

In addition to the point source and air deposited pollutants that impact the environment in the BoF/GoM region, there is an additional problem with nutrients. These pollutants are a result of increasing population pressure and development in the coastal margin. Contaminated shellfish beds, loss of eelgrass, reduced water clarity, coastal development, habitat loss, hazardous waste and pollution have been present with varying intensity along the coast for decades and are a direct result of the population growth in the region. Contaminants include microorganisms from storm water runoff and other nonpoint sources, nutrients (point and nonpoint sources), improperly treated sewage, legacy pollutants (and sediments), and emerging toxic contaminants (NHEP 2000; Sowers 2010; Washburn 2010).

The situation in the Great Bay, located in the southern gulf bordered by New Hampshire and Maine, is an example for many of the environmentally important estuaries and salt marshes in peril around the region. A 2009 Piscataqua Regional Estuaries Partnership (“PREP”) Report sets out the negative trends in the Great Bay. Total nitrogen load (N) in the estuary increased by 42% in the last five years due largely to greater storm water runoff and non-point source pollution loads during recent high rainfall years. Dissolved inorganic nitrogen, a major component of total N, has increased by 44% in the last 28 years. Water clarity has declined as a result of increasing nutrient loads and increasing concentrations of suspended solids and chlorophyll-a. Eelgrass habitat in the estuary has disappeared from tidal rivers, Little Bay, and the Piscataqua, and is in steep decline in Great Bay, Portsmouth Harbor, and Little Harbor. Dissolved oxygen concentrations consistently fail to meet water quality standards in the tidal rivers. Anadromous fish returns to the estuaries are limited by water quality, passage around dams, and flooding. Oyster and clam populations remain depressed compared to historic abundance. Toxic contaminants affect nearly one-quarter of the estuarine sediments and concentrations of compounds associated with petroleum products are increasing in the tissues of shellfish from the Piscataqua River. Bacteria concentrations are no longer declining but water quality standards for swimming and shellfishing are not being met in all areas. Increasing pollutant loads are clearly a problem (PREP 2009).

It also bears mentioning that increased nutrients in the Bay of Fundy/Gulf of Maine region have been implicated in the increasing outbreaks of *Alexandrium fundyense*, or red tide as well as increased beach and shellfish area closures (Jones 2011).

In the U.S. the regulation of non-point source pollution is difficult because it normally involves regulations impacting land use – a regulatory area usually reserved to municipalities. Thus land use measures require municipalities that understand the cumulative impact of their actions – and work together rather than compete with one another to bring in additional businesses. As one federal regulator put it:

A: But the federal government's never going to get explicit with land use regulation. The states are even leery of it. Connecticut is one state that , the only state I think in the country that has ground water...all states have surface water quality standards, Connecticut has ground water standards...pretty advanced. They also have aquifer protection area regulations that are in effect...land use regulations for areas that overlay their drinking water aquifers.

Q: You're talking about where?

A: In Connecticut. It took them over ten years to get the regulations from start to finish. So, there's a lot of resistance to that. And then you know the story here in New England with home rule... what are those territories in the North...

Q: Maine, New Hampshire, Vermont

A: Every one of them acting pretty much independently of each other for their own interests, and there's usually economic interests...bring in more business and with it more people, and you just keep piling it on and eventually there's nowhere else to develop, and I don't know what you do then. (U.S. Federal Employee 1)

The ecosystem processes and properties in the Bay of Fundy/Gulf of Maine region are clearly trending away from the goals espoused by the agencies responsible for regulating the human activities that impact the environment. Despite the gains of the in the 1970s under Clean Water Act and CEPA, water quality in the region still suffers. Coastal development and concomitant nutrient overloads are increasing and there is really very little data on the proliferation of many of the modern emerging persistent

organic pollutants. Overharvesting may have been slowed or even turned around for some species, but overfishing continues and some long depleted fish stocks are showing little sign of recovery. Further, the rapid introduction of invasive species in the Gulf of Maine has “profoundly changed the structure and functioning of ...coastal marine communities” (Steneck 2001). To date at least 64 marine invasive species have been documented in the Gulf of Maine (Pappal 2010). It may be that society will have to cross their collective fingers and recognize marine invasions as the cost of doing business in a global market with related shipping and transportation vectors.

The final environmental trend that we will examine is the threat to the BoF/GoM region posed by global climate change. The functioning of the Gulf of Maine, however, and the ability to provide the services asked of it are jeopardized by the impacts of global climate change. The Earth's climate has warmed by @ 0.6 degrees C over the past 100 years with two main periods of warming, between 1910 and 1945 and from 1976 onwards. The rate of warming during the latter period has been approximately double that of the first and, thus, greater than at any other time during the last 1,000 years. There has been a 10% decrease in snow cover and ice extent since the late 1960's (Walther, Post et al. 2002).

Despite its topography, the Gulf of Maine is a connected westward extension of the North Atlantic Ocean, and problems detected and foreseen for the North Atlantic have relevance for the Gulf region. Signals of change due to climate change are being detected in the waters of the North Atlantic. One of the impacts of climate change, for instance, is that the water of the higher latitudes, including the North Atlantic, is freshening (the impact has been detected at higher i.e. over 50° N and 60° S) or becoming less salty

while salinity is increasing at lower latitudes. This is thought to be a sign that the Earth's hydrologic cycle is changing (Curry, Dickson et al. 2003). Another factor that might signal a decrease in salinity for the North Atlantic is the revelation that the volume of fresh water discharged into the Arctic Ocean from rivers is also increasing (Peterson, Holmes et al. 2002). When this is added to the additional fresh water likely to enter the Gulf from melting ice via the Labrador Current and the increasing amounts of fresh water likely to flow from the major river systems due to the escalating rate of moisture received from the tropics via the hydrologic cycle it is clear that salinity changes are likely in the Bay of Fundy/Gulf of Maine.

These trends could conceivably affect the Bay of Fundy/Gulf of Maine marine ecosystem at all trophic levels and spell more bad news for a commercial fishing industry already reeling as a result of overfishing. Fish recruitment has been known to be a key process strongly influenced by climate variability. In one example from the Bering Sea, variations in atmospheric circulation, though interactions with ocean currents, influenced transportation of juvenile Pollock away from adults, increasing the intensity of cannibalism and, ultimately, year class strength (Walther, Post et al. 2002). It is unknown what impact these changes will have on the ultimate abundance and distribution of fish species in the Gulf of Maine, but it is disturbing to think of the magnitude of change the may lie ahead. Fish are simply not that good at acclimation to new or even gradual changes in temperature (Stillman 2003). To make matters worse, commercially significant groundfish species in the Gulf of Maine, especially cod, have evolved to live a long adult lifespan in order to buffer the impact of recruitment failures. Overfishing,

however, has shortened the age structure of the population and rendered some groundfish species vulnerable to the adverse effects of global change.

The news for other trophic levels is not good either. The direction and flow of water into the Gulf of Maine is controlled to a significant degree by the location of the North Atlantic Oscillation (NAO). The position of the NAO determines whether inputs into the Gulf come more from the cold, nutrient-poor Labrador Current or the richer, warmer Scotian Shelf slope water. It now appears that human-introduced greenhouse gases are influencing sea level pressure by increasing it over the subtropical North Atlantic and decreasing it in the higher latitudes. This may lead to an upward trend in the North Atlantic Oscillation index (Gillett, Zwiers et al. 2003). Such positive anomalies of the NAO have modified marine primary and secondary production, meaning that the availability of planktonic food for fish larvae may be diminished, resulting in reduced recruitment (Walther, Post et al. 2002). Whether from NAO influence, or from increasing intermediate flows of reduced nutrient-laden fresh water from increasing rates of glacial melting, the phytoplankton assemblage is being altered (Balch, Drapeau et al. 2007; Townsend, Rebeck et al. 2010). Changes at the bottom of the food chain cannot be good for secondary and tertiary consumers. Other species important to New Englanders, like blue fin tuna and striped bass, may change their migration patterns due to climate-induced changes in prey abundance.

Climate change is influencing the abundance and distribution of species. Whether the influence has started in the Gulf is unknown. There is just too much “noise” because of the overfishing issues that have taken the time and attention of marine scientists and policy makers. The influences that might be anticipated include changes in the density of

species as they shift their ranges either poleward or up in elevation (terrestrial or tidal) in order to occupy areas suited to their metabolic temperature tolerances. In addition, because many natural history traits are triggered by temperature-related cues, changes could occur in the timing of events, such as breeding, migration, and seasonal phytoplankton blooms. Changes in temperature can also lead to changes in species morphology. Thus body size or even behavior may be affected (Root, Price et al. 2003). Temperature, for example, was found to be the primary factor in the differences of weight-at-age of cod sampled from 17 stocks across the North Atlantic (Brander 1995). Extinction may be the ultimate price that some species pay for human-induced climate change (Thomas, Cameron et al. 2004).

One other possible impact of global climate change is a change in the currents and upwelling in the Gulf. Temperature (air and sea surface) and salinity changes could have a negative impact in the physical movement and vertical mixing of water in the Gulf region. The ecosystem dynamics of the Gulf depend greatly on the physical mixing mechanisms that continually serve to bring nutrients up from deeper water to the shallower water where light is available for photosynthesis. Some of these mixing mechanisms are driven by the difference between the temperature of the water and the air, e.g. winter convection, thermohaline circulation, etc. Others depend upon mixing of fresh and salt water. If the air warms in the winter to a more moderate temperature it could restrict coastal ocean circulation, vertical mixing and upwelling. The result would be few nutrients delivered to the photic zone, with a concomitant reduction in primary productivity and the cascading consequences that would follow through all trophic levels.

It has also been suggested that climate change could impact the timing of the spring phytoplankton blooms both inshore and on the Banks. Spawning success for many commercially valuable species in the Gulf is thought to be linked to the delicate timing of the seasonal phytoplankton blooms (Townsend, Rebeck et al. 2010). Fish larvae need available plankton on which to feed as they emerge and begin their lives. Warmer climate conditions may cause phytoplankton to bloom earlier in the season. The organisms that graze on these primary producers might develop at their normal seasonal times, cued by the length of daylight that is thought to control their natural cycles. Such a mismatch could lead to significant disruption for the Gulf of Maine ecosystem up and down the trophic levels (Root, Price et al. 2003). The difference in timing between phytoplankton blooms and the natural cycles of primary consumers could also change the pattern, timing, and amount of the exchange of carbon dioxide. The mismatch could lead to a higher fraction of organic carbon being recycled by bacteria and through photooxidation, resulting in a greater fraction of photosynthetically-fixed carbon returning to the atmosphere as carbon dioxide (North and Duce 2002).

Focusing on the near-coastal environment, the impact of climate change on the coastal ecosystem could also be drastic. Things could be made worse if the offshore component of the Gulf of Maine ecosystem begins to show sustained loss of function and fishing and related harvesting effort moves inshore. Extinction risk is a real possibility for those creatures that live in the tidal and estuarine areas of the coastal margin. Although many terrestrial plants and animals and marine organisms might be able to shift their ranges and distributions poleward, extinction risk might impact most heavily on those species of fauna (chiefly ectotherms) and flora that form part of salt marsh and



coastal ecosystems in the Gulf of Maine. Species adapted for this peculiar environment simply may not be able to compensate for the rate of increase in temperature and salinity changes.

These systems play a key role in the ecosystem by filtering out sedimentation and run-off, serving as a buffer between land and sea, and as a productive habitat and nursery for a broad spectrum of species. Seagrasses are a critical component of these ecosystems. Short and Neckles (1999) have suggested that increased atmospheric temperature will alter growth rates and other aspects of these species' physiology. Air temperature rise could also increase disease in these systems (Dionne 2002).

Another threat to the coastal estuaries and salt marshes in the Gulf of Maine is the rise in sea levels that results from temperature increase (Karl and Trenberth 2003). The global average sea level rise is thought to be in the neighborhood of 1.2 mm/yr. While salt marshes and tidal wetlands have managed to keep up with the gradual sea level rise that has occurred over the last 3,000 years, they are reaching the limit of their ability to accrete peat and thereby gain elevation at rates to match the modern rate of rising water (Dionne 2002). Furthermore, intensification of the hydrologic cycle may increase precipitation in the Gulf region (due to increasing evaporation at low latitudes and redistribution to higher latitudes), leading to decreased salinity in estuarine regions and salt marshes. Increased precipitation could lead to increased run-off and the possibility of nutrient overload on these fragile coastal systems. If run-off causes an increase in nitrogen in the system, for instance, algal blooms could develop and deny needed sunlight to sea grasses and related organisms. An uptick in eutrophication would likely result. This has definite implications for the continued productivity of these systems.

In addition to the above, many coastal areas around the Gulf will be affected by increased erosion, flooding, and sea water intrusion into fresh water systems (IPCCa 2001). Coastal communities are threatened. Significant ports in the region may have to retreat. Those whose structures might be safe because of elevation may still be impacted as the intrusion of salt water into fresh water aquifers will present particular problems for the thousands of human residents around the coast who rely upon fresh water from wells, municipal and private, that are located near the coast.

The situation in the coastal estuaries and salt marshes is exacerbated by the fact that development of marsh-upland perimeters means there's no way for wetland species to expand their range by migrating inland. We know that between 1780 and 1980 the Northeast lost nearly 40% of its wetlands (USEPA, NOAA et al. 2001). Coastal species confronting the increased stresses of temperature and salinity change have no place to go – their migration increasingly blocked by coastal roads and shoreline development. Unimpeded retreat, the best mechanism to replace inundated wetlands with the creation of new ones inland, is rapidly becoming unavailable as an option (IPCCa 2001).

A great deal of time has been spent exploring the nature of the collaboration and reliability of methods and data that are used to determine whether socioecological variables are moving closer to, not away from, goals. Even more time has been spent tracing trends toward or away from goals that can be described as good water quality, healthy and diverse fish populations, and smart development. As we have seen, ecosystem conditions are not trending toward the goals.

Given the magnitude of the threats to the BoF/GoM ecosystem it is important to look at whether there is a positive trend toward the open and transparent communication

of the progress and trends data to policy makers and to an informed public with significant opportunities for community members to be involved with scientists in the assessment of trends using local knowledge and local preferences. It would seem fairly obvious that unless the public and policy makers are aware of the nature and extent of the threats to the system there will be little public pressure or policy innovation to turn the trends around.

We have already seen that there is no overarching accountable entity that has the capacity to coordinate, evaluate, and act upon data. Further, there is no regular process for reporting data to the public. While there is a web site for each agency, and for the Gulf of Maine Council where interested parties who know where to look can find a great deal of information related to the health of some components of the ecosystem, no common, publicly accessible web site exists that could provide a forum for all data and information for the watershed and/or an opportunity for comment and input. "A linked network of the many existing and developing repositories is required to offer direct searching capability and retrieval of information" (Wells 2010, 13).

More and more information about the regional ecosystem has been forthcoming. The Gulf of Maine Council, for instance, has been publishing the first ever "State of the Gulf of Maine" report beginning in 2010. It appears that it is being written chapter-by-chapter by authors selected by the GOMC. The information contained in the report is generally well-documented and extremely helpful. There is no indication, however, that the public was involved in any meaningful way in the preparation of this valuable report (Thompson 2010). Further, there is no indication that the report is being used as an

outreach tool to help form a base of an educated public. It is, at this point, available to those who are interested.

Given the above, and despite the best intentions of the many hard-working employees of governments and agencies, the jurisdictional fragmentation seriously impairs the ability of governance in the BoF/GoM to provide an ecosystem-based version of developing information related to overall trends or, when information is available, getting that information out to the public or to communities in a manner that would be consistent with the development of a public that is knowledgeable about the environmental threats to the region.

Conditions. In an ideal system, condition analysis should be part of an iterative effort by scientists and community members to determine the causes or factors influencing trends. Resources should be available to permit scientists and others to sort out the various environmental signals and determine what conditions are factors in any negative ecosystem trends. The inquiry, however, should not be limited to ecosystem factors. Trends can be affected by the individual and institutional effects of economic activity. Thus special interest activity that detracts from the common interests of resilient ecosystems may give rise to conditions that need to be investigated and, if necessary, abated (Table 43).

From the previous section describing the environmental trends in the region we know that the CWA goal of restoring the chemical, physical, and biological integrity of the waters in the region is threatened by nutrient overloads along the coastal margin and, to an unknown extent by industrial pollution and persistent organic pollutants to some extent not clearly understood. We also know that the goal of a sustainable and resilient

ecosystem is threatened by overfishing, shoreland development and related habitat destruction, and by invasive species (Steneck, Vavrinec et al. 2004). In order to put these threats into context there is a need for at least a limited understanding of the current conditions extant in the BoF/GoM. Thus, as we did in Chapter IV, this section will begin with a description of the physical and biological characteristics of the region.

Table 43 Conditions

<b>Ecosystem-based Approach</b>	<b>BoF/GoM Approach</b>
<p>Conditions analysis is iterative with collaborative efforts by scientists and community to gain and share knowledge necessary to determine the conditions that are factors in any negative trends. Conditions analysis explores more than ecosystem factors and examines social and economic factors in order to understand whether economic or other special interests are overriding common interests and the public good. Collaboration between scientists, regulators, and citizen participants jointly work to identify causes and conditions responsible for negative trends.</p>	<p>The natural biological components of the GoM/BoF ecosystem appear to be weakening due to anthropogenic factors. There doesn't appear to be any meaningful iterative conditions analysis done through the collaborative efforts of scientists and community. Information about conditions is generally published by scientists in peer-reviewed publications or used within their respective agencies. Some articles make it onto the GOMC web site. There is no mechanism for collaborations between scientists, regulators, and citizens that would enable them to jointly work to identify causes and conditions responsible for negative trends.</p>

The Gulf of Maine is a semi-enclosed sea extending from Cape Cod to the Bay of Fundy and southwestern Nova Scotia. It is bordered to the South and West by the United States, to the North and Northeast by Canada, and to the East and Southeast by prominent underwater Browns Bank and Georges Bank. Georges and Browns Banks effectively isolate the Gulf from the open Northwest Atlantic Ocean, forming a semienclosed continental shelf sea (Table 12). At depths greater than 100 m, the exchange of waters between the Gulf and the North

Atlantic is confined to the deep (>300 m) Northeast Channel separating Georges Bank from Browns Bank and the Nova Scotian Shelf (Hildebrand 2009).

As discussed in prior sections, strong tides combine with upwelling currents, strong lunar tides, stable water temperatures and storm activity to create ocean circulation patterns that constantly mix deep-water nutrients into the photosynthetic zone, resulting in increased primary productivity (Jennings, et al. 2001).

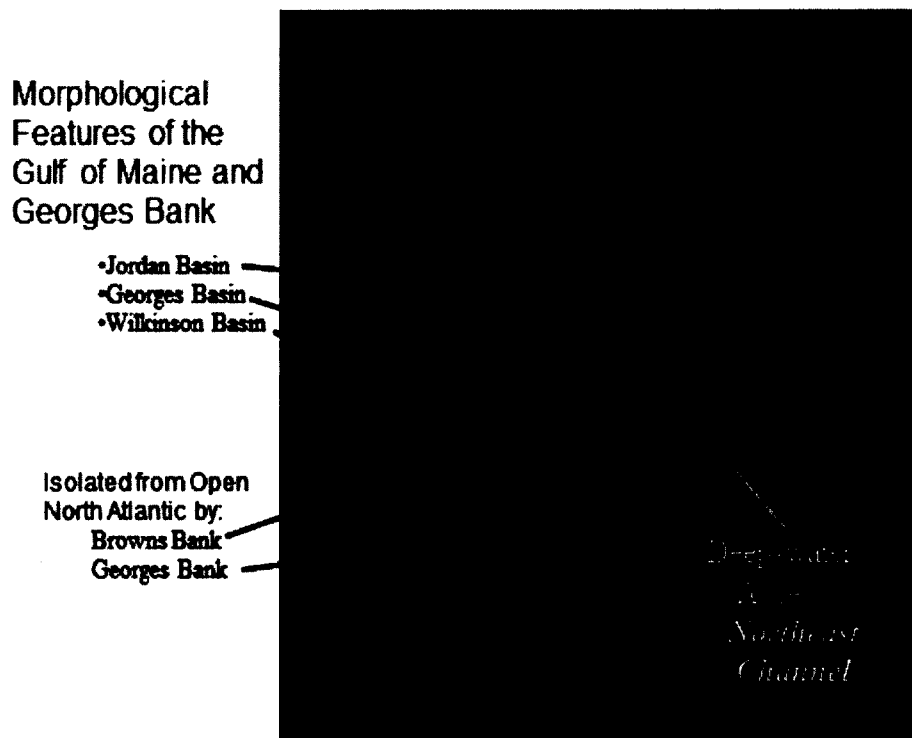


Figure 12 Morphological Features of the Gulf of Maine. Used with Permission of David Townsend.

Cold, relatively fresh water from the Labrador Current flows into the Gulf over Browns Bank. Fresh water also flows into the bank from river systems around the Gulf. Finally deeper, saltier Atlantic Slope Water seeps into the Gulf basin along the bottom of the Northeast Channel (See Figure 13). The dense, cold, deep slope water tends to lay at

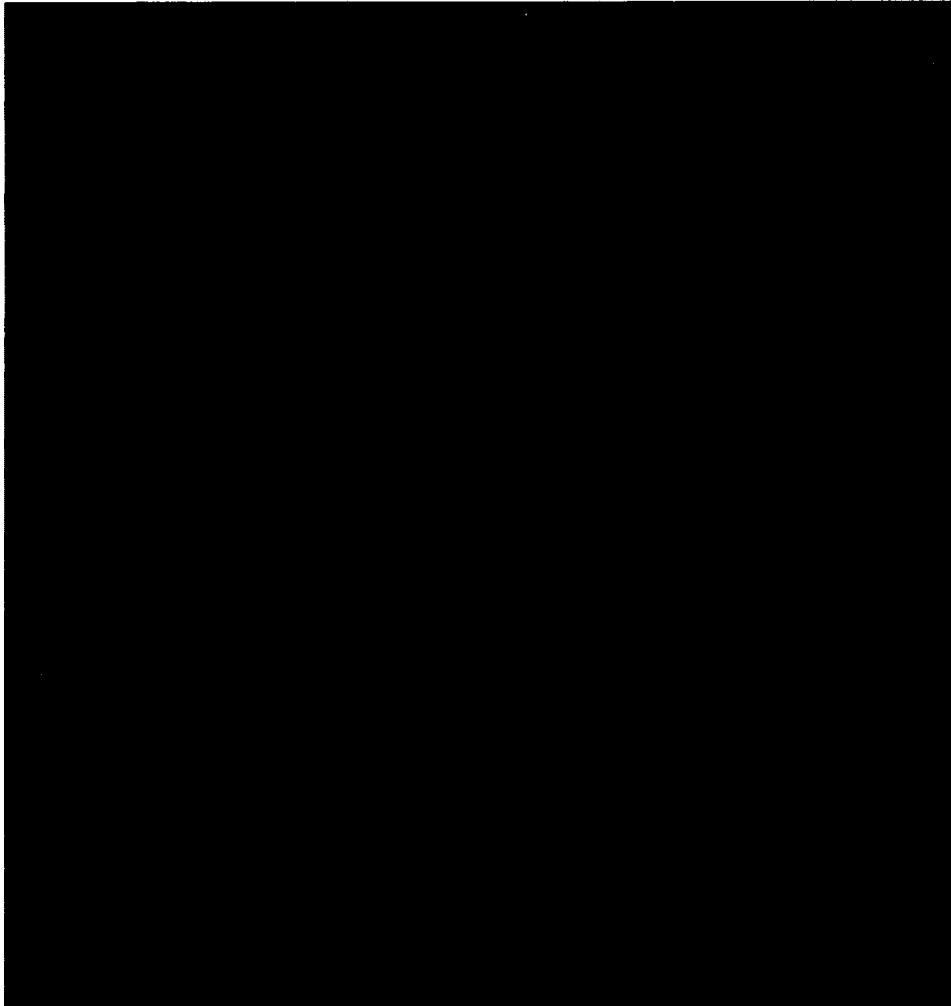


Figure 13 Morphology Important to Water Mass Flows into and out of the Gulf of Maine. Used with permission of David Townsend.

the bottom of the deep basins. Cold intermediate continental slope water lies between the deep slope water and the warmer surface water in the summer and is the layer that is generally loaded with nutrients (See Figure 14). On the surface, there are a variety of currents that are active in the Gulf of Maine and the Bay of Fundy. The Eastern Maine coastal current moves surface water south along the Maine coast. Above the deep basins baroclinic currents move in a counter clockwise direction, while surface water over the banks moves clockwise (Figure 15). The coastal current system in the Gulf of Maine is



Figure 14 Cross-section of Gulf of Maine with typical summer water density fields (Used with Permission of David Townsend)

likely the most important for the overall nutrient budget of the Gulf. Vertical nutrient fluxes driven by tidal mixing in the northeastern Gulf, especially via the eastern Maine coastal current, create an offshore plume feature of nutrient-rich water critical to species composition and abundance of plankton in the offshore waters of the Gulf (Kitthananan 2006).

It is important to understand that at any moment the source of water surging into the Gulf is dependent upon a variety of environmental factors, including the location of the NAO, Gulf Stream and the amount of fresh water flowing out of the Gulf of St. Lawrence (Hildebrand 2009).

It is the morphology and current movement that help make the waters of the Bay of Fundy/Gulf of Maine well known for their productivity. Although it was discussed in the preceding section, it bears repeating that productivity is dependent upon a variety of



other factors, including light and nutrients (Valiela 1995; Mann and Lazier 1996; Jennings, Kaiser et al. 2001; Apollonio 2002; Norse and Crowder 2005).

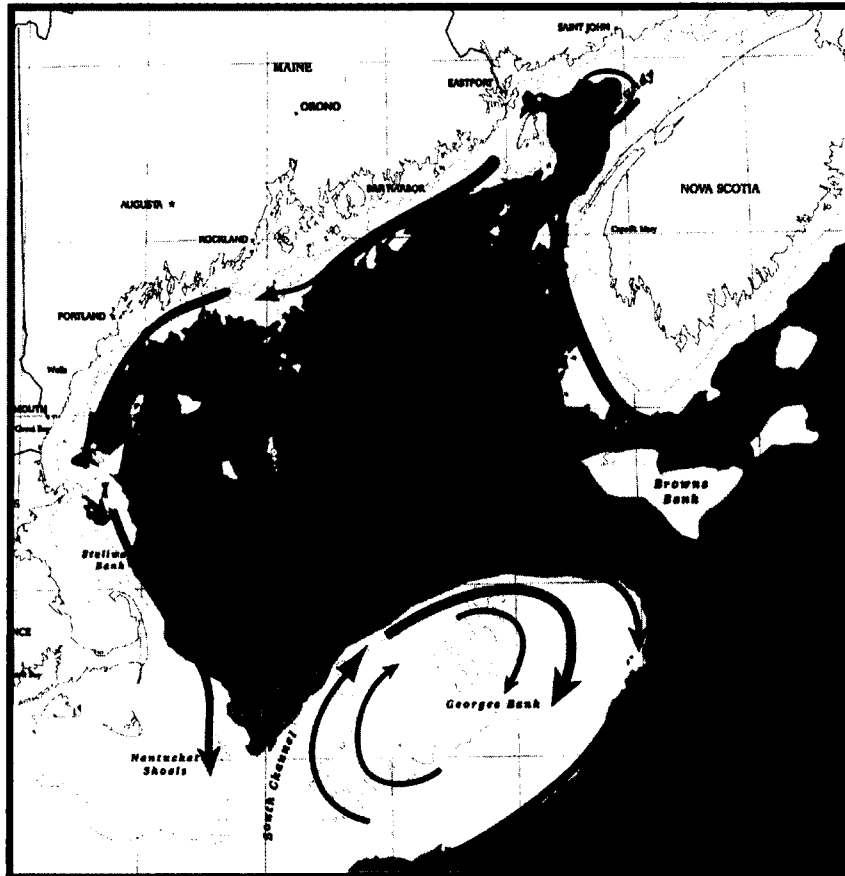


Figure 15 Residual Surface Circulation (Used with permission of David Townsend)

Nutrients in this system come from a variety of sources. The five significant river systems that empty into the Gulf collectively supply an estimated 100 million gallons of fresh water and nutrients daily, lowering the salinity of the Gulf's waters. These characteristics contribute to enormous amounts of primary producers fueling the bottom of the food chain, leading to an abundance of life that drives the growth and development of the food chain's tertiary consumers. The principal source of nutrients supporting this production, however, has been generally thought to be the influx of nutrient-rich deep

slope water from beyond the Gulf through the Northeast Channel (Townsend 1998; Apollonio 2002). Once delivered to the Gulf, those nutrients are mixed into the surface (photic) layers by way of various physical mechanisms including winter convection and tidal mixing (Townsend 1998; Apollonio 2002; Townsend, Rebeck et al. 2010). As Figure 15 demonstrates, the surface water currents can then deliver nutrients and other constituents around the Gulf.

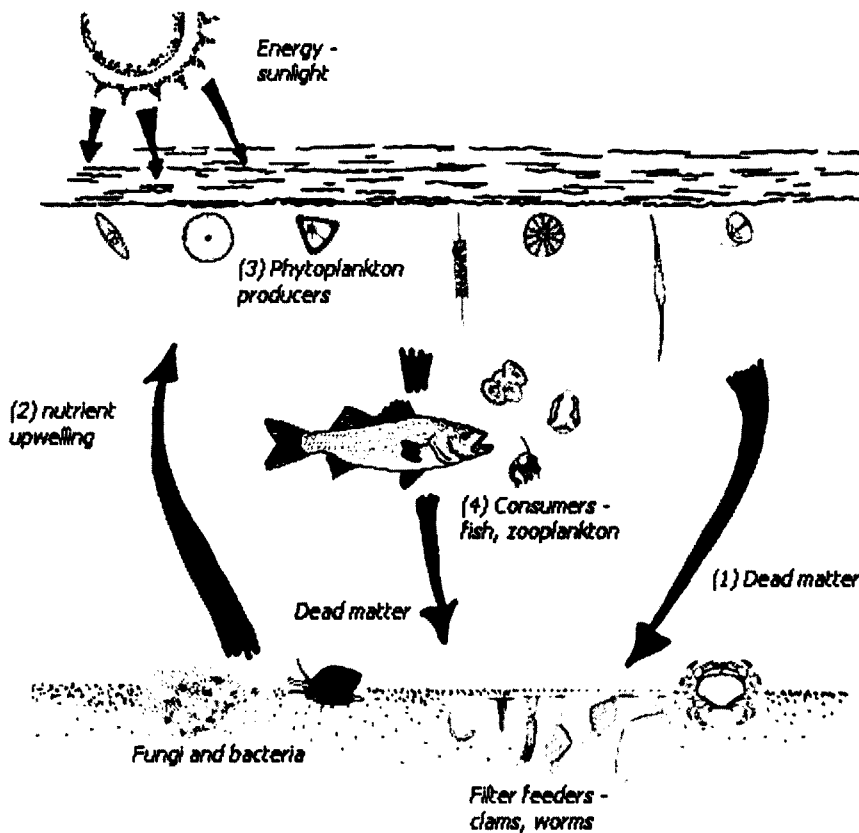


Figure 16 Simplified Gulf of Maine trophic process (NOAA)

Thus the physical processes of the BoF/GoM set the stage for the biological forces and living resources that comprise the ecosystem in the region. As depicted in Figure 16, light energy from the sun is essential for photosynthesis necessary for primary

production. But phytoplankton need more than photosynthesis, they need growth. For growth you need nutrients. Nutrients like nitrogen and phosphate are needed to convert the glucose to form a higher energy molecule, like ATP. Nutrients are therefore necessary in order to have a high level of biomass that can fuel upper trophic levels (Mann and Lazier 1996; Jennings, Kaiser et al. 2001).

There is, however, a conundrum in the marine ecological processes. Sunlight comes down and its impact *decreases* with depth. Nutrients *increase* with depth. Phytoplankton die near the surface in the photic zone after stripping the available nutrients, then die and sink. At depth, bacteria work to restore nutrients from dead phytoplankton. Hence there is a need for nutrients to get mixed back into the photic zone. When sunlight and essential nutrients like phosphorus, nitrogen and silicates combine with oxygen, water, and inorganic carbon, water-borne plants or phytoplankton can survive.

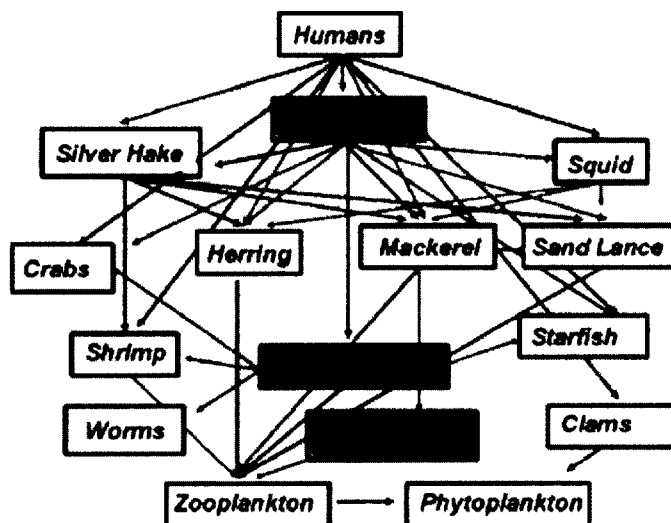


Figure 17 Simplified Gulf of Maine food web (NOAA)

Phytoplankton is consumed in the water by zooplankton. Energy is transferred to the next level by organisms that feed on other animals (carnivores) or those that feed on both plants and animals. As depicted in Figure 17, the food chain in the Gulf of Maine supports adult cod as a keystone species with humans, pinnepeds, and birds also at the top of the food chain (Mann and Lazier 1996; Jennings, Kaiser et al. 2001).

The above provides a basic overview of the physical and biological conditions that make the BoF/GoM not only one of the most productive ecosystems in the world, but also one of the most unique. These unique processes also create a situation that leaves the ecosystem in the marine environment vulnerable to a variety of threats. The BoF/GoM is a semi-isolated system. Disturbances in the form of overharvesting, pollution, habitat destruction, nutrient overloads have impacts that do not simply get “flushed away.” Residence time for particles introduced into the Bay of Fundy/Gulf of Maine are estimated to be around one year in the intermediate water layer, and 2 – 4 months in surface waters before exiting over Georges Bank (Personal Corres Townsend).

So pollution deposited in the basin from the land or the atmosphere does not simply disappear. And the warning signs of degradation around the watershed have resonated throughout the research for some time now (Hildebrand and Chircop 2010).

Perhaps Hildebrand, et al. (2002) describes it best:

The growth of human population and concomitant development in the Gulf region have resulted in a series of stresses that impinge upon the regional environment. Although limited data exist to fully assess the trends in environmental quality in the Gulf of Maine, and this ecosystem appears to remain healthy overall, the warning signs of degradation throughout the Gulf are clear in the research results of the last two decades. Tons of raw and partially treated sewage are discharged into the Gulf each day, resulting in several hundred thousands of acres of

productive shellfish habitat being closed to harvesting and serious loss of livelihood. Industrial discharges, urban runoff, and agricultural practices all introduce toxic contaminants and bacteria to marine and estuarine waters on a chronic, sometimes acute basis, with the result that certain fish and shellfish exhibit liver lesions, fin rot and other signs of environmental stress. Health advisories have been issued in several nearshore regions of the Gulf to protect the public from the hazards associated with swimming in polluted waters and eating contaminated seafood. Increased fishing effort has reduced fish stocks to all time lows and populations of some commercially valuable fish species now depend upon an increasingly limited number of year classes, and some may not be reproducing themselves at all. Coastal habitat has been altered and destroyed by land development ever since European settlement several centuries ago and development in the coastal zone continues to encroach on environmentally significant marine wetlands. The right whale, piping plover and other species of wildlife are endangered or declining, and accidental spills of oil and other toxic material place additional stresses upon the Gulf environment (Hildebrand, Pebbles et al. 2002, 424)

Unfortunately, with so much literature published decrying the threats posed to the health and resilience of the Bay of Fundy/Gulf of Maine ecosystem, we still don't seem to 'get it'. There is no need to revisit the disturbing trends described in the previous section. There are indications, however, that current conditions and governance input continue to pursue the failed policies of the past. In 2004, for instance, the Gulf of Maine Council on the Marine Environment identified sewage, nutrients, and mercury as the three contaminant problems of greatest concern to the region (Pesch and Wells 2004).

Sewage remains an issue and contributes to bacterial contamination, nutrient loading, and, even with secondary treatment, chemicals that are endocrine disruptors, persistent organics, and pharmaceuticals. Yet in New Brunswick's largest urban area, Saint John, only 58% of the population's sewage is treated – the remainder discharged raw into the Bay of Fundy. The systems of many smaller communities are in need

upgrading. In Nova Scotia there are still towns that discharge untreated sewage. In the U.S., most communities have at least secondary treatment. The exception is Portsmouth, New Hampshire, which historically has had a waiver allowing them to discharge sewage with only primary treatment (Thompson 2010).

Mercury is still likely the heavy metal of most concern because of its ubiquitous presence in the regional ecosystem and its tendency to bioaccumulate. Mercury enters the ecosystem largely through atmospheric deposition from combustion-related sources, including utility and non-utility fuel combustion (Pesch and Wells 2004). Even if there is limited information on the contaminant levels in the Gulf of Maine, other indicators exist that tell us that there may be problems. One indicator is the number of current fish consumption advisories in the United States due to bioaccumulative pollutants contained in the fish we eat. New Hampshire has 9 current fish advisories, Maine 20 and Massachusetts 122. The advisories apply to marine fishes as well as to fishes from all lakes and streams in the region. The 2002 EPA advisories for five primary bioaccumulative contaminants nationwide showed disturbing trends:

- Mercury = 2,140 advisories in 45 states active in 2002 (up 11% from 2001, up 138% from 1993)
- PCBs = 813 advisories active in 2002 in 38 states (up 6% from 2001, up 155% from 1993)
- Chlordane = 97 advisories active in 2002 (down from 99 advisories in 2001)
- Dioxins = 74 advisories active in 2002 (down 2 from 2001)
- DDT and metabolites = 48 advisories active in 2002 (up 2 from 2001)  
(EPA 2002)

The Gulf of Maine Council, or those who participate in the GOMC, has clearly sounded alarms over the threats posed by sewage, nutrients, and mercury. There are

additional threats posed by the overharvesting of marine resources that, for reasons discussed before, are not able to be addressed by the GOMC. The latest data shows that cod, a keystone species in the regional ecosystem, is overfished and that overfishing is continuing. By law, when a stock is overfished and overfishing persists, there is an obligation for the relevant regional fishery management council to take immediate action (MSFCMA 1996). As we know from the discussion in the Trends section of this study, the NMFS has determined that their population estimates from prior years were overly optimistic and that cod populations are now at new lows. Quoting from the report:

- Currently, the Gulf of Maine cod stock appears to be at a very low biomass, which will likely affect harvests of other groundfish stocks from the nearshore Gulf of Maine.
- Management measures have not yet been formulated, but could include reductions in other fishing opportunities, including recreational catches.
- NOAA is taking immediate and responsible steps now to work with fishery leaders, scientists, and managers in the Northeast to make sure the assessment results are understood and responded to as quickly and effectively as possible

#### Preliminary Results

- Stock is overfished and overfishing is occurring
- Rebuilding by 2014 is not possible; under the best conditions it could get there by around 2018 but under worst, it will be later than 2020.
- From 2007 onward, recruitment (the number of fish born each year) has been below the long- term (1982-2010) average.
- There are few fish older than age 9, in a stock with potential lifespan of roughly 20 years
- Fish weights-at-age in recent years are generally lower for older fish (ages>5) than those in the early 2000-period.

- Recreational catches (both landings and discards) have increased substantially over the last 15 years. Over the past ten years recreational catches have exceeded 30% of the total catch of Gulf of Maine cod.
- As stock abundance has decreased over time, the distribution of the stock has contracted to a much smaller area compared to its distribution in the 1970s.
- Similarly, the fishery has also undergone a general contraction over the past twenty years and is now operating primarily in the western Gulf of Maine in the same area now occupied by the contracted stock. Because of this contraction, catch per unit effort in the fishery has remained high, despite a large decline in overall stock abundance. (NMFS 2011, 1).

Thus the most recent data from NMFS tells us that their prior estimates of cod populations were, frankly, wrong. Cod stock abundance is precariously low and the distribution of cod has contracted into the western Gulf of Maine. Decades of management by NMFS and the NEFMC have done this fishery few favors.

It should be clear by now that conditions in the BoF/GoM ecosystem are threatened from a number of directions. But an examination of conditions must not be limited to the natural physical and biological processes. We have discussed in these last few sections some of the most significant physical and natural processes in the region, their susceptibility to further deterioration, and presented some of the more relevant law and policy that have attempted to control and alter the behavior of humans toward their environment. It is important, however, to briefly examine the more general socioeconomic situation extant in the Gulf.

We have discussed the contaminants and pollutants that infect the region. There are also ample sources that can give a better history than I can about the boom and bust nature of the fisheries in the Bay of Fundy and the Gulf of Maine. Numerous books and articles detail the environmental tragedies and administrative incompetence that typify



overfishing and the collapse of one stock after another (Harris 1999; Dobbs 2000; See, e.g. ; Hanna, Blough et al. 2000). The fact remains that our regulatory system has still not figured out how to deal with overcapacity – or too many boats chasing too few fish. It is not surprising that the hands of our government regulators are tied not only with jurisdictional limitations but their ability to reduce fleet size is hampered by political pressure:

**Q:** Okay. Your goal is sustainability. What would have to change from a governance standpoint to make this a manageable, achievable goal?

**A:** I think one of the hardest things for the Council and government to deal with is the issue of capacity. It's very difficult, and with political pressure, to say "okay, we have 1400 boats fishing and there's only room for 400." There's a certain aspect of social engineering, a certain aspect of designing how many permits each state gets, and this and that. The Council knows it has to reduce capacity. There have been a number of plans that have gone through in terms of buy-backs. The industry had a buy-back program. The goal of the program, including the goal of the Council, is to maintain the general diversity and make-up of the fleet. So same percentages, same numbers of owner-operator boats, that's always been the goal. Some people fish offshore for the day, some for a week. You have inshore boats, draggers, gill netters, hook boats. Some boats need 40 days, some need 80, some say they just want 10 days, that's all. But none of them can have what they want. There's just not enough for all these boats who just want ten days so that they can supplement their catch. They just want 10 days. So capacity is just a huge issue. In fact, there's a number of things we do that in my opinion we should be addressing capacity first. Once you get it down to a manageable number then you don't have all the pressure to be flexible and be easy on them. That's a huge reason why things in the past didn't work very well, because we had open capacity and the amount of pressure on the council, on the agency, the National Marine Fisheries Service, on the politicians. The amount of pressure from this huge group was just too much to put in there what was needed. You've got to get the numbers down to manageable numbers by matching the sustainable harvest with the capacity of the fleet to catch them. (US Federal Employee 3)

So our conditions analysis must include the very strong influence of special interests and the politicians that promote them.

But enough about the fish; the region has a land-based side and those activities should be examined if only briefly. The fact is that along with our abundant fish, the forests of this watershed have been one of the true sources of wealth. Since the arrival of European settlers in the Bay of Fundy/Gulf of Maine region pushed deep into the material, clearing forests for farms and harnessing the power and energy of swift rivers to mill old-growth timber. The first lumber boom began in earnest two centuries ago in the heart of the region. Between 1840 – 1880 thousands of lumber schooners sailed to the head tides of the Penobscot, the Merrimack, the Androscoggin, and many others to load the logs that had been driven downstream from the far reaches of the watershed. Scores of lumber mills ringed the basin producing clapboards, boards, and timbers. To facilitate the transportation of logs the ecosystem was essentially “remodeled.” Rivers were straightened, splash dams installed, and ponds and lakes were raised, thus enhancing spring water flows and rendering brooks drivable (Conkling 1995).

There were environmental impacts, of course, that persist to this day. Fish spawning habitats were destroyed, dams blocked fish migration, and heavy accumulations of bark and sawdust were left behind in the streams and estuaries or flushed down rivers to settle in bays and estuaries. Together with sediment from lands where trees had been cleared for lumber or farms caused coastal rivers, bays, and shallow harbors to silt up. Spawning and nursery areas were destroyed. Trout and salmon abandoned many of these streams or failed to reproduce (Pesch and Wells 2004).

The exploitation of forests and land-based resources continued and took a variety of forms. The industrial revolution began to drive the region in the 1790s. Shoe making, clothing, wool and cotton textiles, tanneries, and ultimately pulp and paper were powered first by water and then by steam. As small mercantile towns developed into mill towns, dams were enlarged and more were built. Wood was needed to supply the heat to create the steam. By 1920 the harvesting of Maine's remaining 2 million acres of "virgin forests" were being harvested at a rate 3.5 times faster than replacement. Chemicals, dyes, and other pollutants were dumped into the rivers. These constituents, together with raw sewage from growing mill towns flowed into the receiving waters of the Bay of Fundy and Gulf of Maine. Electrification and better technology enabled mills to flourish and there was seemingly no end to the chemicals and toxic effluent dumped into the rivers and bay. Clear-cutting techniques scarred the landscape of the northern forest (Conkling 1995; Pesch and Wells 2004; CoML 2012).

The conditions that stem from this serial exploitation show no signs of abating. While federal and related state and provincial environmental laws and regulations enacted in the 1970's have had an undeniable positive impact in the form of cleaner air, lakes, and rivers, locally and regionally rapid population growth, coastal development, and increasing user conflicts have degraded natural resources and led to declines in both environmental integrity and general productivity (Ullsten 2003). Historic and on-going human activities in and around the Bay of Fundy/Gulf of Maine watershed and beyond have led to increasing ecosystem alterations in a variety of forms due chiefly to overextraction of marine organisms, invasions of nonindigenous (exotic) species,

chemical pollution, eutrophication, toxic phytoplankton blooms, alteration of physical habitat, and the consequences of global climate change (Steneck 2001).

Thus the coastal areas that provide services necessary for human existence as well as essential habitats for a significant portion of commercially valuable marine species are reeling from the effects of habitat loss, pollution, and overfishing that have reduced populations of coastal fish and other species to historically low levels of abundance and diversity (VanderZwaag 1995; Sutinen, Clay et al. 2000). Further, larger coastal population leads invariably to larger sewage treatment facilities, expanded solid waste landfills, increased recreational use, and other environmental pressures (Cicin-Sain and Knecht 1998). Future conflicts will for sure include new challenges, like competition for and threats posed by ports and increased shipping (Portland, Maine is the largest oil port on the east coast, for instance), aquaculture, energy needs, including wind, tidal, LNG exploration, transportation, and storage, and oil and gas exploration, not to mention continued overharvesting and climate change (CoML 2012).

So for centuries exploitation, and frequently horribly excessive exploitation, of the natural resources in the region have been allowed to continue seemingly unabated. Is this simply another case where "...the same governments have always done only what the public permitted, or pressured, them to do" (Dempsey 2004, 4). So where is the public – the residents of the region who are witnesses to the exploitation or are victimized in some way by it?

The public, those who live and work and play around the Bay of Fundy/Gulf of Maine are, largely, absent. In the previous chapter it was stated that common or public interests only prevail over special interests when the voice of the people collectively

demand that the 'powers that be' rise in the face of pressure from single or special interests to act for the public good. The silence of the public in this region confronted with a legacy of ecosystem plundering is almost deafening. With respect to the damaging logging practices of the 19<sup>th</sup> century described above, Conkling (1995) even seems a bit stunned when he laments:

It is a striking fact that during the logging era almost no voices were raised for retaining any areas of the coast, lakeshores, forests, or mountains in a pristine condition. This was true as well in New Brunswick and Nova Scotia, where extensive forests remain in public ownership even today. Most people of the nineteenth century would have found preservation of virgin forests a strange and even antisocial notion. Progressive people of the first half of the nineteenth century believed the forest was a useful but temporary resource, which would be cleared to make way for farms. As a result of this history, the Gulf of Maine watershed contains only tiny, accidental remnants of forest in a primeval condition, the scarcity of which makes it difficult to gauge the degree to which the biological diversity of the region may have been compromised (Conkling 1995, 179-80).

And today – where is the public? An ecosystem appears to be unraveling around the basin and there is hardly a whisper of protest from those who are most affected. Without an educated and active public movement, what chance is there to overcome the pressures from single or special interests in order to act for the public good?

Recall that our model ecosystem-based approach requires conditions that are iterative with collaborative efforts by scientists and community to gain and share knowledge necessary to determine the conditions that are factors in any negative trends. What we have seen is that collaboration is accomplished chiefly through the Gulf of Maine Council on the Marine Environment. While that forum is apparently a valuable tool for discussion and interaction between agency heads from both Canada and the U.S., it does not appear to impact the decision-making of any of the participating agencies. In

a discussion of the data generated by Gulfwatch, a GOMC backed project that funds the collection and analysis of mussel tissue collected from around the BoF/GoM. It is generally considered a “signature” activity by the Council. But do the results have any impact on decision-making within the agencies that participate in the Council?

It’s a good thing to do together, and we know that knowing the levels of contaminants in sentinel species is a good thing that will inform decision-making. Okay, we’ve been doing it for all of these years, we have great data, we know what the trends are, but we haven’t yet gone that next step to say, okay, how significant? And what do I and others have to do about it. So, that’s our next step and I think sometimes in the Gulf of Maine, we do things because we know that we’ve agreed that they’re the right thing and we have shared interest, but either we haven’t gotten to it yet, or we haven’t had the mindset to make the link into decision-making. Because, I can’t, frankly, John, point to anything, quite frankly, that information generated through the Gulf of Maine process that’s changed decision-making. Maybe that’s unfair to say not anything. I know that actually Gulfwatch data, I think, in New Hampshire is being used for shellfish harvesting area. So, there are some examples, I just don’t have the information to know all of that. But, overall, if we think of Gulfwatch and all the data that we’ve generated and so on these various analytes and contaminants, okay, how significant is it, and do we have to do anything? I don’t know. (Canadian Federal Employee 2).

There is no doubt that the Gulf of Maine Council provides an excellent forum for discussion, but does it represent a true collaboration? Do its activities result in decisions that are implemented through its members? It appears that this is not the case – certainly not because the individuals who are part of the Council aren’t trying. I have observed them in action repeatedly over the years. They are, simply, jurisdictionally bound and are unable to go outside the interests and mandate of their respective agencies. As a result, true collaboration is not possible.

I think, John, it’s hard for the council to be in this decision making, dictating, leading role when everything is so disparate from jurisdiction to

jurisdiction. The Gulf is not managed as a gulf. Not everybody is using the same standards for water quality, for health of the ecosystem, for what's a functioning estuary, to you name it. There isn't a standard there, and I think until you have an agreement on what is acceptable, it's very difficult to have a decision-making process that manages a whole system like that that spreads across three states and two provinces. (US NGO 4)

And what if there is a problem detected by members of the Gulf of Maine Council that is negatively impacting the health and resilience of the Gulf. Will the GOMC act?

Q: Okay, let's assume that there's a suite of indicators and that there's a problem that's been detected, be it contaminants in St. John or contaminants in Portland, and it's brought before the council by a member.

A: You mean by someone outside of New Brunswick, for instance?

Q: What in reality can happen?

A: Decision-making wise, getting back to your original theme on this, honestly, I don't think anything is going to happen. I think it will be an informal kind of thing where it will be brought to the council's attention, and the New Brunswick person sitting at the table is probably already aware of it, and if they aren't they sure will be after that particular council discussion, but I don't think the council is going to do anything itself with it. I think the council is leading, or participating in the process so that it can give that information to those jurisdictions. I don't think it's going to become a Gulf-wide regulatory system. I think that if there's even a breath of that intent it would kill ESIP. I think it's just providing objective information about what's healthy and what's not. And if New Brunswick, for instance, if St. John Harbor isn't meeting that particular measure or standard, then I guess it's still is going to ultimately fall on New Brunswick as to what they're going to do with it. (US NGO 4)

Thus our examination of the natural physical and biological conditions extant in the region tends to indicate that the Bay of Fundy/Gulf of Maine ecosystem is under stress from a variety of sources. Overfishing, chemical pollution, nutrient overloads, shoreland development, habitat destruction, and climate change are all actors in a scenario that can only serve to weaken the resiliency of the ecosystem. Further, the

socioeconomic conditions that we have looked at seem to indicate that there is no one body that has the ability to accumulate data pertinent to these various threats and act to counter the trends. The only entity that provides a forum for discussion among the various responsible government agencies on both sides of the border is locked into a pattern that limits their collaborative efforts mostly to talk, not necessarily action.

In the governance of the Bay of Fundy/Gulf of Maine, the Gulf of Maine Council could conceivably act as the lead or overarching institution with the ability to guide the adaptation of government responsibilities in the region. Although many members indicate that it is not the role that the GOMC was created to play, it has played a similar role in the past. There have been times when members of the Gulf of Maine Council would challenge each other to do a better job with their environmental management functions:

I mean the goals that we've set are pretty ambitious. We do some stuff. We do a lot of stuff. But, I think in terms of our mandate as one of those agencies around the table, who's not a signatory, by the way, they are fully signatory in spirit, we should go back within EC and say, look, coastal habitat in the Gulf of Maine is a real priority, it's shared by lots of others, what we're doing now is contributing toward it, but we've got to double up our investment of money and people and designating more protected areas, etc. *For little brief periods in the Council's history, we had that kind of challenge function*, and where councilors would come to the table and say, we agreed we were going to do more on coastal habitat, so, rep from New Hampshire, what have you done? Uh...we only have twenty miles of coastline, so go away. But, I think that's what's really missing and I think we need to get back at, because it's gotten too nice...The fact is that we all recognize that we need to all work together to achieve our own selfish objectives and those shared goals, but I think we do need to go more aggressively at upping the ante. It's only moral persuasion and/or embarrassment. There's definitely a role for that, but I don't want to necessarily embarrass the Minister of Environment from Nova Scotia, but I want him or her to be challenged to come to the table and say, looking at those goals and objectives, Nova Scotia is going to put in a stronger



sewage management system. We commit to that, investing in it...  
(Canadian Federal Employee 2) (Emphasis added)

As we have seen, however, the overall feeling of the members of the GOMC is that its role is as a forum. There is simply no initiative to play a larger role. Of course, without participation by fishery management it is still questionable whether the Council could play an effective role as an overarching institutional entity.

The conditions examination has also failed to turn up any significant involvement with the public or with communities in order to educate them about the potential threats to the ecosystem. There doesn't appear to be any mechanism to overcome the influence of special interests that seek to use the natural resources of the region for their private gain. All in all, then, it is fair to conclude that the overall conditions in the BoF/GoM are not consistent with the ecosystem-based approach ideal.

Are these conditions likely to be turned around? Is there hope that a new regime can develop that can counter the negative environmental trends and provide a mechanism for the public good to take precedence over special interests? This will be examined in the next section.

Projecting Developments. In our ideal system, reliable knowledge must underpin the projection of developments. If trends and conditions are such that projected developments appear to take a community away from its goals, away from progress toward human dignity, and toward a weakened, less resilient ecosystem, there needs to be a system that will reward those who bring these issues to the attention of policy makers. There also must be a way for policy makers to make adaptive changes in an attempt to reverse negative trends without fear of retribution from a system more concerned with

power and wealth than long-term environmental viability. Strong public and community participation is a requirement for reliable assessment and projection of developments (Table 44).

Table 44 Projecting Developments

Ecosystem-based Approach	BoF/GoM Approach
Through regular public education and outreach, an involved public collaborates with academic institutions, scientists, and policy makers to understand reliable data and project developments.	Public education rare and outreach even more rare. Other than the fisheries, where fishers play active role in development of FMP's, there is little in the way of public collaboration with scientists and policy makers to understand data and project developments.
With the input of knowledgeable public, scientists and policy makers can acknowledge mistakes or policy failures, learn from them, and make adaptive changes, to reverse negative trends without fear of retribution from the governance system.	There is no pool of knowledgeable public due to lack of basin-wide or even community outreach. Adaptive change occurs only after long periods of research of departments and experts. Fear of retribution from public (especially fishers) or from political sources for failed policy is not uncommon.

In Chapter III we learned that projecting developments requires regular public education and outreach, meaning that an involved public collaborates with academic institutions, scientists, and policy makers to understand reliable data and project developments. We have thus far examined the physical and natural conditions that drive the Bay of Fundy/Gulf of Maine region and described the apparent threats to the resilience of the natural processes that combine to furnish the region with valuable goods and services. The trends, we have seen, appear to be trending away from the goals of the various agencies that control activities from sector to sector. Yet in the previous sections of this chapter this study we have failed to turn up any significant consistent involvement

with the public or with communities in order to educate them about the potential threats to the ecosystem. There is always the danger, however, that government agencies will insist that they are in control – that they have the expertise and resources to reverse the trends.

An exchange highlighted by Brunner and Lynch (2010) as part of a discussion about the need to move away from scientific management toward a more adaptive and community-assisted governance regime, might prove helpful. Their example centers on a debate about climate change that took place more than 20 years ago. As they describe it, the exchange began with an editorial Introduction that was written for a September, 1989, single-topic issue of *Scientific American* entitled “Managing Planet Earth.” The Introduction acknowledged that “changes in individual behavior are surely necessary but are not sufficient” responses to climate change. The Introduction went on to emphasize the need to expand the issue:

It is as a global species that we are transforming the planet. It is only as a global species – pooling our knowledge, coordinating our actions and sharing what the planet has to offer – that we have any prospect for managing the planet’s transformation along pathways of sustainable development. Self-conscious, intelligent management of the earth is one of the great challenges facing humanity as it approaches the 21<sup>st</sup> century. (Brunner and Lynch 2010b, 13)

Hendrik Tennekes, the Director of Research for the Royal Netherlands Meteorological Institute picked up on the liberal use of the term ‘management’, and all that it means to the *status quo*, and also took a shot at EPA’s newly launched program “Stabilize the Climate System” in a letter published in *Weather* in 1990:

I am terrified by the hubris, the conceit, the arrogance implied by words like these... Who are we to claim that we can manage the planet? We can't even manage ourselves. Who are we to claim we can run the planetary ecosystem? In an ecosystem no one is boss, virtually by definition. Why are we, with our magnificent brains, so easily seduced by technocratic totalitarianism? (Brunner and Lynch 2010b, 13)

This exchange highlights the message of Chapter III that there is seeming consensus that the way we are managing the human activities that impact the ecosystem is not working. We have discussed Dryzek's explanation that there may simply be too much on the government's agenda – that it no longer has the support, resources, or expertise necessary to take on the more complex problems created with population explosion, global trade, and increasing resource exploitation pressures. This is the “implementation deficit” that saddles government agencies with more work as problems increase and responsibilities expand – all with shrinking economic support (Dryzek 1997). With limited public outreach and education, and no overarching and accountable entity working with scientists, managers, educators, communities, and the public to teach them about the threats and learn from the perspectives of all participants, the chances of overcoming the influence of special interests that seek to use the natural resources of the region for their private gain.

Chapter III, and to some extent Chapter IV, attempt to explain why strong public participation needs more than just lip service. It is in fact an imperative that:

...abounds with allusions to democratic ideals and principles and the good things assumed to result from stakeholder exercise. Implicit throughout is the notion that broad public involvement is the principal route to improved decision making, especially where the risks are controversial and disputed. Outcomes to be expected, it is claimed, include increased trust in experts and decision makers, greater consensus among publics and between science and politics, reductions in conflict and controversy, greater

acceptance of preferred solutions, and increased ease in implementation (Hildebrand 2009, 31).

Given the degradation of the natural environment in the BoF/GoM, and the threats that peck away at it from many directions, our exercise in projecting developments is primarily a search for the development of improved governance process. Governing is not necessarily the exclusive preserve of government; to govern means to influence, shape, regulate, or determine outcomes, and in this sense there are many other agencies and institutions that are involved in governing a social order (Kitthananan 2006).

For purposes of this study, developments in governance must begin to trend toward the goals espoused in the ideal ecosystem-based governance model. More citizen involvement, public participation, and more collaboration involving scientists, policy makers, academic institutions, and the public is a possible way to permit governance to act and for the public to understand the importance of action. It is a device for decision making to trend more toward the public interest. Again, any trend toward greater community involvement should not be a threat to traditional governance. The role of government simply must begin to shift. It doesn't need to disappear or shrink. A reshuffling of government tasks and a greater awareness of the need to cooperate with other societal actors does not render traditional government interventions obsolete. It merely implies a growing awareness, not only of the limitations of traditional public command-and-control as a governing mechanism, but also as responses to societal problems which require broader sets of approaches and instruments (Kooiman 2003; Hildebrand 2009).

There are meaningful collaborative efforts that either exist or at least have been attempted around the region that have included some combination of scientists,

regulators, citizens, and, at times, industry. They should not be discounted. I will discuss some examples of developments from which we can learn.

One organization that promotes collaboration is, of course, the Gulf of Maine Council on the Marine Environment. We have discussed the work of this group previously and will return to it again in future sections so there will be no further discussion of the GOMC in this section.

Another group that provides a forum for collaboration and cooperation in the region is the Bay of Fundy Ecosystem Partnership. Its mission is two-fold:

- Promoting the ecological integrity, vitality, biodiversity and productivity of the Bay of Fundy ecosystem, in support of the social well-being and economic sustainability of its coastal communities
- Facilitating and enhancing communication and co-operation among all citizens interested in understanding, sustainably using and conserving the resources, habitats and ecological processes of the Bay of Fundy (BoFEP 2011).

While much of the proceedings of BoFEP centers on the Bay of Fundy – the 270 kilometre (167 mile) northern extension of the Gulf of Maine, its influence spreads throughout the BoF/GoM region. Membership in BoFEP is open to “...all interested citizens who share the general Vision, including community groups, resource harvesters, scientists, resource managers, coastal zone planners, businesses, government agencies, industries, shipping interests and academic institutions” (BoFEP 2011) (Figure 18).

The Vision of BoFEP is both comprehensive and inclusive:

- Conservation, protection and management of Bay of Fundy resources and their habitats should be ecosystem-based and reflect an holistic understanding of ecosystem structure, processes and interactions.
- Resource development and other coastal zone activities should be based on ecologically sound integrated coastal planning and management.
- Coastal planning and management should be transparent and open to participation by resource users, coastal communities, industries, scientists, governments, managers and all other individuals and groups with interests in the Bay of Fundy ecosystem.
- Effective communication and active co-operation among all citizens with an interest in the Bay of Fundy, and linkages with groups and programs that share similar objectives are vital to this enterprise.

BoFEP also sponsors a biannual Science Proceedings that is generally well-attended by scientists, regulators, watershed groups, and other interested parties from around the BoF/GoM region. I have attended two of these multi-day forums and was impressed by the diversity of the participants. Presentations were by scientists, regulators, and even watershed group representatives. Discussion was promoted. BoFEP also frequently hosts Citizens' Forums with "learning circles" designed to inform diverse groups that include community and other organizations about topics important to the Bay of Fundy ecosystem and publishes an e-magazine called the "Fundy Tidings" as a tool to inform the community (BoFEP 2011).

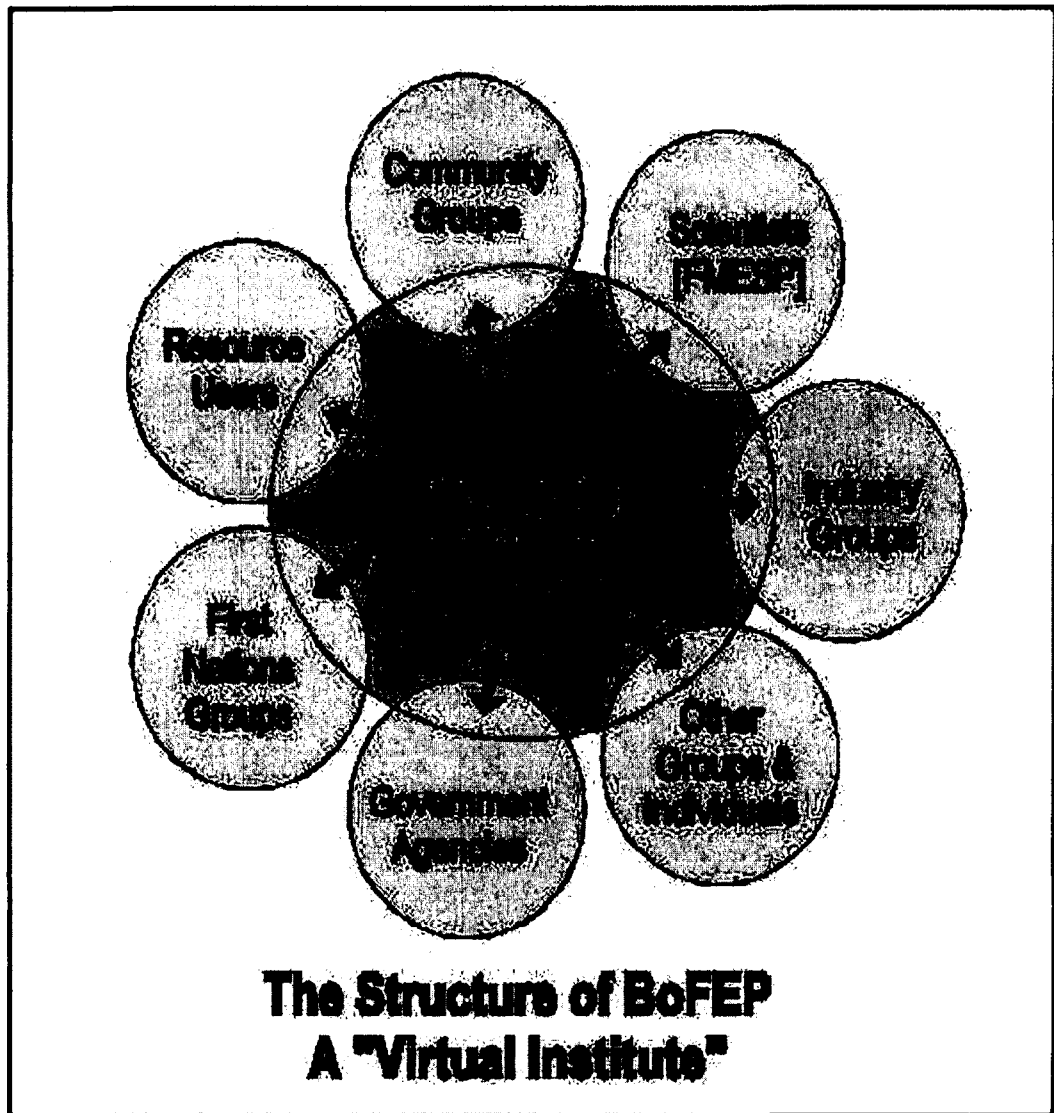


Figure 18 The BoFEP Structure (BoFEP 2011)

BoFEP also partners with DFO and others to promote citizens' groups and watershed organizations around the Bay of Fundy. One example is the Minas Basin Working Group which, as we can see below, has had success and struggles, as related by an individual involved with its formation and operations:



A: So that's a working group of BOFEP, which is the Bay of Fundy Ecosystem Partnership. Basically, that group the Minas Basin working group was formed around 1998, and the ultimate goal of the group has changed over the years, and it's now to develop integrated management plans for the Minas Basin watershed...It's a collaboration of industry to some extent, primarily government and academia, some citizens, and non-government organizations.

Q: And by industry are we chiefly talking fishing?

A: We've been trying, they've been trying to get industry at the table, and some of it's aquaculture, but for obvious reasons it's difficult to get them at meetings, etc.

Q: What about any attempts at pulp and paper, forestry?

A: No. Nothing directly land-based. No.

Q: And the goal of BOFEP would be?

A: The goal? It would be increased communication, increased effectiveness of work with the goal of more comprehensive management in marine resources. And it's well recognized that land use and land activity is a big part of that. Even if you go to the website and not see a lot of land-based references, people at the table are aware that it's a big issue....Shoreline development is really not an issue, and it's...

Q: By agriculture you're talking about erosion, chemical runoff...

A: Yeah, runoff. There are other types of agriculture. Blueberries for example rely a ton on chemicals.

Q: The actors that participate in those activities, do they show up at the table?

A: Nope, they don't. The Minas Basin is primarily, it's touted as being a community group, or community-working group, but it's really not. It's a bunch of government people. There are a couple of citizens that come occasionally, but it's primarily government and academic people at the table. ... I guess it's been a really long process. A couple of years ago we had community workshops and we had four community workshops all around the Minas Basin to identify what the major issues are. If you want I can give you a report. And so from there the idea was that we were going to develop action plans and get the community involved. We asked for volunteers who would be willing to work on this issue with others in the area, and we had hoped to develop action plans for all these issues,

such as water quality came out number one, agriculture came out number two, and then forestry came out I think number three. But we didn't get funding for a full-time coordinator, so it's really a resource deficiency problem. Right now we have lots of things we could do, and lots of direction from the community directly to where they want to see change happen, and it's primarily land use and land-based activities. But, there's just no money there now for a coordinator.

It's interesting, actually. I mean, we've gone really far, but we lost the momentum, and now people are starting to go "...oh why bother because they don't do anything" because we didn't get to take that next step. It's unfortunate. We do have a lot of good background information. We have the socioeconomic overview of the area. We have the community workshop reports, and we have a draft ecosystem overview. The material is there, but there's no crisis, so there's no funding. Primarily, Gulf of Maine/Bay of Fundy funding will go toward Gulf of Maine broader issues, making of the counsel, and all that stuff. (Canadian Federal Employee 3)

So the Minas Basin group appears, at least as of this 2007 interview, to be struggling chiefly because of lack of funding. The point may be that people are at least trying, government/citizen partnerships are being tested and, if there are failures, lessons should be learned.

The region is certainly not without successful efforts at community partnerships. There are at least two examples of community governance initiatives that are impressive. The Saltwater Network is one such example. Saltwater Network was created in 2001 to enable and support community-based management and conservation for the health of our communities and the resources of the Gulf of Maine.

Since the Saltwater Network was created it has helped support two marine support centers and started four other centers. Their goals include: support for capacity-building, working with existing and new civil institutions involved in community capacity-building, helping groups and individuals to access learning opportunities that support

community-based management, provide opportunities for diverse groups and communities around the Gulf of Maine to meet, in order to share their knowledge, skills and awareness about community-based management (Saltwater\_Network). Indeed, the principles articulated by the group reflect a strong bias toward an ecosystem- and community-based approach to governance and public participation (Figure 19).

**Saltwater Network Principles**

The principles provide fundamental guidance to all operations of Saltwater Network. This includes its governance and all actions of the core part of the organization. It is not binding on members except in those aspects of their activities that involve participation in the network.

The principles illuminate one another and should be considered as a whole.

1. The Saltwater Network recognizes that the health of our communities, our economies, and the environment are inextricably linked.
2. The Saltwater Network works to achieve health and quality of community and resources for many generations into the future.
3. The Saltwater Network recognizes, respects, and encourages diversity of people, perspectives, and approaches.
4. The Saltwater Network works to resolve opposing interests and opinions in a creative, cooperative and constructive manner, and to achieve results through dialogue.
5. The Saltwater Network enables its participants to share knowledge, skills and awareness.
6. The Saltwater Network protects privacy and confidentiality of personal information, sensitive geographic information, or information that materially diminishes competitive position.
7. In all the Saltwater Network's activities, collaboration and negotiation will be used in order for authority to be vested in, functions performed at, and resources used by the smallest or most local part that includes all relevant and affected parties.
8. The Saltwater Network values the work involved in community capacity-building by providing funding that matches the organizational capacity, preparedness required for the proposed work, and by drawing on the knowledge and skills within the network whenever possible.
9. The Saltwater Network gives high value and priority to people's unique historical attachment to resources, places and communities.
10. The Saltwater Network recognizes citizen participation as an inherent and necessary good, not merely a means to an end.
11. The Saltwater Network promotes, supports and facilitates collaborations among diverse organizations and institutions, based on mutual respect and clearly articulated principles, practices, and outcomes worked out between all involved parties.
12. The Saltwater Network implements responsive and accountable processes in all its activities including fundraising, grantmaking and fund development.

(Saltwater\_Network)

Figure 19 Saltwater Network Principles

How did the Saltwater Network get started? What role does it play? How did it spread from the Canadian side of the Bay of Fundy to downeast Maine communities? One of those involved in the founding of the network spoke to me about the Network, and its evolution:

A: It's like a community based civil institution. It's not a government thing. It wasn't set up like...it's never really been supportive in this operation...the government. We rent offices for the GIS center. We actually sell maps to DFO now. We do contract work for the government. More or less sustainable with a good deal of support from private foundations. So, that's going along. And while we're doing that, we find out there's another center across the Bay at Eastport that's very similar. At the same time we're starting to talk to people...And they came up...their grand opening was the same day as ours, by chance. We started doing this and people came up from Stonington, and people from NAMA, people going back and forth...the fishermen's forum, and all that. We started to say, we're getting a lot out of this stuff. This is a really interesting approach. That's when we started talking about actually trying to support that kind of work...community based management, and support peer learning. We started with some support again from Campbell to talk about some kind of bioregional community foundation. Everyone we talked to said don't just send checks out. This should be something people are engaged in and supports capacity ability and convening and education. So, we started Salt Water Network...there's a brochure there...and that essentially supports community based management around the Gulf of Maine through grant making, convening, learning opportunities, and some peer...(Canadian NGO 1).

So given the principles of the Saltwater Network, combined with the Marine Resource Centers supported by the Network, there appears to be at least one meaningful community participation effort in existence in the BoF/GoM watershed. There are others that should be noted.

The Atlantic Coastal Action Program (ACAP) is another example of a successful community-based government effort is the. ACAP is a model of community-based ecosystem governance. Began in 1991, Environment Canada initiated ACAP as a way to

empower local communities to take the lead and address their environmental and coastal restoration challenges. Seed money was given the community organizations sufficient to provide them with core funding for their work. Beginning in 1998, though continuing to provide some funding, the groups were conducting education and outreach, establishing key partnerships, and working with busy, industry, and the government collaboratively in scientific work as well as direct community action. The work resulted in substantial improvements in water quality, reduction in toxic substances, habitat restoration, and climate change adaptation measures. There are at least 14 ACAP organizations now in communities throughout Atlantic Canada working toward a collective goal of “developing capacity to take responsibility for their own futures”(Gardner\_Pinfold 2002, i).

There are economic implications to the success of ACAP as well. In 2002 it was determined that the services delivered by the ACAP groups resulted in a cost savings in excess of \$65 million over the period (Gardner\_Pinfold 2002). A later study, again examining the cost to Environment Canada of its annual contributions to the ACAP programs and comparing those costs with the value of the services provided by the ACAP groups for the six-year period between 2001/02 to 2006/07. This second study demonstrated that the 14 ACAP groups had cost Environment Canada 7.0 million dollars over the period and that the value received by EC through the activities of the ACAP organizations was assessed at \$79 million – a net gain of over \$70 million (Gardner\_Pinfold 2008).

Another benefit of community-based groups like ACAP is that they can help to bridge jurisdictional gaps between federal, provincial/state, and local governments:

Municipalities have the responsibility for land use planning. Unincorporated areas are usually the responsibility of the province. It varies from Nova Scotia to New Brunswick. Again it sort of broadens our outlook. We all try to influence each other, I guess, with our various instruments, so through our Atlantic Coastal Action Program, ACAP, where we're enabling these community-based organizations, they are pretty effective in terms of working together. They have municipalities as part of their structure, so they work in terms of, "okay, we know that a lack of sewage treatment or adequate sewage treatment is a real issue let's make sure that we do the science, that we do the public understanding, we build the case for getting sewage treatment." And this is still a real issue here where we have a lot of our major municipalities, and a lot of minor ones, with no sewage treatment. (Canadian Federal Employee 2).

There are other examples of public and community involvement around the Bay of Fundy/Gulf of Maine, but the Saltwater Network and ACAP stand out by virtue of the scope of their success. These initiatives, however, started in the 1980s or early 1990s – are not new. They certainly cannot be said to represent any growing trend toward increased public participation.

We have seen that recent legislation in Canada under its Oceans Act, Plan, and Strategy, call for increased collaboration, public participation, and citizen involvement (1996; 1999). The same emphasis on integration, collaboration, and public participation is called for under the new Ocean Policy in the U.S. (USCOP 2004; 2010). The momentum set by the Canadian government toward integrated coastal management has seemingly flagged (Ricketts and Hildebrand 2011). And, in reality, how much difference did the language of the Oceans Act make to the development of the Saltwater Network:

Q: Along comes the 1996 Oceans Act, which tends to put into statutory form in Canada a lot of the ecosystem-based principles that you have already been working with, basically. What change has it made in your ability to carry on or accomplish any of the functions that you're working on?

A: Well, I think...I don't want to be negative here...I think the positive thing of it is that it was there, and so when we started the marine resource center, I wouldn't say...there may have been other people doing this work...I'm relatively new to it compared to others...I would say that knowing it was there, when we started the marine resource center for example, we said, well at least we're going the same way our federal government is going. At some point they'll turn around and support what we're doing, because we're doing what they're talking about. We're bringing everybody together, we're looking at integrated management.

Q: Here we are we're actually doing it?

A: We're doing the stuff, so at some point they'll turn to us and say let's partner in this. That was...you know it never happened ... the partnering thing never happened, but the fact that it was there probably was an incentive to that kind of community-based civil society. Quite a bit has happened. So, I suppose in an odd way it's been a kind of an incentive just having those words on paper. The fact that you could say here is an act of parliament, you know? It was passed years ago that says this stuff is real...not only is it real, it's the law of the land, although we know the regs were never written and that there was no policy around it or anything, but still it does have weight. But, the actual substance of a commitment to this work hasn't made any difference to our work. We're on our own up here. I mean we're getting funded by Boston foundations to do work that is described in the Ocean's Act. Or Montreal foundations, or whatever, it's not all...and that's fine. We just went ahead and said okay we'll just go ahead, and when the time comes, we know we're going to have to engage with the federal government. And so we sort of said well, we'll just keep building, and at some point they'll sit down with us and say okay let's build this together. But, in the meantime, there's just been no substantial communication... (Canadian NGO 1)

What is clear from the experience of our two community-driven examples is that meaningful public participation and integrated community governance at a local or regional level is possible with determined public involvement and the assistance of funding. Environment Canada saw the possibilities in its partial funding of ACAP – and reaped the rewards. For the Saltwater Network, more toward the marine side of the land/water interface, funding or other support has been difficult to obtain through government or agency sources, but help has come through private foundations and other

non-governmental sources. Regardless of the source, with financial assistance there can be meaningful public participation as part of an ecosystem-based governance regime.

The experience of Saltwater Network and ACAP as community-based groups whose efforts were devoted to public education, outreach, and integrated community management may indicate a developing positive trend. They also, including Minas Basin, raise questions about the willingness or ability of government agencies, or those entities dependent upon government agency funding to fund true citizen participation initiatives.

We have now viewed a lot of information that should put the governance situation in the BoF/GoM region into some context. We now turn to the next and last section of Problem Orientation: the task of Inventing, Evaluating, and Selecting Alternatives.

Inventing, Evaluating, and Selecting Alternatives. As we learned in Chapter III, and again in Chapter IV, this component is the essential real-world method for the implementation of adaptive governance. Governance, and the ability to invent, evaluate, and select alternatives, must be adaptive (Regier and Baskerville 1986; Francis and Regier 1995; Straussfogel and Becker 1996; Costanza, Low et al. 2001; Kjær 2004; Brunner, Steelman et al. 2005; Fiorino 2006; Whiteside 2006; Armitage, Berkes et al. 2007; Steelman 2010; Brunner 2010a; Brunner and Lynch 2010b).

Under an adaptive governance regime, policy choices and interventions are treated as experiments (NRC 2009), relying explicitly on monitoring, evaluating, expanding successful interventions and terminating failed policies instead of expert-driven planning that relies primarily on science-based technology rather than trial and



error (Francis 1993; Costanza, Low et al. 2001; Gunderson 2003; Brunner, Steelman et al. 2005; Fiorino 2006; Steelman 2010).

The characteristics inherent in this broad function are scattered throughout and nested within the components of the framework. Rather than risk excessive redundancy by setting forth the basics of adaptive management in a separate table, we will, as in Chapter IV, move on to the Social and Decision processes where the broad public participation, rapid feedback, reliable intelligence, transparent promotion, and appropriate value trade-offs capable of creating a process capable of coping with multiple, complex systems may be found.

### **Social Process**

In this section the social process extant in the BoF/GoM region is explored. This chapter is rather front-end loaded and much of the story has been set forth in the Problem Orientation section. I will make every effort to avoid unnecessary repetition of issues and items that have been set forth above. I should reiterate that this study is an attempt by one person to sketch a high altitude view of the social participants in the governance process in the Bay of Fundy/Gulf of Maine.

It is again important to be reminded that in the social process we must be cognizant that every participant in the use of resource services and every player with a potential say in the governance of the human activities that impact the ecosystem employs strategies in order to pursue particular values and/or outcomes. People tend to improve their well-being by acting in ways that they perceive will leave them better off than if they had acted otherwise and therefore engage in an interplay of human value trade-offs. Generally no amount of “cold, hard facts” collected by “neutral objective”

scientists, no amount of “education,” or “transparency” can completely neutralize basic inherent value differences or perceptions among people. Certainly, however, this realization should not take away from the fact that there are common interests and the need to attempt to clarify and secure them (Lasswell 1971; Clark, Willard et al. 2000; Clark 2002). To the degree possible we will now turn to an examination of the participants in the Bay of Fundy/Gulf of Maine governance regime.

Participants. As a reminder of the participant characteristics in ideal ecosystem management regime, discussed in Chapter III, there is an expectation or at least the opportunity for meaningful participation and input of a broad segment of the regulated population in decision making processes (Costanza, Norton et al. 1992; Pauly and Maclean 2003). Significant, meaningful public participation is required (Becker 1993; Francis 1993; Francis and Regier 1995; Cortner and Moote 1999; Clark 2002; Jackson 2005; Fiorino 2006; Folke, Lowell Pritchard et al. 2007). Participation must be open to almost any person or group with a significant interest in the issue (Becker 1993; Kjær 2004; Brunner, Steelman et al. 2005; Jackson 2005; Brunner and Lynch 2010b).

Regulatory agencies must participate in coordinated and integrated fashion and allow softer local and regional input into governance (Regier and Baskerville 1986; Berkes, Colding et al. 2003; Folke, Lowell Pritchard et al. 2007). Citizen involvement and partnership designed to build “civic science” is needed, not public information programs to inform passively (Gunderson, Holling et al. 1995). Better governance and enhanced accountability can come through grass roots ecosystem management i.e. the ongoing, collaborative governance arrangement in which inclusive coalitions of the unlike (citizens, government regulators, small businesses, environmentalists, commodity

interests, and others) come together to resolve policy problems affecting the environment, economy, and communities of a particular place (Brunner, Colburn et al. 2002; Weber 2003; Brunner, Steelman et al. 2005; Walker and Salt 2006; Clark 2008; Steelman 2010) (See Table 45).

Table 45 Participants

<b>Ecosystem-based Approach</b>	<b>BoF/GoM Approach</b>
<p>Significant, meaningful public participation is required. The expectation is for significant meaningful participation and input of a broad segment of the affected population in decision making processes. Participation must be open to almost any person or group with a significant interest in the issue. Active outreach to develop citizen involvement and partnerships and build “civic science” base</p>	<p>This is largely a region of top-down, traditional government. That said, there are some organizations that provide for collaboration and public input. GOMC provides forum for agency collaboration, but membership open only to designated agencies. BoFEP has biannual basin-wide programs supplemented by other outreach, educational, and scientific forums. Other citizen groups have managed to develop, some with more success than others. Few examples of true citizen/government partnerships designed to build an educated public base.</p>
<p>Regulatory agencies must participate in coordinated and integrated fashion and allow softer local and regional input into governance.</p>	<p>There are few discernible examples of regulatory agencies participating in softer local and regional governance efforts. Compliance is generally still enforced through formal enforcement and litigation. ACAP and the Saltwater Network are two notable exceptions.</p>

Through personal observation and participation, it is my view that there are few opportunities for meaningful public participation in the governance regime in the Bay of Fundy/Gulf of Maine. In the United States the regulation of activities that impact the environment in the region is left to traditional top-down regulation by federal and state officials that use the threat of enforcement action in order to induce compliance with applicable laws and regulations.

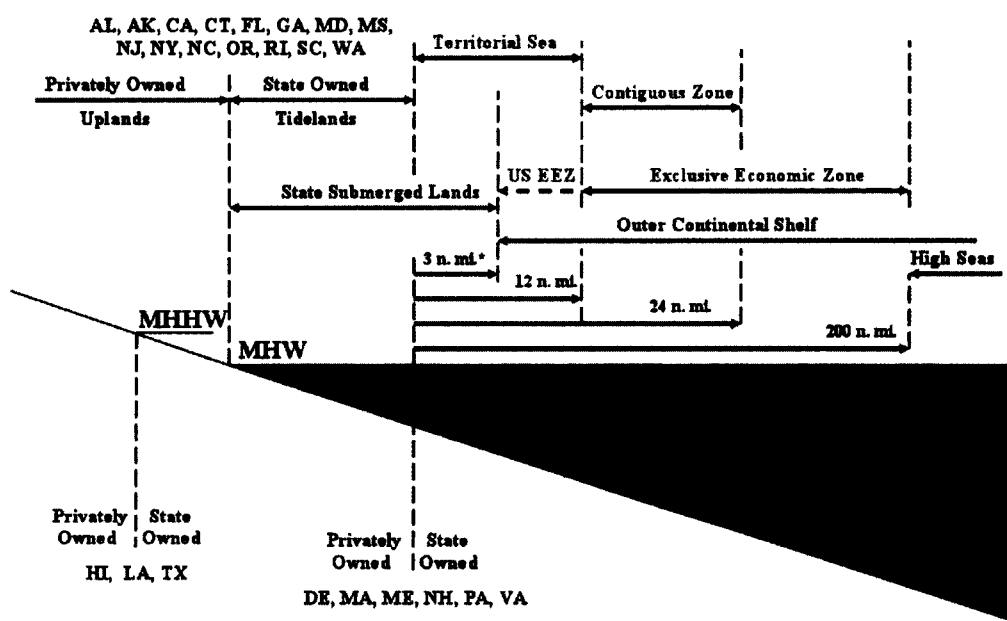


Figure 20 U.S. Maritime Boundaries (NOAA)

With some key variations that will be highlighted in the section on the Decision Process devoted to prescriptions, this appears to be relatively similar to the Canadian experience. So fragmentation of government jurisdictions is the name of the game in the BoF/GoM watershed.

Figure 20 details the meticulous lines drawn in the sea by U.S. law. In brief, the U.S. absolute sovereignty over its territorial land extends to its internal waters and territorial sea, including the airspace above and the seabed below. The contiguous zone extends to 24 nautical miles. In this zone the U.S. allows the boarding of foreign flag vessels. Finally, the Exclusive Economic Zone (EEZ) was established by presidential proclamation for a variety of purposes, including the protection of U.S. fish stocks and the extension of U.S. sovereign rights for the purpose of exploring, exploiting, and managing natural resources in the seabed and subsoil (NOAA 2012).

U.S. agencies dealing in the coastal margin have very definite geographic lines within which to stay. The New England Fishery Management Council, for example, knows precisely where they have jurisdiction to regulate U.S. fishing efforts (MSFCMA 1996):

Q: NEFMC essentially has jurisdiction over federal fisheries?

A: Federal fisheries 3 to 200 miles from the coast. We manage species throughout their range, so we can manage monk fish from Maine to North Carolina. We can manage red crab from Maine to North Carolina and we do. Primarily the voting members are from New England, from Connecticut to Maine. We don't have a federal region like NMFS does. We manage throughout the range.

Q: The fisheries that are regulated are in federal waters. If I'm in state waters I don't need to worry about your regulations?

A: If you're completely in state waters and only have a state permit you're not regulated by the Council or the federal government. If you fish in state waters and have a state permit to fish in state waters and have a federal permit as well for that same species, then you are bound by the federal permit and usually, well all the time, the federal laws are more stringent than the state rules. So if you have a federal permit you must abide by the more stringent federal permit. That has created problems over the years because fishermen are very smart and they find loopholes. So what they do is they forfeit their federal permit for a certain period or don't renew it for a certain period, fish under their state permit, fish their quota in state waters, then apply for their federal permit, because it's a yearly federal permit, don't ask me why. So they've been able to get away from the federal law because they forfeit their federal permit then get it back again.

Q: Does that happen even in groundfish?

A: Especially in groundfish. And we don't allocate certain amounts of fish to state fisheries. So that they have open access to groundfish. Massachusetts, for instance, to my knowledge has an open access program. You can still get a permit to catch cod in state waters.

Q: So you can take your 200 pounds or whatever in federal waters...

A: You can take I think it's 800 pounds of Gulf of Maine cod in federal waters. When you're done fishing your days, you forfeit your permit you can go fish the same cod stock under the state permit, because you forfeited your federal. That was going on for years until I sent a letter to the state directors and asked them to stop this because in Massachusetts, for instance, while we were going down on federal cod landings, we found out state landings of cod were going up during the same period three and four fold. So we put an end to that. I wrote some letters and Maine came down very hard on their partner in Massachusetts because none of the other states are going to have the phenomenon where the cod would go in shore like they do in Massachusetts state waters. And as soon as they came in they would be pounced upon. It was mostly the Gloucester fleet and we had public hearings all up and down the coast for two or three years and finally they put in some closed areas and NMFS has worked over the last couple of years with state folks to address the loopholes in the permitting.

That whole thing that we just talked about in my opinion shows how there can be difficulties managing fish, state waters only 0-3 miles, then having a different governance policy system 3 – 200. There are problems associated with that. There are problems now, and they're only going to get worse, as we start regulating recreational fishing. I see in the future huge problems with recreational fishing, trying to get that under control, and huge problems with state fisheries that are under different governance. There laws are not near as strict as the federal laws for rebuilding. And that's going to create problems.

Q: But the stocks are related?

A: The same stock. (US Federal Employee 3)

From the perspective of a fisheries manager in a U.S. state marine resource agency, however, the 3 mile jurisdictional rule may have some exceptions:

Q: It seems when we talk about the United States, or even your jurisdiction, we're talking about the zone between the low water mark and three-miles out. Do you have any authority over anything on the land side of that land/water interface?

A: Limited authority over some anadromous fish species. And then when we go beyond three miles because Maine fishermen are bound by state law regarding where they fish we have jurisdiction beyond three miles.

Q: Say that again?

A: Maine fishermen are bound by state law regardless where they fish. So if they're fishing in federal waters they're bound by state laws still. And that came up most recently last week in the context of dragger fishermen from Maine landing drag-caught lobsters in Massachusetts.

Q: I read about that. Now does it make any difference where they land the catch?

A: No. Technically if they landed a load of lobsters in Brazil they'd be bound by the conditions of Maine state law. (U.S. State Employee 2)

The boundaries that are drawn so meticulously in the US impact more than fishery management. NOAA was established as a result of the 1969 Stratton Commission. Although it was originally envisioned as a cabinet-level twin to NASA, it was ultimately placed in the Department of Transportation by then-President Richard Nixon. NOAA's broad mandate includes a number of marginally connected divisions, including the National Weather Service, federal marine science, marine sanctuaries, fisheries managements (beyond state waters) and coastal management (through state agencies with approved coastal management plans).

For purposes pertinent to the ecosystem-based management of the coastal margin, NOAA's most recent assessment sets forth a mission statement: "To understand and predict changes in the Earth's environment and conserve and manage coastal and marine resources to meet our nation's economic, social and environmental needs" (NOAA 2004). Among NOAA's five expressed goals is to "Protect, Restore, and Manage the Use of Coastal and Ocean Resources through an Ecosystem Approach to Management" (NOAA 2004).

NOAA is involved at various levels in the BoF/GoM region assisting states on coastal issues and with issues related to consistency of state regulation with federal laws, but generally only within the federal and state-defined coastal margin:

**Q:** In these roles or capacities, do you directly play a role in any of the activities that impact the ecosystem?

**A:** No I do not. I move money to states. The state coastal programs are the regulatory arm here. Neither OCRM nor CSC has any regulatory authority to actually make changes on the ground. We partner with the states and enable them to do that.

So the states want to review an activity happening in state waters or just outside of state waters where they've designated that they have a real interest in the stewardship of those resources they have the ability to block or challenge any kind of activity, whether it's a federal or non-federal activity, in those areas. Federal consistency is the teeth of the Coastal Zone Management Act.

**Q:** The geographical region that you work within is pretty much confined to the coastal region?

**A:** Correct. The state waters are 0-3 miles so in terms of my relationship with the states, that's the geography.

**Q:** What about inland? Are there different jurisdictional lines in different states?

**A:** Yes there are. Coastal boundaries were set in place when the programs were approved and they can be changed over time. For instance, New Hampshire just expanded their coastal boundary a couple of years ago to include Great Bay and include some of the tributaries of major fresh water flow coming in – so it's more of a watershed approach. Do all these coastal program boundaries go up to the top of the watershed? No. Most of them, if you look at a national map, tend to stay closer to the coastal county line so they'll include all of the coastal counties and maybe a county inlet. But that's usually the extent of it so they do not go up to the top of the watershed. That is not part of the decision making process in terms of setting the boundary and perhaps it should be. (U.S. Federal Employee 4)



NOAA is also concerned with another important participant in the governance regime in the BoF/GoM watershed: municipalities and local governance. The following exchange with an employee knowledgeable of NOAA coastal activities tends to show that the geographical limitations imposed upon NOAA's Ocean Coastal Service may also be an impediment to the assistance of watershed-wide community support:

**Q:** And yet the states are often handcuffed somewhat by local governments when it comes to land use, zoning and these kinds of non-point pollution factors?

**A:** Yes. Particularly in this region in the Gulf of Maine and in New England in general a lot of states operate by home rule and the state/local relationship becomes dicey in terms of local governments really want to do things their way and a lot of the land use decisions that are setting precedent and are very important in terms of set backs or any kind of mitigation for coastal hazards, sea level rise, or erosion or any of those types of issues are all made at the local level. So NOAA then is two steps removed from that real decision making and it's really up to us to give the state the capacity to then work with the local government on making real change whether it's helping with their master plan or providing technical to local folks through protocols or model ordinances or things that can actually help them on the ground.

**Q:** Can NOAA provide funding to watershed groups that would help mitigate some of that local influence?

**A:** That's actually up to the states. When we give money to the states if they have enough cash to then move some of those funds, like New Hampshire for example, in the past has moved \$100,000 out of the state office to exactly what you're saying – to watershed groups, to regional planning commissions. Then you're really building capacity of watershed groups. But there is a problem in that those funds need to be spent within the coastal zone boundary that's been set and approved by the program. So if you have a watershed group that's way up stream you'd be hard-pressed to actually get that approved. The funds really are meant to be spent within the coastal boundaries. You might be able to get a project approved that's in the next county in if you make a case that non-point source pollution or there's some issue that's heavily influencing the coastal zone and work needs to be done in that region to have an impact on the coastal zone. The sticking point is that we hold a pretty firm line in

terms of NOAA funds being spent within that coastal zone boundary which may not extend up into the watershed. (US Federal Employee 4)

From the above we have learned something about participants like the NEFMC, a state fishery management employee, and NOAA. Through them we learned about municipalities and local governance whose participation in governance in the coastal margin is critical. Simply put, participants have limited authority, fragmented jurisdiction, and often lack funding. We next look at the water quality in the US which, as we learned earlier, is the responsibility of the Environmental Protection Administration (EPA).

The Environmental Protection Agency was created in 1970 during the administration of President Richard Nixon as the product of a groundswell of environmental activism. The EPA administers a variety of environmental laws and regulations. Its overall mission is to protect human health and the environment. Perhaps most relevant to the subject matter of this summary are various commitments that the EPA has made with respect to water quality and watershed management. The EPA has committed to the protection of human health by reducing exposure to contaminants in drinking water (including protecting source waters), in fish and shellfish, and in recreational waters. It has also committed to protecting the quality of rivers, lakes, and streams on a watershed basis and to protect coastal and ocean waters (EPA 2003)<sup>32</sup>. In practice, however, an interview with a federal employee familiar with EPA's coastal efforts in the region, pointed some potential jurisdictional conflicts:

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<sup>32</sup> The EPA's obligations under the Clean Water Act and the Clean Air Act are discussed in the Decision Process section of this study.

A: To get back to the jurisdictional point. In a nutshell, you know, we were largely concerned with stuff that's fairly close to shore, near coastal area. Obviously when we have dredging and remediation sites that are in federal waters, we have jurisdiction over those. But, NOAA...I think of NOAA as really more of an ocean agency and EPA as sort of more a coastal...if you had to really make some sort of distinction. But, then you have the Coastal Zone Management Act, and the fact that NOAA administers the Coastal Zone Management program with states. There are definitely areas where...there's probably inefficiencies in there, and I think the Ocean Action plan itself, but a court recommended either merging or that certain programs like the National Estuary Program be moved from EPA to NOAA. We didn't like that recommendation... (US Federal Employee 1)

No discussion of water quality in the U.S. would be complete without mention of the U.S. Army Corps of Engineers. Not actually a branch of the armed services, much of the mission of the U.S. Army Corps of Engineers ("USACE") involves providing engineering, design and construction pertaining to national infrastructure, homeland security, war preparations and combat support. It is included in this analysis because of its statutory mandates related to environmental and water resource matters relating to dredging, wetlands activity permitting, and ecosystem restoration efforts. The Environmental Operating Principles of the USACE provide insight into the agency's emphasis and include the need to achieve environmental sustainability. The principles expressly recognize that an environment maintained in a healthy, diverse and sustainable condition is necessary to support life and stresses the need to assess and mitigate cumulative impacts to the environment (USACE 2002). Further, Section 306 of the Water Resource Development Act 1990 made environmental restoration one of the

primary missions of the Corps of Engineers, permitting the Corps to undertake studies and build projects which restore habitat.<sup>33</sup>

The BoF/GoM watershed extends upland from the coastal margin. There is no longer any debate that land based activities have serious impacts on the coastal and marine ecosystem. The USFWS is an agency within the U.S. Department of Interior. Its mission is to work "...with others to preserve, protect and enhance fish, wildlife and plants and their habitats for the continuing benefit of the American people" (USFWS 2000). To help with its mission the USFWS has adopted an ecosystem approach to the management. It describes its ecosystem approach as comprehensive and based on all of the biological resources within a watershed. Consistent with this approach, its field offices have been geographically aligned to conform to watershed boundaries.<sup>34</sup> It also provides additional services and data including the National Wetlands Inventory.<sup>35</sup> Further, the USFWS is involved with enforcement, implementation and conservation on a number of fronts pertinent to the Gulf of Maine region.

The Coastal Program, for example, focuses the USFWS efforts in bays, estuaries and coastal regions of the United States. The purpose of the Coastal Program is to conserve fish and wildlife and their habitats in order to support healthy coastal ecosystems. The program is guided by 4 explicit goals: (1) Serve coastal communities by providing assessment and planning tools to identify priority habitats that should be protected and restored; (2) Conserve pristine coastal habitats through support of locally-

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<sup>33</sup> 33 USC § 2316; See also Appendix A.

<sup>34</sup> <http://www.fws.gov/ecosystems/>

<sup>35</sup> <http://wetlands.fws.gov/statusandtrends.htm>

initiated conservation efforts; (3) Restore degraded coastal wetland, upland, and stream habitats by working with partners to implement on-the-ground projects, and (4) Focus resources through conservation alliances that leverage the financial and technical resources of our partners and multiply the impact of the taxpayer's dollar.<sup>36</sup> The Coastal Program currently provides funding to 21 high-priority coastal ecosystems including the Gulf of Maine.<sup>37</sup>

Finally, at least at the U.S. federal level, the U.S. Department of Agriculture is an important participant in regulatory efforts that have the capacity to impact the region's ecosystem. The USDA is the cabinet level department ultimately responsible for the regulation of two important categories of activities that impact the Gulf of Maine ecosystem: agriculture and forestry. The U.S. Forest Service expressly adopted an ecosystem-based approach to forest management in 1992 in conjunction with the United Nations Conference on Environment and Development ("UNCED") Earth Summit in Rio de Janeiro.<sup>38</sup> Since that time USDA agricultural regulation has increasingly supported funding for farmers to adopt practices designed to reduce non-point source run-off of pesticides and fertilizer and encourage open space preservation.

No discussion of participants in the regulatory regime on the US side of the BoF/GoM region would be complete without discussion of the role of the states that are included within the watershed. Frankly, given the federalist nature of the U.S. governmental scheme, states play a critical role in the regulation of the human activities

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<sup>36</sup> <http://www.fws.gov/coastal/CoastalProgram/>

<sup>37</sup> <http://www.fws.gov/northeast/gulfofmaine/>

<sup>38</sup> <http://www.fs.fed.us/global/news/article4.htm>

that impact the Gulf of Maine ecosystem through the exercise of police power authority to protect the health, safety and welfare of their citizens as well as through the delegation of enforcement and implementation responsibilities in accordance with federal legislation. Although an exhaustive review of applicable state statutes and pertinent state agencies is beyond the scope of this report, what follows is a brief survey of some of the agencies and statutes that underpin state regulatory activities for those states that directly border the Gulf of Maine.

Starting with Massachusetts, the Massachusetts Office of Environmental Affairs (“MOEA”) is the umbrella administrative agency responsible for the coordination and oversight of a host of Massachusetts environmental initiatives and agencies. Included within its oversight are the Office of Coastal Zone Management, the Massachusetts Environmental Protection Act, the Division of Conservation Services, the Smart Conservation strategy, the Office of Technical Assistance for Toxic Use Reduction, the Massachusetts Conservation Trust, and others. Set forth below are summaries of a variety of statutes and administrative offices coordinated by the MOEA pertinent to the Gulf of Maine region.<sup>39</sup> MOEA also is charged with authority for the implementation of the Massachusetts Environmental Protection Act (“MEPA”).<sup>40</sup> MEPA requires project proponents file an Environmental Impact Report for projects that meet certain threshold requirements that trigger state agency action. It mandates the gathering of information by project proponents and provides an opportunity for input by the public and other involved agencies and stakeholders.

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<sup>39</sup> <http://www.mass.gov/envir/>

<sup>40</sup> M.G.L. c. 30 ss 61-62H and 301 CMR 11.00

In Massachusetts, the office of Coastal Zone Management administers the Coastal Zone Management Act<sup>41</sup> and for the administration and implementation of its federally approved Coastal Zone Management Plan (“CZMP”). Its mission is “...to balance the impacts of human activity with the protection of coastal and marine resources...”<sup>42</sup> The CZMP articulates policies and permitting procedures affecting marine habitat, water quality, protected areas, public access, energy, ocean resources and coastal growth management in the coastal zone.<sup>43</sup> In addition to assuring that projects comply with the CZMP, the Office of Coastal Zone Management conducts federal consistency reviews to determine whether federal activities undertaken or authorized by the federal government are consistent with the state CZMP.

The Massachusetts Ocean Management Initiative and Task Force was created in recognition of the increasing array of coastal and ocean challenges and conflicts. The Massachusetts Office of Coastal Zone Management became the central coordinator and facilitator of the Ocean Management Initiative. The Initiative was one of the first attempts by a state to develop a comprehensive plan for multiple ocean uses. The initiative created a Management Task Force in June of 2003 and charged them with investigating ocean use trends and existing governance mechanisms; drafting recommendations for administrative, regulatory, and statutory changes; and developing ocean management principles that address complexities of present and future multiple use

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<sup>41</sup> 16 USC §§1451 *et seq.* and 15 CFR 930; M.G.L. c 21A §§ 2, 4 and 301 CMR 20.00

<sup>42</sup> <http://www.mass.gov/czm/>

<sup>43</sup> The Coastal Zone in Massachusetts is that area bounded by the outer limit of the Commonwealth's jurisdiction as established by the United States from time to time; the northern and southern lateral seaward boundaries of the Commonwealth as established by interstate compact, agreement, judicial decision, or as otherwise provided by law; and 100 feet inland of the roads, rail lines, or rights of way delimited in the CZM Coastal Atlas. 301 CMR 21.00; <http://www.mass.gov/czm/frczmregs.htm#5>

planning. The task force conducted public meetings and received input from stakeholders over a 10 month period. The efforts of the task force resulted in the release of its final report and recommendations entitled *Waves of Change: The Massachusetts Ocean Management Task Force Report and Recommendations*. Recommendations of the task force include the strengthening of state agencies to better address environmental, planning, and public trust issues in both state and federal waters; establishing an ecosystem-based protocol to improve management of federal waters; and initiating ocean education and stewardship initiatives.<sup>44</sup> Legislation intended to implement the recommendations of the task force was introduced into the Massachusetts legislature in March, 2005.<sup>45</sup> This effort developed the foundation for ongoing mapping and planning activities and the Oceans Act of 2008, which was signed by Governor Deval Patrick on May 28, 2008. The Act required Massachusetts to develop a comprehensive plan to manage development in state waters. The Massachusetts Ocean Management Plan was released on December 31, 2009.

The Oceans Act of 2008 that resulted from this process specifically directs that the Massachusetts Ocean Management Plan:

- (i) set forth the commonwealth's goals, siting priorities and standards for ensuring effective stewardship of its ocean waters held in trust for the benefit of the public; and
- (ii) adhere to sound management practices, taking into account the existing natural, social, cultural, historic and economic characteristics of the planning areas;
- (iii) preserve and protect the public trust;
- (iv) reflect the importance of the waters of the commonwealth to its citizens who derive livelihoods and recreational benefits from fishing;
- (v) value biodiversity and ecosystem health;
- (vi) identify and protect special, sensitive or unique estuarine and marine life

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<sup>44</sup> [http://www.mass.gov/czm/oceanmanagement/waves\\_of\\_change/index.htm](http://www.mass.gov/czm/oceanmanagement/waves_of_change/index.htm)

<sup>45</sup> <http://www.mass.gov/czm/oceanmanagement/orca/index.htm>



and habitats; (vii) address climate change and sea-level rise; (viii) respect the interdependence of ecosystems; (ix) coordinate uses that include international, federal, state and local jurisdictions; (x) foster sustainable uses that capitalize on economic opportunity without significant detriment to the ecology or natural beauty of the ocean; (xi) preserve and enhance

The Division of Marine Fisheries is the Massachusetts agency charged with a mission to provide benefits to the public by managing "... the Commonwealth's living marine resources and the harvesting of those resources by the commercial and recreational fisheries, while maintaining a diverse number of self-sustaining fish populations at healthy levels of abundance in balance with the ecosystem."<sup>46</sup> The DMF is responsible for the management of living marine, estuarine, and anadromous resources within the waters of the Commonwealth. In doing so, it works closely with NOAA Fisheries, the New England Fisheries Management Council, the Mid-Atlantic Fisheries Management Council, and the Atlantic States Marine Fisheries Commission to craft regulations that create sustainable, healthy fisheries in compliance with applicable Fishery Management Plans.

The Massachusetts Department of Environmental Protection, by virtue of Article XCVII of the Massachusetts Constitution, underpins the constitutional commitment to help guarantee the people's right to "clean air and water", as well as "the natural scenic, historic and aesthetic qualities of the environment."<sup>47</sup> DEP is the state agency responsible for protecting human health and the environment by ensuring clean air and water, the safe management and disposal of solid and hazardous wastes, the timely

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<sup>46</sup> <http://www.mass.gov/dfwele/dmf/information/mission.htm#x>; Massachusetts Marine Fisheries Regulations are codified at 322 CMR; [http://www.mass.gov/dfwele/dmf/commercialfishing/cmr\\_index.htm](http://www.mass.gov/dfwele/dmf/commercialfishing/cmr_index.htm)

<sup>47</sup> Massachusetts Constitution, Article XCVII

cleanup of hazardous waste sites and spills, and the preservation of wetlands and coastal resources.<sup>48</sup> The DEP is headed by a Commissioner with three deputy commissioners (including the Deputy Commissioner for Operations and Programs), a general counsel, and two directors reporting directly to the commissioner. DEP's programs are divided between three programmatic bureaus: The Bureau of Resource Protection, the Bureau of Waste Prevention and the Bureau of Waste Site Cleanup. The responsibility for responsible for identifying critical inland and coastal water resources and devising strategies for protecting and preserving them fall within the Bureau of Resource Protection. Permitting for groundwater discharges, surface water discharges, estuary and watershed programs and other media regulation also fall within the Bureau of Resource Protection. Air and water planning units fall within the Bureau of Waste Prevention.<sup>49</sup> Further, under Massachusetts General Law Chapter 91 the state legislature has charged the Department of Environmental Protection with the responsibility for the protection of the Commonwealth's interests in its harbors, tidelands, and waters and with acting as a steward of the public's interest in the those lands.<sup>50</sup> It is the basis for the Commonwealth's waterways licensing program. It is also designed to protect traditional maritime industries from displacement by modern development.

The Waterways Regulation Program, the section of DEP that oversees Chapter 91, is the primary division charged with implementing this codification of the traditional

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<sup>48</sup> <http://www.mass.gov/dep/about/missionp.htm>

<sup>49</sup> <http://www.mass.gov/dep/about/contacts.htm>

<sup>50</sup> M.G.L.c. 91§ 2; 310 Code Mass. Regs § 9.01 (2) (2000)

"public trust doctrine."<sup>51</sup> The DEP Waterways Regulation Program is intended to protect access to the water's edge for fishing, fowling and navigation, protect navigation rights, protect and promote tidelands as a workplace for commercial fishing, shipping, passenger transportation, boat building and repair, marinas and other activities for which proximity to the water is either essential or highly advantageous, and protect Areas of Critical Environmental Concern, ocean sanctuaries and other ecologically sensitive areas from unnecessary encroachment by fill and structures. Its provisions apply to any project located in, on, over or under tidal waters seaward to the three mile Commonwealth territorial limit. It also applies to filled tidelands, Great Ponds (ponds in excess of 10 acres), many non-tidal rivers and streams. The basic activities subject to Chapter 91 authorization include structures, regardless of size, filling or placement of unconsolidated materials including material placed for purposes of shoreline protection or beach nourishment, dredging of any materials or bottom sediment and sand in any waters of the Commonwealth, any change in use of a structure for a purpose unrelated to the authorized or original use, and any change in the dimensions or demolition/removal of a structure as originally approved.<sup>52</sup>

In Massachusetts, air pollution controls and regulation are the responsibility of the DEP's Air Program Planning Unit using powers delegated to it by the EPA. The program concentrates on controlling ambient emissions of air pollutants, including emissions of toxic compounds, from stationary sources (e.g., industrial) and mobile sources (e.g., automobiles) that contribute to violations of federal ambient air quality standards. In

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<sup>51</sup> At its core, the public trust doctrine stands for the proposition that certain resources are held in trust by the government for the benefit of the public.

<sup>52</sup> <http://www.mass.gov/dep/brp/waterway/about.htm>

addition to controlling the federally CWA priority pollutants and hazardous air pollutants (“HAPS”), additional programs provide some increased levels of regulation and air pollution prevention in Massachusetts,<sup>53</sup> including participation in a Zero Mercury Program in furtherance of the New England Governors and Eastern Canadian Premiers Regional Mercury Action Plan of 1998 (NEG/ECP 1998).<sup>54</sup>

Under the Massachusetts Clean Water Act the responsibility for water pollution control and the prevention, control, and abatement of water pollution rests with the DEP.<sup>55</sup> Pursuant to the EPA’s National Pollutant Discharge Elimination System (NPDES) Program, all point source discharges of pollutants are prohibited unless a NPDES permit is procured. Since Massachusetts is a non-delegated NPDES permit states, all permits are jointly issued by EPA and DEP and are equally and separately enforceable by both agencies. Permits regulate discharges with the goals of: (1) protecting public health and aquatic life, and (2) assuring that every facility treats wastewater.<sup>56</sup> The department’s TMDL strategy contemplates the completion of impaired water classification by 2012, after which an implementation plan allocating allowable pollutant loads by watershed will be developed.<sup>57</sup>

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<sup>53</sup> <http://www.mass.gov/dep/bwp/daqc/files/airtox.htm>

<sup>54</sup> <http://www.mass.gov/dep/bwp/daqc/files/airtox.htm>

<sup>55</sup> M.G.L.c. 21, §§ 27, 53

<sup>56</sup> 40 CFR 122: EPA Administered Permit Programs: National Pollutant Discharge Elimination System; M.G.L. Ch. 21 §. 26-53: Massachusetts Clean Waters Act; 314 CMR 3.00: Massachusetts Surface Water Discharge Permit Program; <http://www.mass.gov/czm/envpermitnpdes.htm>

<sup>57</sup> <http://www.mass.gov/dep/brp/wm/files/tmdlfs.pdf>

The DEP manages wetland issues through its Wetlands Program. The statutes underpinning the program include the Wetlands Protection Act as amended by the Rivers Protection Act.<sup>58</sup> The purposes of the program are the protection of private or public water supply, protection of groundwater, flood control, prevention of storm damage, prevention of pollution, protection of land containing shellfish, protection of wildlife habitat, and protection of fisheries. The Rivers Protection Act establishes a state policy for protecting the natural integrity of the Commonwealth's rivers and to establish open space along rivers. The Act also sets aside funds for the acquisition of lands bordering streams and rivers.

Moving now away from Massachusetts to the state of Maine, we will first examine the institutional arrangements proscribed under the Coastal Zone Management Act (1972). While the Maine Coastal Zone Management Plan received formal federal approval in 1984, the Maine Coastal Program (“MCP”) was established in 1978 as an initial response to the passage of the federal CZMA. The CZMP, together with other coastal and land use programs, are administered through the Maine State Planning Office (“MSPO”), which facilitates a variety of partnerships among state, regional and local agencies. Under the Maine Coastal Program, the MSPO expressly recognizes that although coastal resources must be protected and conserved, residents must be able to thrive economically. The Maine Coastal Program strives to achieve a balance between resource protection and human uses.<sup>59</sup> With a coastal zone that extends for 5,300 miles

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<sup>58</sup> M.G.L. c.131, § 40.

<sup>59</sup> The legislative policy applicable to the Coastal Program is set forth at 18 M.R.S.A. § 1801:  
The Legislature finds that the Maine coast is an asset of immeasurable value to the people of the State and the nation, and there is a state interest in the conservation, beneficial use and effective

and includes municipalities that border the coast, tidal waterways and territorial waters out to the three mile territorial limit the MSPO's Coastal Program undertakes or supports projects that promote sustainable economic development, encourage environmental stewardship and education, conserve and manage marine fisheries, reduce coastal hazards, and improve public access. The Maine State Planning Office is also the state agency designated to conduct federal consistency reviews of federal actions impacting the Maine coastal zone (MSPO 2002). Finally, Maine voters have made their priorities known by voting for bond issues designed to fund the acquisition and protection of land with "exceptional natural or recreational value." Thus among its other duties, the MSPO administers the "Lands for Maine Future" Program, identifying and facilitating the purchase and protection land identified under this program. To date, MSPO has assisted with the purchase of at least 139,000 acres from willing sellers, with an additional 53,500 acres protected through conservation easements.<sup>60</sup>

Maine's Department of Environmental Protection ("MDEP") is the primary agency responsible for protecting and restoring Maine's natural resources and implementing and enforcing environmental laws. Its mission is straight forward: To prevent, abate and control the pollution of the state's air, water and land and to preserve,

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management of the coast's resources; that development of the coastal area is increasing rapidly and that this development poses a significant threat to the resources of the coast and to the traditional livelihoods of its residents; that the United States Congress has recognized the importance of coastal resources through the passage of the United States Coastal Zone Management Act of 1972 and that in 1978 Maine initiated a coastal management program in accordance with this Act which continues to be of high priority; and that there are special needs in the conservation and development of the State's coastal resources that require a statement of legislative policy and intent with respect to state and local actions affecting the Maine coast.  
1985, c. 794, Pt. A, § 11

<sup>60</sup> <http://www.state.me.us/spo/lmf/>

improve and prevent diminution of the natural environment of the State. MDEP is also directed to protect and enhance the public's right to use and enjoy the State's natural resources. Organizationally, three separate bureaus administer the department's environmental programs: Air Quality, Land and Water Quality, and Remediation and Waste Management. All three bureaus report to a Deputy Commissioner who reports to the Commissioner.<sup>61</sup> In addition, the Maine legislature created a 10 member appointed Board of Environmental Protection citizen "to provide informed, independent and timely decisions on the interpretation, administration, and enforcement of the laws relating to environmental protection and to provide for credible, fair, and responsible public participation in Department decisions." The Board shall fulfill its purpose through rulemaking decisions, decisions on selected permit applications, review of the Commissioner's licensing and enforcement actions and recommending changes in the law to the Legislature."<sup>62</sup>

Maine's air quality regulation falls within the jurisdiction of the DEP's Bureau of Air Quality. The mission of the Bureau is to coordinate a statewide program to control present and future sources of air contaminants to assure the continued health, safety and general welfare of the people of Maine, to protect property values, and to protect plant and animal life. To fulfill this mission, the Bureau implements a two-pronged strategy focused on the improvement of air quality in those areas where air quality has degraded and the prevention of deterioration of air quality in areas where the air quality is

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<sup>61</sup> <http://www.maine.gov/dep/overview.htm>

<sup>62</sup> 38 MRSA § 341-B; <http://www.maine.gov/dep/bep/purpose.htm>

acceptable.<sup>63</sup> Maine's Air program was created in response to Federal requirements under subsection 110 of the Clean Air Act and its State Implementation Plan ("SIP") has been approved by the EPA.<sup>64</sup> In addition to the regulation of priority and hazardous air pollutants mandated by the CAA, Maine's SIP also includes other toxic chemicals such as dioxin, furan and PCBs. Maine has also adopted a program to reduce mercury emissions, recognizing the link between mercury exposure and human health and the threat posed by human consumption of mercury-tainted fish and shellfish. In 1998 the Land and Water Council adopted a multidisciplinary approach Mercury Reduction Strategy for Maine that has resulted in an estimated reduction of overall mercury emissions by more than 75% from 1991 levels. Further, Maine participates in the 1998 New England Governors and Eastern Canadian Premiers Mercury Action Plan.<sup>65</sup>

Maine's DEP also manages water quality pursuant to the Natural Resource Protection Act, 39 M.R.S.A. §§ 408 *et seq.* The policy articulated by this 1987 legislation provides:

The Legislature finds and declares that the State's rivers and streams, great ponds, fragile mountain areas, freshwater wetlands, significant wildlife habitat, coastal wetlands and coastal sand dunes systems are resources of state significance. These resources have great scenic beauty and unique characteristics, unsurpassed recreational, cultural, historical and environmental value of present and future benefit to the citizens of the State and that uses are causing the rapid degradation and, in some cases, the destruction of these critical resources, producing significant adverse economic

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<sup>63</sup> 38 M.R.S.A § 581; <http://www.maine.gov/dep/air/overview.htm>

<sup>64</sup> 40 CFR Part 52, Subpart U.; Maine statutes specific to the air program are codified at 38 M.R.S.A. §§581 through 608-A; regulations implementing the program set forth at Chapters 100 – 138 of the Department's Regulations.

<sup>65</sup> <http://www.maine.gov/dep/air/toxics/mercury.htm>



and environmental impacts and threatening the health, safety and general welfare of the citizens of the State...The Legislature further finds and declares that the cumulative effect of frequent minor alterations and occasional major alterations of these resources poses a substantial threat to the environment and economy of the State and its quality of life. 39 M.R.S.A. § 408A

Under the Act a permit is required<sup>66</sup> whenever any “activity” is proposed on or over any protected natural resource or in an area located adjacent to a coastal wetland, great pond, river, stream, wetland or significant wildlife habitat. “Activity” includes dredging, bulldozing, removing or displacing soil or vegetation, as well as the construction, repair or alternation of any permanent structure.<sup>67</sup> Thus the NRPA provides the fundamental statutory protection for Maine’s wetlands, estuaries and other areas of environmental significance. Rules and regulations promulgated by the MEPA and other state agencies provide specific permitting requirements for activities proposed in significant areas.<sup>68</sup>

Maine’s application to administer the National Pollutant Discharge Elimination System Program of the Federal Clean Water Act was approved by the EPA on January 12, 2001. Pursuant to the Waste Discharge Permitting Program a license must be obtained from MDEP for the point source discharge of pollutants to a stream, river, or lake of the state, or to the ocean.<sup>69</sup>

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<sup>66</sup> The MDEP is the permitting authority within the organized territory of the State of Maine. Permits for activities in the unorganized territories, i.e. land not in organized municipalities or townships, are obtained from Maine’s Land Use Regulation Commission (“LURC”).

<sup>67</sup> 39 M.R.S.A. § 408-C

<sup>68</sup> <http://www.maine.gov/dep/blwq/docstand/nrpapage.htm#stat>

<sup>69</sup> 38 M.R.S.A. § 413

Maine has also acted to address the threat posed by invasive species. In 2001 Maine's Legislature adopted An Act to Prevent Infestation of Invasive Aquatic Plants and to Control Other Invasive Species.<sup>70</sup> The Act provided for the establishment of an interagency task force to study the risks and potential responses of invasive species infestation. The resulting Invasive Aquatic Species Program Report was released in 2002. The task force recommendations included the designation of MDEP and the Maine Department of Inland Fisheries to jointly head an intergovernmental effort to educate the public on the existence and threats posed by invasive species, the ways to prevent their introduction and spread, and put in place a largely-volunteer monitoring effort to track the progression of invasive species in the land and coastal regions of the state. Strategies for interagency coordination, monitoring plans, rapid identification and eradication, and other measures for invasive species control are set forth the report (Interagency Task Force 2002).<sup>71</sup>

In recognition of the importance of municipal and local government to the governance of the human activities that impact the environment, in Maine municipal zoning ordinances along the coast must conform to certain minimum requirements determined by the MDEP.<sup>72</sup> Developments that qualify for MDEP-mandated requirements are those that may have a substantial impact upon the environment, including those that occupy more than 20 acres, oil and terminal facilities, and other large

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<sup>70</sup> 12 M.R.S.A. §§ 7791, *et seq.*

<sup>71</sup> Invasive species have also been a focus of the Casco Bay Estuary Partnership and other National Estuary Programs within the Gulf of Maine. A forum sponsored by the CBEP was held in November, 2004 and the threat of marine invasive species has been added to the list of priorities for the CBEP and other programs. <http://www.cascobay.usm.maine.edu/habitat.html#Habitat%20Protection>

<sup>72</sup> 38 M.R.S.A. § 438-A

structures and subdivisions. Also subject to MDEP permitting requirements are projects in shoreland areas subject to zoning and land use controls. Shoreland areas include those areas within 250 feet of the normal high-water line of any great pond, river or saltwater body, and within 250 feet of the upland edge of a coastal wetland.<sup>73</sup>

Finally we come to the manner in which Maine, through its Department of Marine Resources, manages the activities within the state's maritime zone. The purpose of the Maine DMR, as set forth in its enabling legislation, is to conserve and develop marine and estuarine resources; to conduct and sponsor scientific research; to promote and develop the Maine coastal fishing industries; to advise and cooperate with local, state and federal officials concerning activities in coastal waters; and to implement, administer and enforce the laws and regulations necessary for these enumerated purposes, as well as the exercise of all authority conferred by this Part.<sup>74</sup> In the exercise of its functions, the Department is empowered to adopt and enforce fisheries management plans (within the three mile territorial limit) as well as to adopt emergency measures for resource protection when confronted with unusual damage or imminent depletion. It also has jurisdiction to manage and regulate the inshore recreational fishing and aquaculture sectors. Finally, DMR has policy and regulatory responsibilities to prevent the introduction and spread of unwanted marine organisms into Maine waters.<sup>75</sup>

Moving now to our final U.S. state, New Hampshire, we can discuss the participants within that state's jurisdiction. First it should be noted that the vast majority

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<sup>73</sup> 38 M.R.S.A. § 435

<sup>74</sup> 12 M.R.S.A. § 6021;

<sup>75</sup> <http://www.cascobay.usm.maine.edu/invasilaw.html>

of responsibility for statewide environmental policy, regulation and enforcement in New Hampshire has been consolidated within the jurisdiction of the Department of Environmental Services (“DES”) since 1987.<sup>76</sup> Its duties include water quality and supply, shoreland development, recreation, ecological balance, air quality and monitoring, and municipal and industrial waste management. These functions are carried out through the department’s three divisions: Air Resources, Waste Management, and Water. A Senior Leadership Team comprised of the three division directors and two commissioners coordinate policy making and implementation for the department. In addition, a several commissions have been created by statute to advise the departmental directors on matters related to their jurisdiction and to hear appeals of final agency administrative decisions. These include the Air Resources Council, Water Resources Council, Water Council, Waste Management Council, Wetlands Council, and Well Board. The mission of the department is “...to help sustain a high quality of life for all citizens by protecting and restoring the environment and public health in New Hampshire.”<sup>77</sup>

New Hampshire’s coastal zone is comprised of the 17 municipal communities that border on the coast of New Hampshire or its tidal bays, estuaries and rivers. The New Hampshire Coastal Program (“NHCP”) received federal approval under the CZMA in stages, with approval for the current NHCP obtained from the federal ORCM in 2004. The New Hampshire Department of Environment Services (“DES”) has administered the NHCP and federal consistency reviews through the NHCP since 2004 (NHDES 2005).

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<sup>76</sup> RSA 21-O (1987)

<sup>77</sup> <http://des.state.nh.us/alook.htm>

The mission of the New Hampshire Coastal Program includes a reference to intergenerational equity by declaring that NHCP seeks to "balance the preservation of natural resources of the coast with the social and economic needs of this and succeeding generations." To accomplish this mission, the Coastal Program pursues goals that include the prevention and abatement of coastal pollution, fostering community stewardship and awareness of coastal resources, and protection and restoration of coastal natural resources. The NHCP is active in other aspects of coastal land and habitat protection through its participation in NOAA's Coastal and Estuarine Land Conservation Program ("CELCP") NHCP has contracted with The Nature Conservancy to develop a draft Coastal and Estuarine Land Conservation Plan (CELCP). The CELCP will assess and prioritize conservation needs in the Great Bay Watershed.<sup>78</sup> The NHCP is also attempting to qualify for funding to help restore coastal wetlands through the CZMA's Enhancement Program.<sup>79</sup> The New Hampshire Estuaries Project, a program funded by the EPA's National Estuary Program and administered by the University of New Hampshire, plays a vital role in research and planning for the state's coastal estuaries, including Great Bay and Little Bay (NHEP 2003).

With respect to air quality issues, the New Hampshire Department of Environmental Services, Air Resources Division, with guidance from the New Hampshire Air Resources Council, seeks to promote cost-effective, sensible strategies and control measures to address complex and inter-related air quality issues. The issues addressed by the Air Resources Division include ground-level ozone, particulate matter,

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<sup>78</sup> <http://www.des.state.nh.us/Coastal/CoastalEstuarine.html>

<sup>79</sup> CZMA § 309; <http://www.des.state.nh.us/Coastal/Restoration/>

regional haze (visibility), mercury emissions, increasing concentrations of greenhouse gases, acid deposition, and air toxics. Like the other New England states, New Hampshire recognizes that its direct impact is limited since many problems that the states in the Northeast U.S. can only be solved on a regional or national basis. The express considerations set forth for the Air Resources Division include guidance that Actions should be supported by the most recent scientific and health effects data available, while at the same time recognizing that new information will emerge in the future. Many ongoing state, (e.g., NH Comparative Risk Project), regional and national research efforts will provide better scientific data and improved understanding of ways to achieve multiple health and environmental benefits at lower cost. Further, the importance of public education and outreach activities is emphasized "...because they transcend all programs and because the pollution contributions of individual citizen's activities represent an increasing share of air pollution emissions." The DES also recognizes that alternative approaches to the "command and control" approach to regulation are needed to face current issues and to develop solutions that provide better environmental and public health outcomes faster and more cost-effectively.<sup>80</sup> New Hampshire DES has also promulgated rules that recognize the link between mercury emissions and mercury-tainted fish consumption and has joined with Maine, Massachusetts and Canadian Maritime Provinces Maine to participate in the 1998 New England Governors and Eastern Canadian Premiers Mercury Action Plan. The DES has also implemented a

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<sup>80</sup> <http://www.des.state.nh.us/airdiv.htm>

statewide New Hampshire Mercury Reduction Strategy to help reduce more localized mercury releases.<sup>81</sup>

The Water Division of DES, with guidance from the Water Council, the Water Resources Council and the Wetlands Council, is responsible for the variety of programs that draft and implement water quality and waste water regulations, including Safe Drinking Water, wetlands, coastal water issues, groundwater, safe beaches and other programs.<sup>82</sup> The mission of the Water Division is "...to ensure that New Hampshire's lakes and ponds, rivers and streams, coastal waters, groundwater and wetlands are clean and support healthy ecosystems, provide habitats for a diversity of plant and animal life, and support appropriate uses." Water quality standards under the CWA are used to protect the state's surface waters. Accordingly, New Hampshire designates uses for water bodies, such as fishing or swimming; establishes numerical or narrative criteria to protect the designated uses; and an establishes policies intended to maintain water quality that exceeds the criteria.<sup>83</sup> NHDES has recently completed its surface water quality surveys in accordance with the Clean Water Act, including a TMDL inventory (or "303d list").<sup>84</sup> New Hampshire's permitting requirements for the discharge of pollutants into surface and ground water are set forth in its Water Pollution and Waste Water legislation.<sup>85</sup>

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<sup>81</sup> <http://www.des.state.nh.us/nhppp/intro20.pdf>

<sup>82</sup> <http://www.des.state.nh.us/waterdiv.htm>

<sup>83</sup> R.S.A. § 485-A ; <http://www.gencourt.state.nh.us/rsa/html/L/485-A/485-A-8.htm>

<sup>84</sup> <http://www.des.state.nh.us/wmb/swqa/2004/default.asp?go=summary>

<sup>85</sup> R.S.A. § 485 *et seq.*

The management and protection of New Hampshire's rivers are subject to the provisions of the Rivers Management and Protection Act.<sup>86</sup> The act established the River Management and Protection Program ("RMPP") and is administered by the NHDES. Any interested individual or group may nominate a river for inclusion under the RMPP based upon the river's values and outstanding natural or cultural characteristics. If the nomination is accepted the river is deemed a "designated river" by the DES Commissioner the legislature may approve the designation if it finds sufficient local support and important river values. The designation is final upon signature of the governor. Once a river has been designated for protection a management plan must be developed designed to protect the river for future generations. Any such plan is developed and implemented by a volunteer local river advisory committee. Plans generally identify goals and propose actions necessary to protect the designated river. NHDES assists with the development and implementation of the plan and enforces regulations governing quality and quantity of flow in the protected river segments.<sup>87</sup>

Invasive species are the task of the New Hampshire DES Exotic Species Program which coordinates activities associated with the control and management of exotic aquatic plants; as well as activities associated with the implementation of education programs and volunteer plant monitoring programs.

Finally, the New Hampshire Office of Energy and Planning plays a role in planning, land protection and municipal assistance in New Hampshire. Through 1993 the Land Conservation Investment Program acquired over 100,000 acres of land in New

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<sup>86</sup> R.S.A. § 483

<sup>87</sup> See generally: <http://www.des.state.nh.us/rivers/>



Hampshire in partnership with the private Trust for New Hampshire Land. Since the end of its acquisition phase in 1993, the Conservation Land Stewardship Program has been responsible for the monitoring and protection of state-acquired land.<sup>88</sup>

Before we shift gears and move into a description of the participants on the Canadian side of the BoF/GoM watershed, it might be helpful to recall the maritime jurisdiction figure (Figure 20) that defined the various lines drawn in the sea under U.S. law. For reasons that will be explored more closely in the prescription task in the next section on the Decision Process, the governance approach on the Canadian side is a bit less fragmented and more collaborative to a large part due to their failure to draw such tight jurisdictional lines in the Canadian coastal region and territorial seas.

Simply put, there are few firm boundaries to confine agency activity. When questioned, a Canadian federal employee who has been dealing with environmental issues in the Canadian Maritimes for nearly three decades explained the jurisdictional situation along the coastal margin in Canada this way:

Q: Does the [federal agency] jurisdiction stop at the water's edge?

A: We don't know where the jurisdiction stops, quite frankly, in the Canadian coastal zone. [laughter] It's one of those questions we just kind of never resolved. It's unclear. I work with some constitutional lawyers, law of the sea experts, at Dalhousie and they don't even know. It is uncertain. We don't have, as in the U.S., with the states with 3 mile and so on. It's felt, generally, that jurisdiction between federal and provincial jurisdiction is somewhere around the land/water interface. (Canadian Federal Employee 2).

It turns out, however, that this murky jurisdictional grey area may not be such a bad thing:

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<sup>88</sup> RSA 162-C:6; <http://nh.gov/oep/programs/CLSP/index.htm>

A: With the uncertainty of where the line is and where the division of legal mandates and roles and responsibility, and the Canadian way of just avoiding the question, where we've come and the way we've been operating for years is by saying look, do both levels of government have an interest in this coastal area. Yes, absolutely. Will trying to resolve this and say someone wins and someone loses or someone gets A and someone gets B, going be helpful and productive? Not really, because we realize that you need at least both levels of government working together. So in the absence of that clear definition, we say they both have an interest in the near land and the near shore, and so let's just work together.

Q: So...the grey area does actually play a role in...

A: It's been quite helpful; not really forcing us, but instead enabling us or inspiring us to work together.

Q: With no permit needed from federal...

A: Correct. With the uncertainty of where the line is and where the division of legal mandates and roles and responsibility, and the Canadian way of just avoiding the question, where we've come and the way we've been operating for years is by saying look, do both levels of government have an interest in this coastal area. Yes, absolutely. Will trying to resolve this and say someone wins and someone loses or someone gets A and someone gets B, going be helpful and productive? Not really, because we realize that you need at least both levels of government working together. So in the absence of that clear definition, we say they both have an interest in the near land and the near shore, and so let's just work together.

Q: So...the grey area does actually play a role in...

A: It's been quite helpful; not really forcing us, but instead enabling us or inspiring us to work together. (Canadian Federal Employee 2)

From a federal agency perspective in Canada, jurisdictional questions promote cooperation and collaboration between all levels of government. Is the view the same from perspective of a provincial agency?

Q: And when you're talking about the coastal zone, how do you define the coastal zone?

A: That's kind of a "what's the meaning of life" question. You can give it definition almost anywhere along the coastal drainage area, but that would be all of Nova Scotia. That's a challenge we have here is defining what we call our coastal zone. Intuitively you know what a coastal area is. I think everybody does. I think someone would say 60 kilometers inland may not be considered a coastal area where it drains into the ocean, but it is. But, on the other end of it, to the nearest road, which some jurisdictions have as their coastal zone, is not inclusive enough, either. So, that's one of the challenges that we're facing provincially is in defining what we would consider our coastal zone.

Q: Has it been defined either federally or in any legislation....

A: No, and that's a problem with Canada is the jurisdiction issues around the coastal zone. Larry might have touched upon this a little bit but the coastal zone is really poorly defined. We've all agreed to disagree. And a lot of what's interesting is you hear from my colleagues at Intergovernmental Affairs, they're our agency who work directly for the Premier, and their job is to basically deal with Provincial government interactions internal, but more importantly the external related provinces, federal government, other countries. And their issue is that when they do a coastal issue they spend all their time in making sure that the jurisdiction issue doesn't become an issue. Basically, making sure that how things are phrased, how decisions are made, that we don't start going down the path having to deal with that jurisdictional issue.

Anyway, in short, coastal zone management is not defined in Nova Scotia. I think everyone has a personal interpretation of what it is. I've tried not to really nail it down and try to figure it out like to me it's two kilometers inland. I think it shifts depending on issues, whether you're looking at environmental or social or economic.

Q: Just out of curiosity, in your opinion, does that gray area, for instance, that one...definition of coastal zoning...does that tend to force more collaboration between federal, state and local?

A: I don't know. I think it's both. It can force it in the sense that "look, we have to work together because we don't want to deal with that gray issue." But, it also makes collaboration more difficult because on the one hand you have folks saying "well, it's not really defined so I'm not sure it's our jurisdiction, so therefore, why should we be a part of it?" And on the other hand you say, "...well it's not defined and we think it's been more ours than theirs, so why do they want to do work there?" We deal with this federally and provincially. Why are you doing coastal management? That's our coastal land base. That's our stuff. Feds have from the water down. So I don't know if it actually helps. I would

actually say that it in some issues ...it actually makes it more of a struggle. I think, though, I would add as a condition say that there has been a history, at least, of working collaboratively to deal with that issue, in terms of ignoring it or figuring a way to get around it. The feds and the province don't want to deal with that issue. I think it's one of those things that the CNO folks think is a quagmire they don't want to step into. So, there is a history of collaboration. Sable Island is a good example of seabed rights. Instead of getting constitutional or funding, let's just create MOU. Let's just come to a formal agreement that it's Canadian, but we reserve jurisdiction on how to say how it's going to be used, but it's still a national region. So, I think there is some history there, but when it comes down to, that's at a higher level, but when it actually comes down to doing stuff, I think there it becomes more of a hindrance to opportunity. (Canadian Provincial Employee 1)

So from the perspective of at least one provincial employee, jurisdictional vagueness is a mixed bag. Curiously, the difference in governance approaches and the way in which Canada divides its duties between provinces and states, which will be covered in more detail below, appears to mean that there are relatively fewer but better connected participants in the Canadian governance scheme.

In summary fashion we will run through some of the more important Canadian governmental participants. On the Canadian side, the goals for water quality are generally set forth in the Canadian Environmental Protection Act, 1999 (1999) ("CEPA") and are the responsibility of Environment Canada (EC). The goal of CEPA is to contribute to sustainable development - development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. EC also has responsibilities for pollutants under the Fisheries Act (1985) as well as the other duties and responsibilities set forth in the Goal Clarification section above.

With respect to the fisheries regulation in Canada, Fisheries and Oceans Canada is the counterpart to NMFS in Canada - responsible for developing and implementing

policies and programs in support of Canada's scientific, ecological, social and economic interests in oceans and fresh waters. Aside from the Coast Guard, DFO's mission is to integrate environment, economic and social perspectives to ensure Canada's oceans and freshwater resources benefit this generation and those to come.

The Department's guiding legislation includes the Oceans Act (1996), which charges the Minister with leading oceans management and providing coast guard and hydrographic services on behalf of the Government of Canada, and the Fisheries Act (1985), which confers responsibility to the Minister for the management of fisheries, habitat and aquaculture.

Other notable Canadian federal participants include Industry Canada and Natural Resources Canada. Industry Canada offers support for aquaculture in the region and provides support for continued development of oceans mapping. Natural Resources Canada contributes knowledge and expertise related to geoscience for oceans management and other data collection, management and related services relevant to sustainable development through knowledge integration (CoastLands 2005).

Moving away from the federal Canadian agencies, we can begin to sketch out the provincial agencies that participate in the governance regime in the BoF/GoM. The New Brunswick Department of Environment is active in the Gulf of Maine Council and has numerous environmentally-critical responsibilities. Their historic mission, back when it was the Department of Environment and Local Government, was "Healthy Environment – Strong Communities," effectively capturing the integrated nature of a department that combined environmental quality with community well-being (CoastLands 2005). Now that they are simply known as the NB Department of Environment it appears that they are

taking dynamic steps on a local and province-wide to tackle important issues. The division is now responsible for the administration of all community planning and environmental programs. Its main goal is to connect and integrate the decision making process for all of the department's regulatory programs.

Further, the branch has the responsibility to monitor current environmental conditions, provide scientific testing services, and interpret, evaluate, and report on the state of the environment in NB. It also has a responsibility to provide interpreted data, forecasts, and advice to assist in informed decision making throughout the Department of Environment. Recent accomplishments include:

- In 2010-2011 the department implemented its first year under a pesticides management strategy. The Department announced a ban on the sale and use of more than 240 over-the-counter lawn care pesticide products, and the use of all 2,4-D products, on domestic lawns in the province.
- The Province signed a collaborative agreement with all three Atlantic provinces on climate change adaptation strategies. The three-year initiative, called the *Atlantic Climate Adaptation Solutions Project*, is aimed at helping the Atlantic provinces target local issues such as coastal and inland erosion and flooding, and groundwater resource management.
- New Brunswick recorded the largest percentage reduction in greenhouse gas (GHG) emissions in Canada in 2008 according to Environment Canada's 2010 National Inventory Report.
- In January 2011, the Department launched the Neighbourhood Eco-Challenge. The challenge highlighted the importance of families taking action to reduce their

carbon footprint. It was a partnership between the Department of Environment, Efficiency NB, the New Brunswick Lung Association and the New Brunswick Environmental Network.<sup>89</sup>

The New Brunswick Department of Agriculture, Fisheries and Aquaculture is also active in the Gulf of Maine Council. The department plays a pivotal role in the promotion of aquaculture in New Brunswick. It receives applications for non-repayable strategic assistance in the aquaculture and fisheries sector with an objective to enhance the competitiveness and innovation of the fishery, aquaculture and seafood processing sectors in New Brunswick and to create new economic development opportunities.<sup>90</sup> The department also has the objective of fostering the development of the wild marine resources industry in the province. It is a strong advocate of provincial fisheries interests and provides a variety of extension services to help ensure that maximum value is derived from the harvesting of fisheries resources. Simultaneously the department promotes responsible fishing, sustainable development, and habitat and resource enhancement activities.<sup>91</sup>

Moving from New Brunswick to the province of Nova Scotia we will next examine the two provincial agencies that are active in BoF/GoM governance through the Gulf of Maine Council on the Marine Environment. The first participant that we will look at is the Nova Scotia Department of Fisheries and Aquaculture. This department is

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<sup>89</sup> 2010-2011 Annual Report: Department of the Environment. <http://www.gnb.ca/0009/0374/0013/2010-2011.pdf>

<sup>90</sup> [http://www2.gnb.ca/content/gnb/en/services/services\\_renderer.201271.Aquaculture\\_and\\_Fisheries\\_Strategic\\_Assistance\\_Manual.html](http://www2.gnb.ca/content/gnb/en/services/services_renderer.201271.Aquaculture_and_Fisheries_Strategic_Assistance_Manual.html)

<sup>91</sup> [http://www2.gnb.ca/content/gnb/en/services/services\\_renderer.18937.html](http://www2.gnb.ca/content/gnb/en/services/services_renderer.18937.html)

no small player in the activities that it governs that impact the ecosystem. The Nova Scotia Department of Fisheries and Aquaculture provides services to the province's agriculture and fishing sectors — two of the biggest economies in the province's coastal and rural regions. Combined, these industries contribute almost \$2 billion annually to the provincial economy and create over 20,000 jobs. Its mission statement expresses its goal: To foster prosperous and sustainable fisheries, aquaculture and food industries through the delivery of quality public services for the betterment of coastal communities and of all Nova Scotians.<sup>92</sup> The goals were expanded on by someone familiar with the goals of the department as well as the implicit need to work with the federal agencies:

Well, as an agency, ignoring agriculture for now, looking at just fisheries and aquaculture we deal with aquaculture, obviously, which is leasing of aquaculture areas, we do the monitoring, we do promotion. We service the industry. But we also regulate it in a sense. We don't deal with onsite enforcement as such, that's federal, but we work on that issue because we want to see this industry thrive, so we work with industry to make sure we meet its needs. We also process leases for rock weed, so for some marine plants we do that as well. That's it in terms of the marine environment what we do. We also, for inland fisheries, we have MOU's for the federal government over management of inland fisheries. Because the feds retain the rights over all water courses and the fish in them. But we have signed and MOU with them so that we have management responsibilities for inland fisheries. But, when it comes down to our actual management of actual activity, that's it for our part. (Canadian Provincial Employee 1)

The last Canadian provincial department that will be looked at is the Nova Scotia Department of the Environment. Nova Scotia Environment is responsible for delivering effective and efficient regulatory management for the protection of our environment.

With a staff of more than 250 employees working from offices throughout Nova Scotia,

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<sup>92</sup> <http://www.gov.ns.ca/fish/department/mission.shtml>



Almost 70 per cent of the department's resources support inspections and monitoring activities. Among the items the department is responsible for are air quality, drinking water and many other facets of everyday life. Thus the department regulates coal bed methane extraction, natural gas extraction, municipal solid waste landfills and waste transfer stations, storm drainage, municipal groundwater source water facilities, drinking water standards, and a host of other significant responsibilities.<sup>93</sup>

So in Canada, the lack of formal jurisdictional lines may act as a vehicle that forces increased collaboration among the regulatory agencies at all levels. There may be a trend to include the public more in governance issues, but if there is it is not very significant at the moment.

We have now examined most of the government participants that play a role in the governance scheme of the BoF/GoM watershed. Certainly we have already said a great deal about the Gulf of Maine Council on the Marine Environment. They are a critical participant in the governance process with the chief function of providing a forum for ideas to be discussed and debated among the key regulatory agencies in the region. To get a more complete picture of the Gulf of Maine Council, it may prove helpful to show their organizational chart, which gives a good idea of the broad spectrum of their activities (Figure 21).

From Figure 21 it is interesting that there is a “box” for every function necessary to provide guidance and even accountable oversight for nearly every issue threatening the regional ecosystem – except overfishing. The other critical element missing – input by communities and by an active, knowledgeable public. The vast number of

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<sup>93</sup> <http://www.gov.ns.ca/nse/dept/nse.policies.asp>

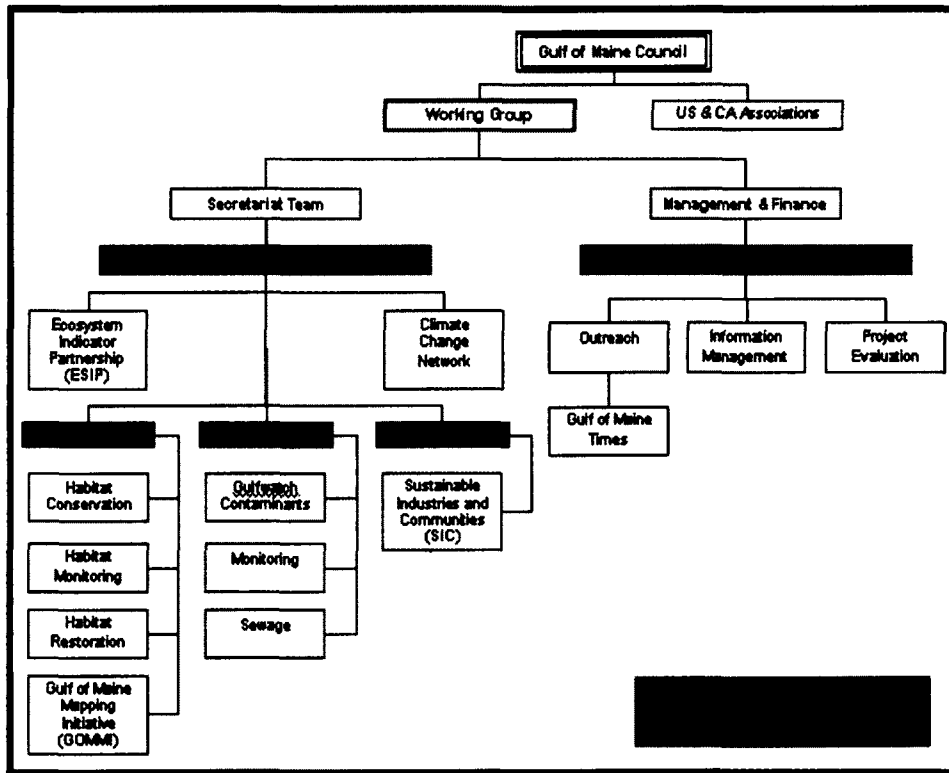


Figure 21 Gulf of Maine Council Organization Chart (GOMC)

responsibilities falls to the Working Group – the mid-level agency management personnel who give of their time to take on tasks for the GOMC, including its committees and subcommittees well in excess of their normal employment.

In the fall of 2005 with funding from the GOMC I conducted a phone survey of Council members. Basically it was my task to obtain the insights of each council member by asking them nine questions drafted by representatives of the Council’s working group (Coon 2005b). Rather than use any more space talking about my impressions of the Council, what follows are quotes from Council members themselves which I believe are representative of their different views of the Council’s role:

- The purpose is to provide a forum primarily for representatives of our state, provincial and federal governments to focus on common resources and issues that affect the common body of water that we all reside on.
- [The purpose is to] [c]oordinate regionally on issues of transboundary importance that we can't attack on our own and to work to improve environmental quality in the region.
- I always go back to the original cooperative agreement that the states and provinces signed. The GoMC is a consortium of state and provincial jurisdictions that creates a dialogue to discuss issues that impact the Gulf of Maine environment and that may resonate because they are of mutual concern between two or more of the jurisdictions. Those issues can be discussed in a forum that is not driven by some of the things as the individual jurisdictions, i.e. it is less encumbered by the issue of the day. It is more prescriptive and broader in its focus on the overall health of the GoMC. In a sense they have their organizational entities able to participate openly without the jurisdictions being put on the spot. The Council has done a good job of getting those ideas out in the open and discussed.
- The main strength is that it provides a forum to discuss issues with counterparts. It also is a priority for my department's leadership. The main weakness is that you have so many different points of view and there are so many complexities. Individual agencies often have their hands tied and they are therefore unable to enter into regional commitments. Another weakness is our public relations program. Only people in the scientific community or agencies of government know what the GOMC is or does. We need to get the word out to a broader constituency.
- I'm not the biggest fan of the Gulf of Maine Council although I'm a member. I do believe the communication function is worthwhile. In addition, because of mission creep I participate to make sure I know what actions the organization is taking.
- It's part of the mandate of the office of the premier to participate. The motivation comes from my love of the ocean and my prior involvement with individuals who are striving to protect the Gulf of Maine. Thus there is a need for good information and the GOMC provides good information and reliable science that we can use in the department.
- From my perspective there is value in getting decision makers together to talk. I don't need a lot of show and tell time, however. I think that we end up with so much structure that we are ignoring the real issues that are impacting the Gulf of Maine ecosystem, for example issues related to

LNG citing. For example we spend so much time revising the action plan that we lose opportunities to provide a forum for leaders to discuss the threats in our Gulf of Maine region and talk about our common interests and how to face challenges. That shouldn't all be public meetings with reporters present. There should be time or a way to have executive sessions to discuss sensitive issues. (Coon 2005b)

The quotes excerpted from the survey help demonstrate the diversity of the views held by Council members and may help explain why there is no apparent movement by the Council to play a bolder role in the governance regime of the BoF/GoM region.

There are, of course, other participants. Industry, for instance, plays a role. Commercial and industrial enterprise is essential to the regional economy and they often rely upon the natural resources of the region either for fuel, or as commodities to be incorporated in a product, or to absorb their wastes. This study only peripherally looked at industrial participants. There is one trend of increased industrial activism and that is in the management of the region's fisheries:

Q: Industry trade groups, what role?

A: I think that you'll find that industry trade groups are becoming more organized lately as they were when I first took over. So when I first took over you might have 400 angry fishermen and not very organized, maybe all saying the same things, or all saying different things. Their message didn't come across too clearly. Now I think you have some very key industry groups like Associated Fisheries of Maine, the Cape Cod Hook Association, the one in Gloucester, the Northeast Seafood Coalition, the Fisheries Survival Fund for scallops, the Herring Alliance. The industry groups are very well organized to the point where you see fewer people at the meetings but you see the representatives paying close attention at every meeting. I've seen that change. (U.S. Federal Employee 3)

Other industry and trade associations play roles, and these will be examined in connection with their impact on the Decision Process.

There are also participants from the world of non-governmental organizations (NGOs). As we have discussed, the NGOs in the region have no umbrella organization and do not appear to work together on the factors that pose threats to the regional ecosystem.

The Nature Conservancy (“TNC”) is an example of an international environmental non-profit that has offices in every state bordering the Gulf of Maine. Their Gulf of Maine program has helped protect thousands of acres of coastal habitat in the Gulf. They have launched an oyster reef restoration project in Wellfleet Bay with a goal of revitalizing populations of the American Oyster. In New Hampshire, TNC is working in the Great Bay to control invasive species like common reed grass. TNC likes to use “market-based” approaches – meaning land conservation through the purchasing of easements, and the leasing or purchasing of resource rights.<sup>94</sup> In addition, TNC has significantly added to the knowledge base of the Gulf of Maine regional community by making available Phase One of its Northwest Atlantic Ecoregional Assessment. The Ecoregional Assessment is a survey and compilation of literature and data relevant to the physical and biological components of the ecosystem (Green, Anderson et al. 2010).

The Conservation Law Foundation works in all states as well. Its Mission is stated as follows:

CLF protects New England’s environment for the benefit of all people.  
We use the law, science and the market to create solutions that preserve

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<sup>94</sup>[http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/maine/facesofconservation/gulf\\_of\\_mainebrochfinal\\_cropped.pdf](http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/maine/facesofconservation/gulf_of_mainebrochfinal_cropped.pdf)

our natural resources, build healthy communities, and sustain a vibrant economy.<sup>95</sup>

CLF's work in New England has four focus areas: Clean energy and climate change, ocean conservation (including fisheries management and estuary restoration), clean water (including nutrient and stormwater pollution), and healthy communities (livable cities and transportation). In my experience, CLF has been one of the most effective conservation advocates in the region. It was a named plaintiff in the 1991 litigation that helped for a while to stop overfishing of the depleted groundfish stocks in the Gulf of Maine. CLF is also taking a lead role in efforts in rivers and estuaries in New England to tackle issues related to nutrients overloads from wastewater treatment plants and agriculture as well as contaminated storm water. CLF's main strategy seems to be using the law and their web site touts their "tenacious legal advocacy."<sup>96</sup>

There are literally hundreds of separate NGOs scattered around the BoF/GoM watershed. Indeed the web site for the Gulf of Maine Council on the Marine Environment states that there are more than 600 organizations with a declared interest in the Gulf of Maine and its waters in its NGO directory.<sup>97</sup> It would appear, however, that the NGO movement around the watershed is fragmented as the governmental efforts. I selected TNC and CLF because they are two of the more prominent NGOs in the region and because of the contrast in their strategies. The CLF is noted for its chief strategy of using the law and, by inference, litigation, to gain traction to achieve their goals. TNC,

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<sup>95</sup> <http://www.clf.org/about-clf/our-mission/>

<sup>96</sup> <http://www.clf.org/our-work/clean-water/>

<sup>97</sup> [http://www.gulfofmaine.org/ngo\\_directory/](http://www.gulfofmaine.org/ngo_directory/)

on the other hand, appears to favor market and economic measures, including the conservation of critical lands through the purchasing of easements as well as the purchasing or leasing of harvesting or permitting rights.

The participants in the governance regime in the region include government federal, state, and provincial agencies, as well as local governments. We have examined the major government players, including the legislation that guides them and their perspectives. We also looked at the growth of industry trade groups in the fisheries management area. Finally two prominent NGOs were briefly examined along with their goals, mission, and principle strategy.

What is missing, unfortunately, is mention of any notion of collaborative partnerships between governments, industry, NGOs, and communities. Significant public participation appears to be largely missing from any examination of the participants in the regional governance regime. At the beginning of this discussion of the participants it was noted that an expectation or at least the opportunity for meaningful participation and input of a broad segment of the regulated population in decision making processes (Costanza, Norton et al. 1992; Pauly and Maclean 2003). This means that significant, meaningful public participation is required (Becker 1993; Francis 1993; Francis and Regier 1995; Cortner and Moote 1999; Clark 2002; Jackson 2005; Fiorino 2006; Folke, Lowell Pritchard et al. 2007). Finally, participation must be open to almost any person or group with a significant interest in the issue (Becker 1993; Kjær 2004; Brunner, Steelman et al. 2005; Jackson 2005; Brunner and Lynch 2010b).

As this section demonstrates, public participation and community involvement are largely missing in the BoF/GoM. Without this important aspect of ecosystem-based

governance, the region is destined to continue the management of human activities that impact the environment in the same manner as in the past. If past is prologue, nothing good can come from that.

The discussion of participants also included many of the perspectives held by the participants examined above. Thus the framework look at perspectives will be summary in nature.

Perspectives. As we have seen, all participants have perspectives. Such perspectives can include conflicting ideas, feelings, and beliefs about a problem and often rest on basic beliefs. Social groups may coalesce around a perspective, but participants are individuals with their own beliefs, interests, loyalties, and faith. The way they see themselves, or their identifications as members of some group, are important to explain their actions. In our ecosystem-based approach model, governance would be open to new ideas and experimental approaches. Participants would reject their traditional adherence to processes that are parochial and resistant to innovation. They would also place the good of the BoF/GoM ecosystem, the resilience and integrity of the natural processes necessary to sustain ecosystem and structure ahead of other more parochial interests and would share a belief in collaboration, cooperation, and citizen empowerment. Finally, the ideal of human dignity would no longer be ignored, and citizen access to democratic processes and an overall commitment by participants to the common interests should prove more important than the preservation of bureaucratic turf. (Table 46)



Table 46 Perspectives

Ecosystem-based Approach	BoF/GoM Approach
<p>Perspective requires a governance structure that looks to find common ground on policies that advance common interests. In addition, the perspective necessary for ecosystem-based governance should be more universal and open to new ideas and experimental approaches rather than parochial and institutionally resistant to innovation.</p>	<p>Governance in the BoF/GoM watershed is a bureaucracy with participants unable to move beyond jurisdictional restraints imposed by law. Overriding perspective is to maintain the <i>status quo</i>. Agency employees who seek to advance common interests are unable to do so because of parochial resistance to significant innovation.</p>
<p>Problem solving should be viewed as a flexible process with broad participation and a variety of perspectives and should be cognizant that environmental, social, and economic systems are related with problems that overlap and need to be approached with a concern for human dignity and a respect for democratic access.</p>	<p>Problems are dealt with by agencies with jurisdiction over the subject matter of the problem. Uniform general rules or laws are applied to specific problems. Concern for human dignity and respect for democratic access are seldom factors.</p>
<p>Common interest in ecosystem-based governance is to enable management to focus on the natural processes necessary to sustain ecosystem structure and function while recognizing the need for human and institutional involvement at every level of the ecosystem. The common interest of maintaining and supporting ecosystem integrity should outweigh parochial interests in preserving bureaucratic turf or command and control hierarchy.</p>	<p>The parochial interests in preserving bureaucratic turf and traditional rules take precedence over the common interest of maintaining and supporting ecosystem resilience and integrity. Innovative efforts are approached by GOMC but true gulf-wide governance focused on the natural processes necessary to sustain ecosystem structure and function is not a realistic prospect at present.</p>

It should be apparent at this point that governance in the Bay of Fundy/Gulf of Maine region is executed through decisions made by agencies charged by law with the authority over some segment of the ecosystem. For the most part, the same agencies have been performing the same services for 30 or 40 years. The beliefs, loyalties, and interests of the participants in the government regime appear to be aligned firmly with the goals and limitations of the agency. While frustrating to many, it is a paradigm by default in the region.

Writing about his experiences and observations gleaned from the spotted owl controversy, natural resource analyst Steven Yaffee wrote about how comfortable it is for bureaucracies to act in standardized ways:

Traditional ways of doing things have been tested by the realities of time, agency staff are accomplished at carrying out their tasks, and longstanding patterns of individual and organizational behavior create a predictable and energy-conserving reality for agency staffers and leaders alike. Organizations generally do what they do because they are administratively comfortable, politically and fiscally feasible, and legally allowable. Like all organisms, bureaucracies define, find, and protect a decision space – a niche – in which they are comfortable and can thrive (Yaffee 1995, 402).<sup>402</sup>

Or as expressed by a state employee familiar with management efforts in the region:

Government right now, whether it's federal or state, is unwilling to grow. When you talk about with ecosystem-based management is that the management system has to grow and the science system has to grow before we can do that. It's not a function of taking my urchin management person and making them an ecosystem person. In fact you need to have both functions going on. (U.S. State Employee 1)

Thus perspectives of the governance participants in the BoF/GoM watershed tend to center around the maintenance of the fragmented regulatory regime in place now for decades. While certainly some individual participants are, again, frustrated with this perspective, there remains little that can be done to overcome the jurisdictional restraints imposed upon them by current law and regulation. Anything more added at this point would be redundant. We turn, therefore, to the task of Situations.

Situations. Participants to an ecosystem governance process may interact in formal or informal settings, on a number of levels, and regularly or only during crises.

Thus the examination of the situations in which participants interact may have temporal

elements depending upon how often the participants interact. It may also have spatial issues determined by the geographic boundaries represented by the participants. There may be institutional issues that depend upon the degree that power is centralized or decentralized in the region and whether regimentation is increasing or decreasing. Finally the issue is whether it takes a crisis for participants to mobilize participants to alter their perspectives and discourse-related practices in order to resolve the crises (Clark 2002).

Table 47 Situations

Ecosystem-based Approach	BoF/GoM Approach
<p>Collaboration, communication and cooperation between government, stakeholders, and the public allow for governance that works more <i>with</i> participants than <i>on</i> them. This means more frequent collaborative interaction between government and participants at all levels. Further, agencies need to be less geared toward enforcement and more willing to be used as resources for local involvement and for solving problems where they arise.</p>	<p>There are few opportunities for frequent collaboration, communication and cooperation between government, stakeholders, and the public. Traditional agency government implementation requires enforcement of uniform laws, applying laws to specific situations. Some progress has been made in public involvement in fisheries management with the advent of sector management, but it may backfire as permits are bought up by wealthy fishermen and local small-boat fishermen are forced out of the industry.</p>
<p>Decision-making and other collaborative processes are iterative and ongoing, not simply single-play problem-solving efforts. The need for passive formal public and adversarial public hearings can be reduced through citizen involvement and partnership, not just public information programs to inform passively.</p>	<p>There are few opportunities for meaningful public participation opportunities in governance. Enforcement of regulatory laws are still basically through penalties and citations for non-compliance.</p>

In an ecosystem-based approach we would expect that there would be ample opportunity, or situations, for participants to communicate and collaborate (See Table 47). In the BoF/GoM region, however, there are generally limited opportunities for communication, collaboration, and citizen involvement. There have been attempts,

including the Gulf of Maine Summit sponsored by the GOMC, but these are infrequent and relatively rare. The GOMC also provides opportunities for its working group to meet four times a year, and the actual Council to meet twice a year. These meetings often are devoted to developing their five year Action Plans. While various approaches have been tried for each plan, the public has not been a huge factor in any one plan – at least through 2008, as one member of the Council’s Working Group relates:

Yes, we’ve used a different process for each of the four action plans. The first one came out of the big Gulf of Maine conference in 1989. It sort of identified the issues and established a general plan around that. The second and third plans were, we thought, okay we need to have more specific objectives, so to fine-tune our actions, and this one’s getting more results-based. The second action plan, I don’t think, 2001/2006, I don’t think had much of a public engagement process. We’d just done a big workshop, we know what it is, we can just make a more specific plan. The plan after that had a lot more outreach: Surveys, engagement, workshops, and some gathering the input. Here’s what we’ve known over the last five or six years, here are the goals we’re shooting toward, what do you think our priorities should be, what role will counsel play? So, it was quite active. We did the summit and everything leading up to this one. The decision here is this is probably more internal. We sort of know the lay of the land, we did some outreach, some engagement. But, I wouldn’t say that was the real emphasis of this current action plan for 2006/2011. It’s really, let’s look internally to what the priority is. (Canadian Federal Employee 2)

One example of a group that exemplifies ecosystem and community-based governance in the region that takes advantage of situations and uses them to encompass frequent opportunities for cooperation and collaboration among a broad-based coalition of the public, scientists, and policy makers

The ACAP model is very much about leadership at the local level. We don’t tell them what they have to work on. What we did in the early years was that we helped them come together and they went through a visioning process, setting the goals and objectives, and each of them developed a

comprehensive environmental management plan. We gave them the first five years to do that. Nothing existed in these areas before, so helping a group come together, letting them determine what they actually wanted to achieve, and helping them do that. So those comprehensive management plans were real touchstones for them. Throughout that process we've said, look here are Environment Canada's goals, which they align with local interests. We hope there is some alignment or we're going to have difficult times working with you. By having those shared goals and the way they developed it, it wasn't just a couple of people sitting in a room doing this. It very much involved broad engagement of the citizenry, all levels of government, the private sector, that's who represents, who forms these ACAP organizations. (Canadian Federal Employee 2)

BoFEP as we have seen provides periodic gatherings of scientists, experts, and citizens from around the basin as discussed previously. But, as we have seen, efforts that go beyond the legal boundaries limiting agency jurisdictions are rare. There has been little indication of movement towards a governance system that is heading toward partnerships with innovative techniques for working with industry other than the traditional confrontational methods. Thus situations in which participants in the region interact are generally controlled and relatively choreographed.

Base Values. In Chapter III it was pointed out that environmental policy disputes are almost always "contests over values" despite the fact that they are often masked in economic or environmental jargon or appear to revolve around technical issues (Layzer 2006).

The values that we will discuss in terms of the BoF/GoM governance regime include the typical assets or resources that participants use in their efforts to achieve their goals. All values, including authority, can be used as bases of power. Brewer and deLeon (1983) have listed the values pertinent to this inquiry:

*Power* is to make and carry out decisions

*Enlightenment* is to have knowledge

*Wealth* is to have money or its equivalent

*Well-being* is to have health, physical and psychological

*Skill* is to have special abilities.

*Affection* is to have family, friends, and warm community relationships

*Respect* is to show and receive deference

*Rectitude* is to have ethical standards

The characteristics of an ideal ecosystem approach to governance include a heavy reliance on significant public participation, vertical and horizontal collaboration, resilience, and learning through trial and error. The values necessary for the implementation of an ecosystem-based approach must move away from the traditional goals of power and wealth as ends in themselves. In order for implementation of an ecosystem-based approach to governance to have a chance there needs to be much more emphasis on utilizing power and wealth to obtain stronger inputs from the values of knowledge, rectitude, well-being, and respect. A trial-and-error approach to management solutions, for example, requires a strong commitment to the gathering and sharing of knowledge together with an ability to acknowledge failures without the fear of punishment or the loss of funding. In addition, collaboration and significant public participation will require a focus on the values of respect, affection, rectitude and well-being. There is simply no way to gain the trust, credibility, and respect necessary for problem-solving and planning collaboration and public and broad-based community support without a shift more in the direction of these important values.

Thus our ideal system must first be characterized by resource sharing and collaborative efforts designed to bring a broad base of the public and regulated interests together with regulators to share ideas, develop knowledge, and gain mutual respect to identify goals, threats to those goals, and possible actions to take in order to preserve and restore ecosystem resilience. In an ecosystem-based approach to governance, base values come into play in both the goals for the governance of the ecosystem and in the implementation processes that seek to implement the goals (Table 48).

Table 48 Base Values

Ecosystem-based Approach	BoF/GoM Approach
<p>Values sought should be consistent with goals of promotion of broad collaboration with emphasis on ecosystem resilience. The values of power and wealth should be utilized to press demands for common interests prioritizing human dignity, ecosystem integrity and resilience. Knowledge (enlightenment) should be a goal that is ideally gained from a variety of sources through a process of trial and error as much as through traditional experimental science.</p>	<p>Agencies rely on the support of elected officials and support is often tied to the satisfaction of those officials with the agency's contributions to or lack of interference with local or regional gains. With limited exceptions (Saltwater Network, ACAP) human dignity is not prioritized. Ecosystem resilience and integrity, though the goal of some participants, limited by jurisdictional constraints and agency turf concerns.</p>
<p>In order for implementation of an ecosystem-based approach to governance to have a chance there needs to be much more emphasis on utilizing power and wealth to obtain stronger inputs from the values of knowledge, rectitude, well-being, and respect</p>	<p>The values of power and wealth appear to be used to preserve the <i>status quo</i> agency set-up as well as to promote private economic gain. There appears to rarely be trades of power and/or wealth to obtain knowledge, well-being, or rectitude.</p>

As we know, the governance regime in the BoF/GoM is fragmented with separate agencies each responsible for a portion of the activities that impact the ecosystem.

Without an accountable overarching entity and a spirit of cooperation, collaboration, and significant public involvement it would be difficult to achieve governance “characterized by resource sharing and collaborative efforts designed to bring a broad base of the public

and regulated interests together with regulators to share ideas, develop knowledge, and gain mutual respect to identify goals, threats to those goals, and possible actions to take in order to preserve and restore ecosystem resilience.”

Given the existing governance regime in the region, it is not surprising that the values of power and wealth tend to trump those of knowledge, rectitude, well-being and respect. As discussed in the prior sections, bureaucratic agencies in the region must constantly guard their turf. As we learned in Chapter III, the behavior of regulatory agencies is often strongly influenced by industrial interests and a desire to minimize or avoid loss of values such as power, wealth (i.e. funding), and respect. In decisions involving potential adverse effects on important industries (e.g. fishing in New England), agency value losses include decreased budget allocations from unsympathetic legislatures so the costs of making decisions that adversely affect various industries are often perceived as too great to risk. Agencies rely on the support of elected officials and support is often tied to the satisfaction of those officials with the agency’s contributions to or lack of interference with local or regional gains. Backlash against strong conservation methods that may impact economic productivity can be severe even at a local level (Wallace 2003).

In contrast to the traditional model of resource management which reduces agency and institutional (public institutions and private business interests) behavior into a constant quest for power and wealth as capital for the purchase of other values, the policy sciences approach has consistently been focused on the intelligence relevant to an integration of values derived from interpersonal relations which prizes not the glory of a



depersonalized state or the efficiency of a social mechanism, but human dignity and the realization of human capacities” (deLeon 1988, 37 - 38) Thus in an ideal society:

...citizens enjoy a full range of values, a state that has also been called ‘a commonwealth of human dignity.’ A healthy society is possible only when citizens enjoy a level of all eight values satisfactory to their needs (Clark 2008, 45).

In order to begin to achieve the kind of society described above, governance in the BoF/GoM region must move away from its administrative rationalist (Dryzek 1997) paradigm. Speaking broadly, the values of power and wealth should be utilized to press demands for common interests of human dignity, ecosystem integrity and resilience (Holling 1995; Holling and Gunderson 2002a; Berkes, Colding et al. 2003). Knowledge (enlightenment) should be a goal that, as we have seen, is ideally gained from a variety of sources through a process of trial and error as much as through traditional experimental science (Brunner and Steelman 2005).

Certainly given the current governance scheme, there is little likelihood that the various jurisdictions represented on the Gulf of Maine Council would move away from a purely fragmented system and toward a more accountable, responsible arrangement with the GOMC playing the coordinating role. The reluctance of the Council, or more appropriate its membership, to evolve into a more accountable governance role can be frustrating to some:

A: Time and time again when we talk to the Council about what they want their role to be, whether it’s about EBM or anything else, and we give them the spectrum, like the chance to give the Council some authority to change something, they always gravitate back to the forum role.

Q: There’s been a reluctance to regulate as a group?

A: Yes. Definitely.

Q: Or to give up or share any power in any way, shape or form?

A: Yes. It's hard enough even to articulate their power. I mean not even a challenge... (U.S. Federal Employee 4)

Others who participate in the Council feel that to maintain their agency's power and respect, as well as the credibility of the Council, industry must be appeased:

Q: Okay, we're almost done here. Gulf of Maine Council. What direction would you like to see it take?

A: Well, it's all over the spectrum, and they probably told you that ... New Brunswick Agriculture and Fisheries and Aquaculture and I are really focused on getting industry. It's our priority. If it doesn't happen, we walk. We basically made that very clear because, what's difficult for us is that development agencies will come to the table not engaging our constituents and being perceived by industry as well, you're just working an environmental group. That's not what council is or is about. And, really, if council wants to achieve what it wants to achieve and we talked about this when we started, you can't do it without engaging industry. You can't ignore the biggest users or potentially biggest impact in the marine environment. (Canadian Provincial Employee 1)

Thus while no one can deny that the GOMC provides a valuable forum for the exchange of information, the goals of power and wealth seem to be the key drivers for governance within the current regulatory system – at least as to many of the agencies participating through the GOMC. As we saw above, however, that is often simply the nature of bureaucracy.

The situation is no different with some regulatory agencies that do not participate in Council activities. The process set up for the New England Fisheries Management Council by the Magnuson-Stevens Sustainable Fisheries Act (1976) appears to allow for power and wealth to be the dominant values in some decision-making. One example is

the ability of the NEFMC or NMFS to crack down on state fisheries that permit too many fish to be caught within waters over which the states have jurisdiction (3 mile limit) – a result that violates the duty of states to act consistent with the federal government or NMFS regulations:

Q: It seems to me that the harder the states hammer the stocks, the more difficult it will be for the Council and the federal agencies to show a court, for instance, that you're rebuilding according to the timetables.

A: Absolutely. And there's one section of the Magnuson Act that I think says that if the states are interfering with rebuilding, the federal government can preempt the state laws if they're not consistent with federal. It has never happened; won't happen. Politics. There's no way that the Department of Commerce is going to preempt the states.

Q: Why the pressure? Why wouldn't Commerce step in?

A: Political pressure.

Q: It would be just too unpopular?

A: Yes. We work closely that they abide by the federal laws but they don't want to. The federal laws are far too stringent for the state fisheries experts.

Q: But if we're talking about the same stocks what is the argument that the states use to keep laws less stringent?

A: They just can. States rights. They can do whatever they want zero to three miles out.

A: So to them it's an economic issue?

A: It's an economic issue and a political issue.

Q: The fishing industry has enough power to force...

A: Absolutely. You know you get to Rhode Island, Massachusetts, they have in shore commercial fisheries that are, like the flounder fishery, black-back fishery, yellowtail in shore fisheries, herring. (US Federal Employee 3)

Recall that under our ideal view of ecosystem based governance, the values sought by participants should be consistent with the promotion of broad collaboration with emphasis on ecosystem resilience. The values of power and wealth should be utilized to press demands for common interests prioritizing human dignity, ecosystem integrity and resilience. Thus whether it involves the regulation of fisheries or the other threats confronting the region's ecosystem, the values that tend to drive the regulatory process in the BoF/GoM region have little relationship to the ideal model. From what we have learned in this study, power and wealth appear to be used often to preserve the *status quo* agency set-up as well as to promote private economic gain. This approach differs markedly from our ideal, which would advocate the use of power and wealth as a means to obtain stronger inputs from the values of knowledge, rectitude, well-being, and respect.

Strategies. Thus far in the analysis of the social process at work in the Great Lakes in first two decades of the GLWQA we have examined the participants, their perspectives, the situations in which they interact, and the base values that are used to achieve the goals of the participants. The strategies employed by the participants will be examined next.

The four basic strategies that were identified in Chapter III may be listed as follows:

- *Diplomatic strategies* use communication among and between the leaders and/or elites of any group or agency;

- *Ideological strategies* involve communications to a public that is wider than just leaders or heads of agencies and include public talks, newspaper and other mass media appeals and, in the extreme, propaganda;
- *Economic strategies* that consist of practices that rely on the production and distribution of goods and services. Boycotts and labor actions are included in economic strategies (Clark 2002), and
- *Litigation* which in this study is defined as disputes that are submitted for binding resolution by a third party.

In Chapter III the need to move toward a governance system that moves away from regulatory enforcement efforts geared toward targeted interventions at point sources and problem areas in the form of commands to different classes of firms mandating change in existing technologies or behavior was discussed at some length. In place of coercive command and control regulatory conduct, at least to some degree, should be a movement toward cooperation and collaboration in decisions about processes and raw materials, sustainability planning integrating environmental goals with other social and economic goals using diplomatic and ideological strategies (Table 49). Certainly there will always be a need for basic rules backed by the coercive power of the state in order to keep firms in line and not give unfair competitive advantage to environmentally noncompliant firms (Harrison 1995; Kagan 2001; Kjær 2004; Fiorino 2006). The point is that ecosystem-based approach governance would seek to work with the regulated public to a greater degree.

In addition to the need to move away from coercive regulatory conduct and litigation, the literature and case studies discussed in chapter III suggest the need for a

*bridging organization* that connects, navigates and/or coordinates the interests of different institutions and stakeholders across organizational levels should also be an integral part of adaptive governance of social-ecological systems. As was pointed out earlier, such organizations provide social incentives by rewarding and creating space for collaboration, value formation, and innovation.

Table 49 Strategies

Ecosystem-based Approach	BoF/GoM Approach
<p>An ecosystem-based approach would rely more on ideological and diplomatic strategies, moving away from regulatory enforcement efforts geared toward targeted interventions at point sources and problem areas which take the form of commands to different classes of firms mandating change in existing technologies or behavior. Instead there would be cooperation and collaboration in decisions about processes and raw materials, sustainability planning integrating environmental goals with other social and economic goals.</p>	<p>Strategies differ between Canada and the U.S. although both are still based largely on traditional command and control governance and enforcement. Canada shows more willingness to use softer intervention using diplomacy rather than punishment as inducement to change behavior and foster compliance.</p>
<p>Litigation will play a role as there is a need for basic rules to be backed by the coercive power of the state in order to keep firms in line and not give unfair competitive advantage to environmentally noncompliant firms. Litigation would, however, rely more upon alternative dispute mechanisms, including facilitation and mediation.</p>	<p>In U.S. litigation is the principle tool used for enforcement and penalties. There may be recognition of a need for greater voluntary compliance efforts, especially as funding is diminished and costly litigation loses attraction.</p>
<p>The existence of a <i>bridging organization</i> that connects and navigates the interests of different stakeholders across organizational levels should be <i>integral part</i> of adaptive governance of social-ecological systems. Such organizations provide social incentives by rewarding and creating space for collaboration, value formation, and innovation. The collaboration that bridging organizations initiate is <i>strategic</i>; conditional on the goals to enhance the values from the ecosystems</p>	<p>There is no bridging organization in the region currently capable of connecting and coordinating different stakeholders across organizational levels. GOMC plays role of a forum to provide discourse between and among regulatory agencies. The goals of the GOMC are broad and ecosystem-based, but are not shared by all participants. Jurisdictional constraints of members also are barriers to change.</p>

The collaboration that bridging organizations initiate is *strategic*; conditional on the goals to enhance the values that may tend to promote the sustainability and resilience of the ecosystems (Hahn, Schultz et al. 2008).

In the final analysis strategies in an ecosystem-based approach should be more goal-oriented and should have institutions and processes that enable and incentivize more diplomatic and ideological strategies and discourage the use of more adversarial and/or litigious strategies (Table 49).

The current regulatory regime in the Bay of Fundy/Gulf of Maine region appears to adhere to a more traditional governance scheme. Activities are regulated by federal, state, or provincial agencies. Strategies have to be built upon a basis laid by formal laws and rules. Reliance is therefore generally upon regulation using economic or social intervention to force compliance with uniform rules. Where this intervention fails, litigation provides the remedy (Kagan 2001; Fiorino 2006). Thus *status quo* strategies use litigation, and by extension enforcement with the threat of litigation, as a principle weapon in the management arsenal (Steneck, Vavrinec et al. 2004; Walker and Salt 2006; Bardach and Kagan 2010).

There is a clear difference between Canada and the United States regarding enforcement strategies. In Canada, with vague jurisdictional lines, federal and provincial agencies tend to work together and compromise with resource users. The strategy is principally diplomatic. Indeed, while formal enforcement responses like criminal prosecution and administrative notices are important tools in Canada, they are typically viewed as mechanisms of last resort. Administrators in Canada more often utilize

informal mechanisms to bring about compliance (Abbot 2009). As one Canadian federal official pointed out respect to environmental enforcement strategy in Canada:

Q: So, your principle strategy, is it safe to say, is basically...and I can give you a choices...there's diplomatic, there's litigation or does that include that from the outside, there's economic, and there's ideological, meaning trying to achieve goals through education on scientific, social, economic, research, etc., education. It seems to me if I were pick strategies, you're using chiefly diplomatic and ideological, would that be fair?

A: Yes. That's fair. Diplomatic...I'm not sure you're interpretation....certainly ideological...

Q: Let's say negotiations...

A: Yes. Okay. Finding consensus, if you will. The legal stuff is always there. Everyone says their legal obligations have to be met, meet them. If you need to educate, enforce, whatever, so if Environment Canada is responsible for enforcing certain regulations, just do it. Meet the letter of the law. We expect that. And industries and so on, meet your obligations on that end. But, in terms of anything legal beyond that, no, it's what are our common interests? (Canadian Federal Employee 2)

Despite the existence of alternatives, litigation has become a tactical and strategic weapon employed by all sides to policy conflicts – at least in the United States (Fiorino 2006). In the US, the courts have also become a political venue for the losers in prior policy battles fought in Congress, or in the agency regulatory process, to launch another assault. Litigation also provides a stalling mechanism to the policy process and creates a bargaining chip to be bartered for concessions from opponents (Rosenbaum 2008).

The management of groundfish stocks in New England is one example of the use of litigation as a strategy that has resulted in the courts playing a significant role in fisheries management in the Gulf of Maine. It was largely the litigation in Conservation



Law Foundation v. Evans<sup>98</sup> that forced NMFS and the NEFMC to take tough measures in order to stop the overfishing of groundfish stocks in the Gulf of Maine following their collapse in the early 1990s. Another result of the New England groundfish collapse was the establishment of the political will to pass amendments to the Magnuson Stevens Fishery Management Act. These amendments, known in short form as the Sustainable Fisheries Act (“SFA”), include mandatory rebuilding provisions as well as a section designed to protect essential fish habitat (“EFH”) (1996a). The EFH provisions of the Sustainable Fisheries Act may open up the possibility of more litigation aimed at controlling the destruction of marine benthic habitats, corals, and other structures caused by bottom trawling and other destructive fishing practices (Bilsky 2006).

Litigation is also beginning to play a role in efforts by the EPA to reduce the nutrient levels in the region’s bays and estuaries. In a recent opinion by the Environmental Appeals Board of the U.S. Environmental Protection Agency in Upper Blackstone Water Pollution Abatement District,<sup>99</sup> the court ruled that EPA had an obligation under Section 303 of the Clean Water Act to require permits to include whatever conditions are necessary to “[a]chieve water quality standards under section 303 of the CWA, including State...criteria for water quality.” The limitations and conditions in any permit under Section 303 “must control all pollutants...which the [Region] determines are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to any excursion above any State water

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<sup>98</sup> 211 F. Supp. 2d 55 (D.D.C. 2002)

<sup>99</sup> NPDES Appeal Nos.08-11 to 08-18 & 09-06;  
[http://yosemite.epa.gov/oa/eab\\_web\\_docket.nsf/Case~Name/F22DB97558D954F2852578E00070F961/\\$File/Denying%20Review....pdf](http://yosemite.epa.gov/oa/eab_web_docket.nsf/Case~Name/F22DB97558D954F2852578E00070F961/$File/Denying%20Review....pdf)

quality standard...” Blackstone at p. 24. Thus the EPA may now impose on any State or municipality a requirement that its sewage discharge reduce levels of nutrients, including nitrogen and phosphorous, to extremely low levels if there is evidence showing that effluent discharged by the state or municipality “contributes” to a violation of state water quality standards. This has incredible implications to regions like New Hampshire’s Great Bay where nitrogen and phosphorus levels exceed water quality standards. No longer does the EPA have to prove that the effluent discharged by municipal water treatment facilities is the “cause” of the violation – a nearly impossible task given the multitude of sources that contribute nutrients to the water. Under Blackstone the EPA need only prove that such facilities *contribute* to the problem. Given that any addition of nutrients in waste water discharge necessarily contributes to the water quality standard violations, EPA enforcement of new permitting standards is sure to be enforced through the courts using the Blackstone precedent.

In sum, traditional top-down government enforcement and intervention is still the main government strategy in the region. When issues arise over compliance with uniform laws, litigation is the primary strategy used to enforce legal standards. There are, perhaps, more diplomatic and ideological tactics being attempted, but litigation remains the main strategy used to achieve compliance with laws, rules, and regulations.

Outcomes. Outcomes, generally short-term but may be medium or long-term as well, are the culminating events measured in terms of values that may be seen as indicative of progress, or not, depending on the perspective of the participants. Outcomes may take the form of changes in process, or institutions, which, at least in terms of a transition to ecosystem-based governance, indicate movement toward the creation and

implementation of the perspectives and institutional structures that are conducive to innovation.

In terms of our ideal system, progress would be indicated by efforts to share power with and distribute more values to a greater portion of the public (Table 50). If analysis of the values set forth in our social process reveals that more power and wealth is being accumulated by fewer entities, this would reflect a negative trend to those who seek to move in the direction of a more ecosystem-based approach to governance. If, on the other hand, there are tangible efforts toward creating governance processes and structures that encourage public participation, collaboration, the mobilization of local knowledge, and more adaptable, accountable, and flexible management, then outcomes are headed in a direction consistent with ecosystem-based governance (Brewer and deLeon 1983; deLeon 1999; Clark 2002; Clark 2008).

Table 50 Outcomes

Ecosystem-based Approach	BoF/GoM Approach
Transition toward a more adaptive ecosystem-based approach to governance. Innovative measures are tried that transform current governance entities and create new or modified value institutions that get beyond scientific management and strict command and control hierarchy of bureaucracy using local input and collaborative processes.	There have been positive developments in the language used by the GOMC and its member agencies indicating their adoption of ecosystem-based approaches to governance. It remains to be seen whether truly collaborative efforts evolve out of these pronouncements and whether the public and communities will be enticed and welcomed into the process to contribute local knowledge and information.

In terms of outcomes in the BoF/GoM region, there are some to be found, although often they are largely symbolic. One outcome, of course, is the continued existence of the Gulf of Maine Council on the Marine Environment as a forum for the

exchange of ideas and information for regulatory agencies in the region. Another positive development are the goals and operating principles set forth in the most recent Gulf of Maine Council Action Plan (GOMC 2007). Discussed at length earlier in this chapter, that document clearly embraces the principles of ecosystem-based governance and recognizes the need for increased collaboration as well as the desirability of increased public outreach and education. In addition, as has been mentioned earlier, many of the participants in the Gulf of Maine governance regime, especially those who are active within the Gulf of Maine Council, have adopted ecosystem-based approaches and public involvement as goals within their agencies. The question is whether these symbolic pronouncements will translate into truly ecosystem-based approaches. Time will tell, therefore, if agencies begin to partner more with each other and with the public and communities to solve problems without regard to jurisdiction.

Effects. Effects refer to the long-term changes in the value positions and institutions in the relevant community. They are outcomes writ large, i.e. long-term outcomes in terms of values, processes, and institutional innovation (Clark 2002).

In essence, effects developed for our ideal system would include innovative measures that transform current governance entities and create new or modified value institutions that get beyond scientific management and strict command and control hierarchy of bureaucracy using local input and collaborative processes (Brunner and Steelman 2005; Coe-Juell 2005; Fiorino 2006; Folke, Lowell Pritchard et al. 2007). It would allow for softer and more voluntary local or regional regulation of activities that impact the ecosystem consistent with community goals and consistent with national

standards. There should also be evidence of a greater acceptance by regulators of public and community input and decision-making (Table 51).

Table 51 Effects

Ecosystem-based Approach	BoF/GoM Approach
Transition toward a more adaptive ecosystem-based approach to governance. Innovative measures are tried that transform current governance entities and create new or modified value institutions that get beyond scientific management and strict command and control hierarchy of bureaucracy using local input and collaborative processes	Transition in the region is more symbolic than tangible. Government agencies are increasingly acknowledging the need for change. Strict command and control is still largely the operating premise, but agencies are aware of need for transition. GOMC Action Plan incorporates goals and operating principles calling for transition toward EBM and greater public outreach and education.

While it is difficult to look around the region and point to tangible outcomes that reflect a broader, more holistic, less confrontational, and more community-oriented governance regime, there is a very important positive outcome that can be discussed. There is, generally, a broader acceptance and understanding of the need to transition toward an ecosystem-based approach to governance. There is even some optimism within government that transition is possible. Illustrative is this exchange with a veteran of U.S. fisheries management efforts:

**Q:** There's very little institutional memory of a groundfish industry downeast.

**A:** Everything is fished out. So maybe some day there will be enough fish to allocate some portion there. But right now we've got to get pretty smart about how many fish there are left and what do we have in terms of capacity to fish them and things like that. But yes there is definitely a role for community stewardship within the structure we have now. There's no reason why we can't have, as we move towards ecosystem management, why can't we have a Gulf of Maine committee, a Georges Bank

committee, and a Southern New England committee, all under the Council structure and only Massachusetts, Maine and New Hampshire will worry about the Gulf of Maine. And then the whole Council can get together can get together to decide on the allocations between Georges Bank and Gulf of Maine, and Georges Bank and SNE, because the fish go up and down. Once you allocate, and you know the numbers of fish you can catch in each ecosystem, you have better governance with a smaller scale and you can then further break it down to advisory groups, of course we can do that. I've been a longtime proponent of that. A Gulf of Maine committee with its own advisors in its own space, all other the council structure so that we can track how they interact with each other and allocate the different species because some of them don't just stay on Georges or don't just stay in the Gulf of Maine. (US Federal Employee 3)

What's impressive is the vision – the mission to rebuild fish stocks so that fish will return to places from which they've been long absent and, once that occurs, the decisions on how to best manage those fisheries can be made with the meaningful input of groups on a smaller scale – perhaps communities.

Further, there are people in government that care about a transition away from the status quo and are increasingly willing to lead a transition towards broader ecosystem-based approaches to governance. NOAA may be headed that way, despite some barriers, as we learn from someone familiar with the situation:

All these definitions are general and innocuous enough but NOAA has dragged its feet a little bit because we don't have an EBM mandate. So it's no one's job to do EBM. It's someone's job to do coastal zone management, someone's job to do fisheries management, marine mammal protection, endangered species, etc., but it's no one's job to do EBM. So I think there's just been a lot of rhetoric at the national level to date to try to define this and figure out how our activities could be better connected through our budget and planning decisions. I haven't felt that it has yet to translate to the regional level where these projects and programs could actually interact and focus on pilot areas and include agencies and other partners. In a data rich place like the Gulf of Maine it certainly could and should be done. But the impetus from NOAA has been a need for NOAA to get its own ducks in a row before it reaches out to other agencies. In conversations with Steve Murawski and other folks at headquarters I have

learned that there is definitely interest by FY 09 to start spending money up here and actually pulling a NOAA team together, talking about EBM, how it would work, how an assessment would work up here. Once we understand our approach we could then start to engage other agencies and do a concentric circle thing but we have to start with ourselves. I don't feel like in this region it has happened yet. There are plans to move that way. But it's no one's full time job to do that. Everybody is still operating in their own stovepipes. (US Federal Employee 4)

If all NOAA needed was a mandate, with the President's recent Executive Order many of the recommendations of the Interagency Ocean Policy Task Force are now law. The mandate is in place and awaits only implementing regulations. Is this the license that NOAA and other pertinent U.S. federal agencies need to move toward integrated management and involving the public and communities in coastal and ocean-related decisions? Time will tell but as we have seen there is unlikely to be a warm reception for significant change at the agency level in the United States.

In sum then, the social process in the Bay of Fundy/Gulf of Maine watershed has generally been handicapped by an inability to work outside of traditional agency structures. What we have seen, however, is there is some recognition that governance in the region must change. It will require a galvanized and educated public to drive any change in the direction of ecosystem-based governance, together with government representatives with the courage to lead change heading into an uncertain future.

### **Decision Process**

The third and final portion of the policy sciences framework that needs to be discussed is the decision process. Much of the information, background, and data concerning the decision process has been set forth and absorbed within the prior sections

involving problem orientation and the social process. Every effort will be made to avoid unnecessary duplication.

Natural resource policy and management are generally analyzed on the basis of the decision process employed in the execution of agency mandates. As we have seen, there is no one agency that oversees the myriad of threats posed to the ecosystem of the Bay of Fundy/Gulf of Maine ecosystem. Thus an examination of the decision process for this region involves the mapping of six interlinked functions: intelligence, promotion, prescription, implementation, termination, and appraisal.

As we have seen, the decision process in the BoF/GoM is a crowded field. Understanding the collective decision process, however, can be a way of reconciling or at least productively managing competing interests and policies through politics. There are inevitable agency turf battles and politics plays a role in their outcome. Politics will always be with us because people seek different policies that reflect their particular, or “special”, interests. The ideal, of course, is for participants to reconcile interest differences in order to clarify and secure their common interest. In the BoF/GoM governance regime, we have seen that it is not really clear who establishes what the common interests are or should be, and even what the community believes is in their common interests.

In terms of ecosystem-based governance, trends can be determined that might indicate whether intelligence data is reliable and linked to the appropriate scales within an ecosystem, whether such intelligence is being communicated to policy makers in a meaningful manner and, ultimately, whether a structure exists that allows for decision makers to react to intelligence in an adaptive fashion. Note that ecosystem-based



governance requires a decision process that is open and transparent, not slanted toward special interests and power (Clark 2002). In terms of ecosystem-based governance, trends can be determined that might indicate whether intelligence data is reliable and linked to the appropriate scales within an ecosystem, whether such intelligence is being communicated to policy makers in a meaningful manner and, ultimately, whether a structure exists that allows for decision makers to react to intelligence in an adaptive fashion, and whether there is impartial third-party appraisal of existing policies that will permit participants to adapt or even terminate programs (Clark, Willard et al. 2000; Wilson 2000; Armitage, Berkes et al. 2007). We have largely examined the trends in the region earlier in this chapter. We now examine the task of intelligence.

Intelligence. Intelligence is the process of obtaining and processing information and making it available to decision makers, stakeholders, members of the public, and others (Clark 2002). It involves the generation of knowledge, the transmission of knowledge, the use of knowledge, and the effects of knowledge on the policy process. Knowledge relevant to environmental decision making may be generated by scientists or it can come from other sources, including local knowledge. Intelligence is simply the process used to gather information about the problem(s) at hand and the relevant context and should incorporate characteristics like timeliness, dependability, and creativity (Clark 2008). The purpose of intelligence is to provide reliable data and information that permits an understanding of whether conditions in the ecosystem are trending toward or away from the goals of the region (Busch and Trexler 2003). Reliability turns on whether intelligence is comprehensive and gathered from appropriate scales in order to detect trends and changes in ecosystem resilience and function (Lasswell 1971; Gunderson and

Holling 2002; Gunderson 2003; Reid, Berkes et al. 2006). Data gathering and analysis should, in an ideal world, be inclusive and open to honest debate. Policy makers, as we have seen in the prior sections, must be willing to put special interests and bias aside and make decisions based upon the available data. The data, and the decisions, should be understandable to the public. Intelligence that reveals trend direction should lead to policy responses through an adaptable and accountable process (Busch and Trexler 2003; Gunderson 2003; Brunner 2010a). (Table 52)

Table 52 Intelligence

<b>Ecosystem-based Approach</b>	<b>BoF/GoM Approach</b>
<p>System is facilitated by identification of intelligence needs and enabled by cooperative agreements among relevant entities to assure reliability, compatibility, timely analysis and accessibility. Intelligence must come from a broad array of participants that includes scientists, academics, the regulated public, and the public at large.</p>	<p>Intelligence is largely a function of member agencies of the GOMC. There are NGOs that perform intelligence functions as well. In both cases, results of intelligence is generally accessible via the web sites of the agency or NGO. Information is shared with GOMC which makes data and reports available on its web site. Public is rarely meaningfully involved in the gathering of intelligence.</p>
<p>Intelligence must be communicated to an accountable entity for analysis and coordinated action, i.e. a person, partnership, or other entity that has an obligation or responsibility to an authority, group, standard, mandate or behavior norm <i>external</i> to that person or entity. Intelligence and information must be made readily available to researchers, scientists and the public.</p>	<p>Intelligence on many topics is communicated to the GOMC. The GOMC, however, is powerless to act upon the information received. It is a forum for discussion and it may foster discussion related to intelligence, but no authority to compel action. With respect to fisheries, GOMC plays no role and all intelligence performed by agencies with jurisdiction over fisheries on either side of the border.</p>
<p>In order for the public to be interested and be able to understand the data and other intelligence, significant public outreach and capacity building is required.</p>	<p>There is little in the way of significant public outreach. Intelligence may be available to the public through web sites, etc., but very few meaningful efforts to inform public as to why they should seek out the information.</p>

Intelligence and complex natural science information cannot simply be dropped on an uninformed public. The public must be informed and interested and therefore be

able to understand the data and other intelligence. Thus the groundwork necessary to create an informed public is necessary before significant public outreach and capacity building can be meaningful (Becker 1993; Fischer 2000; Berkes, Colding et al. 2003; Weber 2003; Walker and Salt 2006). Local groups able to inventory and sample the natural resources with results communicated to a variety of actors, including the general public, using a wide range of methods, are preferable to the kind of closed process we have now that often collects and transfers knowledge only among a select group of peer review journal aficionados. Information, collected by a range of volunteers under the guidance of a blend of scientific and local knowledge and transferred freely provides the basis for feedback loops required for the holistic and sustainable management of complex systems (Walker and Salt 2006).

Examining the factors set forth above, and in Table 52, how does the governance process used to obtain reliable intelligence in the Bay of Fundy/Gulf of Maine watershed compare with our ideal model? The answer is that historically the fragmented governance system in the region has generally conducted research institution-by-institution and agency-by-agency.

**Q:** Are you comfortable that you know the status quo of the environment of the ecosystem, whether it's functioning, whether it's not?

**A:** I think the council would probably be happier getting a better handle on that. I think first breaking it up into the pieces that make sense like, are the harbors clean, do we have functioning estuaries, do we have salt marshes, are we addressing tidal barriers? Things like that. I think if we could articulate those areas of concern for those particular resources, then it would be easier to answer that question.

**Q:** And as I understand it, most of the data, most of the monitoring, is done by staff of the members of the council members.

A: The monitoring of the outputs from the action plan, or the actual conditions?

Q: Actual conditions.

A: Yes. Absolutely.

Q: So, you're relying on data from your members and their employees.

A: Absolutely, and it's not always comparable, which is why that whole ecosystem initiative that David's been working on, I think it's been taking flight. I mean they're looking to come up with indicators that everyone can use to measure the health of the particular system. And not just the health of the environment. Probably one of the things that I remember talking about, and I don't know if it's on the ESIP agenda, which is Ecosystem Indicator Partnership, but the just health of a community, because if a community isn't healthy then we get into the whole land conversion issues and there's no stewardship anymore, and so it just makes it vulnerable to all kinds of exploitation and change. (US NGO 4)

Results of these the diverse intelligence efforts are often shared with interested parties via the web site for the Gulf of Maine Council, BoFEP, or the web sites for the responsible agencies, like NOAA, DFO, the EPA, and New England Fishery Management Council.

The first requirement for the intelligence function under the ideal model is that there be a system in place that facilitates the identification of intelligence needs that is then enabled by cooperative agreements among relevant entities to assure reliability, compatibility, timely analysis and accessibility. Intelligence must come from a broad array of participants that includes scientists, academics, the regulated public, and the public at large.

Q: Is the health of the ecosystem a factor in the policy process? And I can define that further if you want.

A: I'd say that's the basis for environmental laws that make up the coastal program...evaluate the impacts, minimize the impacts, mitigate...avoid,

minimize, mitigate. But, my biggest concern when looking at our effectiveness is that we don't know ... whether the functions that we're intending to preserve are actually preserved, or a process, because we're not doing the early enough monitoring, and we don't understand the systems well enough to really...

Q: Know when you get official...

A: Exactly.

Q: How can you make it better? What would it take to understand better what the human impacts are and what the impacts of decisions are?

A: I think we need to do a whole lot more monitoring and have understanding of how some really basic systems work, and we need to, in addition to a site by site review and development permitting, we need to have some sort of...a design of regulations with the system in mind. (US State Employee 2)

From the perspective of a U.S. Federal employee familiar with the governance scheme in the watershed and with much of the data that is being gathered:

Q: But, going back to the four threats that we mentioned earlier, what are the trends? Are we getting better or are we moving further away from our goals?

A: Well, that depends on how good your indicator systems are and that's an issue. I think you have a lot of different groups that are trying to understand the state of the environment and Gulf of Maine Council is one through their Ecosystem Indicator Partnership. Every office, again, looks at its own indicators. I don't think that anyone...I know that NOAA doesn't have a system in place where we actually understand a whole suite of indicators. So, for instance, coastal development wise, we know that the Northeast is the most highly populated region of the US and it's getting more populated, so that trend is going up. The non-point source pollution is getting worse due in large part to increased development. Now fisheries has their set of indicators where they're measuring fishery stocks and it's very difficult to put that picture together in terms of an ecosystem where some stocks are going up, some stocks are going down, and where you have trophic cascades going on. You might not be able to speak for the entire ecosystem but they're trying to put that picture through individual stocks or suites of stocks. Again, that's not in an ecosystem context.

Q: Here's the ultimate question. Do we really know the status of the ecosystem in the Gulf of Maine?

A: I think we can generally say thumbs up or thumbs down but not in an ecosystem context. It's still stove piped in terms of the way we measure.

(US Federal Employee 4)

From the series of interview segments above it appears that at least as of when these interviews were taken in 2006 and 2007 some questions remained as to the status of the ecosystem in the Bay of Fundy/Gulf of Maine. It is my view that a complete picture of the current state of the system is still missing.

In the Bay of Fundy/Gulf of Maine governance regime there has never been an identification of intelligence needs that was then then enabled by cooperative agreements among relevant entities to assure reliability, compatibility, timely analysis and accessibility. Further, what intelligence that exists has not been the product of a broad array of participants that includes scientists, academics, the regulated public, and the public at large.

We perhaps need to break the monitoring needs down. Let's at least say that monitoring should be sufficient to give governance and the public notice of a problem or even indications that a policy change has helped or harmed. In this study we have focused primarily on the threats posed by overharvesting, shoreland development, pollution (chemical and nutrient), climate change and, to a lesser degree, invasive species (Steneck, Vavrinec et al. 2004).

Let's pick a couple of these threats and see if the status of the region's ecosystem is such that it has the resilience and integrity to either survive the threat or to bounce back from the harm caused by the threat. First we'll examine the threat posed by overfishing.

Are our intelligence efforts reliable, compatible, with timely analysis and accessibility?

Is the intelligence the result of collaboration between a broad cross section of participants including scientists, academics, the regulated public and the public at large? Here are the views of someone active in fisheries management:

Q: Do you think that with the technology that we have now we know the status of the catch as we go?

A: I think we have a pretty good handle on landings. I don't think we have a good handle on catch, which includes discards. I think we have better monitoring, observer coverage, to really figure out what's being caught out there.

Q: And what do we have now percentage-wise for observer coverage.

A: Not near enough. I'd say five to 20% depending on the fishery. The amount of funding needed for observer coverage is not there.

Q: Hasn't been for awhile?

A: Hasn't been for a long time.

Q: And you keep asking for it and it doesn't come?

A: Right. It doesn't come.

Q: Does industry or the Council support observer coverage?

A: Well, we've asked for a national program that appropriates the funding so we can get a good handle on catch. Observer coverage will also help stock assessments. You know those fish are primarily dead if they're caught. If you're catching more fish than landings show and that gets built into the scientific survey, stock assessment, there may be more fish than the science is saying. Or there may be less, I don't know. But they're not including a critical element, the total catch, the total mortality, it's not being included in every fishery. In some of them we do include discards because there has been sufficient observer coverage to give you the accuracy and precision that scientists say they can use. I think that our new, we just passed a standard by-catch reporting plan, and it lists the different percentages of boats that should have an observer that would give you that accuracy and precision to quantify discards based on the sample size of observer coverage. But most of us know that if you've got

an observer on the boat you change your behavior and that's a problem. My goal would be 100% observer coverage and 100% dockside monitoring. That to me will give you the best available science. It's expensive but it's where I'd go. Stop spending money in other places and 100% observer coverage and 100% dockside monitoring. Then you'd have real time data. (US Federal Employee 3)

Thus without 100% observer coverage, NEFMC data can only tell us something about how many fish are *landed* i.e. brought to port and sold. Due to bycatch<sup>100</sup> and other issues, we simply don't know the total mortality of fish caused by fishing. Given the amount of fishing activity in the region, this is a rather frightening gap in our ability to monitor fish populations.

Fishery management also relies on data from bottom trawl surveys conducted by the National Marine Fishery Service. Making estimates of fish populations, and then proscribing total allowable catch limitations on a species-by-species consistent with the National Standards set forth in the Sustainable Fisheries Act (1996a) is no easy task. As P.A. Larkin said in his 1976 keynote address to the American Fisheries Society:

No one can deny that hypothetical animal populations can produce hypothetical maximum sustained yields, but the same cannot be said of real animal populations that are really being harvested (Larkin 1977, 3)

No one can seriously argue that the monitoring and assessment of the status of the fishery in the Bay of Fundy/Gulf of Maine is not an endeavor fraught with uncertainty. To use one example already touched on in this study, the status of the cod stock in the Gulf of Maine was assessed using a peer-reviewed assessment process along with other

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<sup>100</sup> National Standard 9 of the Sustainable Fisheries Act states "Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch." The SFA defines bycatch as "fish which are harvested in a fishery, but which are not sold or kept for personal use," and includes regulatory discards – or the discarding of fish caught but unable by law to be kept or landed. (1996a). Sustainable Fisheries Act Amendments of 1996. USC. US. 16.



groundfish species managed under the Northeast Multispecies Fishery Management Plan in 2008. That assessment resulted in a determination that the cod stock was rebuilding and that prospects for a full recovery by 2014 were good. Annual catch targets and total allowable catch (“TAC”) were adjusted upwards as a result.

The peer-reviewed 2008 study turned out to be wrong. The 2010 data suggests that Gulf of Maine cod recruitment (the number of fish born each year) has been below average. Rebuilding by 2014 is no longer possible. Within the stock, there are few fish older than age 9 in a stock with a lifespan of over 20 years. Finally, what’s left of the stock has contracted into an area in the western Gulf of Maine which is where the last vestiges of a cod industry is located. Why is the 2008 assessment wrong and 2011 assessment correct? It is apparently because the 2011 assessment does a better job of dealing with uncertainty.

Thus stock assessments for commercial fish, or for any fish for that matter, have inherent uncertainties. Do we know the status of the Gulf of Maine ecosystem without truly having a handle on fish stock abundance and distribution? Maybe. If we learned from our 2007 mistakes and are now better able to factor uncertainties into the assessments. Of course, there are no guarantees that uncertainties won’t increase and become more complex. The water temperature in the Gulf is increasing. The water chemistry is changing and salinity is decreasing as more fresh water from glacial melting surges into the Bay of Fundy/Gulf of Maine bringing with it a changing nutrient regime (Townsend, Rebeck et al. 2010). Further, the composition of the phytoplankton – the bottom of the food chain - community is changing (Balch, Drapeau et al. 2007). Clearly uncertainty will remain a factor in future stock assessment.

Fish stocks and stock assessments are tricky. But what about indicators that tell us about water quality. Is it getting better or worse? What do we have as indicators? If so, is their existence the result of a system designed to facilitate the identification of intelligence needs that is then enabled by cooperative agreements among relevant entities to assure reliability, compatibility, timely analysis and accessibility? Does our water quality intelligence come from a broad array of participants that includes scientists, academics, stakeholders, and the public at large?

As we see from a Canadian federal regulator, the stove pipes are still a problem when it comes to monitoring and indicators for, among other things, water quality:

Q: The status quo right now is, separate departments, separate indicators, separate monitoring?

A: Largely. Largely. Now there are good examples of collaboration, a few departments working together. I think, when we talk about our priorities, there's always the need for more consistent set of indicators, collaborative monitoring, sharing of the data, joint interpretation, feeding into more than one body for decision making. (Canadian Federal Employee 2)

Contamination continues as a persistent and perhaps growing problem within the Bay of Fundy/Gulf of Maine. The GOMC has identified sewage, nutrients and mercury as the three contaminants of greatest concern to the BoF/GoM. There has already been discussion of all of the above, including the problem of un- or under-treated sewage, nutrient overloads (not unrelated to the sewage issues), and mercury, particularly the fish consumption advisories involving mercury burdens in fish tissue.

Mercury burdens, nutrient overloads, and sewage contamination are, of course, monitored by the appropriate federal, state/provincial, or local government charged with

that responsibility under law. The water quality issue gets murkier when the discussion turns to the emerging threats posed by persistent and bio-accumulative chemicals making their way into the pelagic food chains and their risks.

The Gulf of Maine Council on the Marine Environment sponsors a valuable and vitally important monitoring program involving the collection and testing of mussels from around the basin for the presence of a range of chemical contaminants. Mussels, of course, are filter feeders. Thus contaminants in the water column accumulate in their tissues through feeding and surface contact. Obviously, tissue concentrations of chemicals are indications of the presence or absence of chemical constituents in the water.<sup>101</sup> Thus environmental concentrations their tissue contains a wealth of information as to the presence, or not, of a variety of contaminants. With the collection of mussel tissue on an annual basis conducted mostly by volunteers, the Gulfwatch program is charged with:

... the assessment component of the GOMC's 2007-2012 Action Plan Goal 2 (of 3): *Environmental conditions in the Gulf of Maine support ecosystem and human health*. Two monitoring goals were established to help meet the goals of the current Action Plan and the mission of the Gulfwatch Program:

- (1) Conduct regional contaminant monitoring using the blue mussel (*Mytilus edulis*) as an indicator of exposure to organic and inorganic contaminants
- (2) Assess the status and trends of chemical contaminants in coastal habitats of the Gulf of Maine and Bay of Fundy. (LeBlanc, Krahforst et al. 2011)

Thus the GOMC has sponsored, over time, a valuable monitoring program that has tracked the presence of ten heavy metals (Ag, Al, Cd, Cr, Cu, Fe, Hg, Ni, Pb, Zn) and

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<sup>101</sup> <http://www.gulfofmaine.org/gulfwatch/mussels.php>

a number of organic compounds, including aromatic hydrocarbons, chlorinated pesticides, as well as a range PCB congeners<sup>102</sup> in the water column around the BoF/GoM since the mid-1990s.

While it is somewhat comforting that the Gulfwatch program sponsored by the GOMC has monitored to some degree heavy metals and some PAHs and PCBs in the water column and designated regions around the basin, there is still a fundamental issue with respect to what is done with these results. The results of the Gulfwatch indicate that the regional ecosystem remains exposed to low levels of PCBs, DDT, and residues, long after their use was banned. Further, many bioaccumulative industrial chemicals in the Gulf's ecosystem have yet to be characterized for risks to human health and biota in the region. These include nanomaterials, plasticizers, toxaphenes, and fire retardants like PCDEs. Further, endocrine disrupting chemicals including pharmaceuticals, estrogens and personal care products, many the common constituents of normal wastewater discharges, are present in the waters of the BoF/GoM (Wells 2010).

The list could go on. Emerging chemicals from point and non-point sources that threaten ecosystem resilience and integrity include the common herbicide atrazine, bisphenyl (think plastics), and other dioxin-like compounds, non-ionic organics, the antimicrobial agent triclosam, and other unfortunately ubiquitous chemicals that are part

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<sup>102</sup> A PCB congener is any single, unique well-defined chemical compound in the PCB category. The name of a congener specifies the total number of chlorine substituents and the position of each chlorine. For example: 4,4'-Dichlorobiphenyl is a congener comprising the biphenyl structure with two chlorine substituents, one on each of the #4 carbons of the two rings. In 1980, a numbering system was developed which assigned a sequential number to each of the 209 PCB congeners.  
<http://www.epa.gov/osw/hazard/tsd/pcbs/pubs/congeners.htm>

of the hundreds of household, industrial, and other chemicals in common use (Wells 2010). Many of these “new” chemicals of concern are being increasingly detected in the Great Lakes (Figure 22). Despite the harm posed by their present in the water column and tissue of fish, pinnipeds, and humans, there is no monitoring for these substances in the Bay of Fundy or Gulf of Maine (personal communication S. Jones).

Chemical/Group	Comments
Perfluoro-octane sulfonic acid (PFOS) and amide derivatives (e.g. N-ethylmorpholine)	PFOS in cold water fish (minnow, fish)
Perfluoro carboxylic acids and related perfluoro alcohols	PFOA found with PFOS; terminal residues of perfluorinated alcohols?
Brominated diphenyl ethers (pentabromo-decaboro)	Increasing concentrations in GB Herring gull egg and lake trout (Great Lakes)
Chlorinated naphthalenes	Contribute to TCDD/ planar PCB TEQs; fish and fish eating birds
Chlorinated paraffins (C10-C17 chlorinated alkanes)	Similar concentrations to PCBs in sediments
Pharmaceuticals e.g. ibuprofen, clofibric acid, diclofenac, carbamazepine	ng/L in tributary waters and MWTP effluents
Phenols (e.g. alkyl phenols, TBBPA, etc.)	Phenols in GB found in effluents and in tubular molluscs
Current use pesticides (e.g. atrazine, metolachlor, endosulfan)	Atrazine persistent in oligotrophic waters

Figure 22 "New" Chemicals of Concern" adapted from (Suzuki 2000)

Certainly there is a need to monitor for the presence of these substances, but perhaps a bigger question looms: armed with the knowledge of the presence of these compounds in our water and the food chain, what can be done under the current governance scheme? Do we need to wait for an outbreak of disease or some other tragic consequence before the governing agencies around the BoF/GoM decide to roll up their sleeves and get to work to solve problems?

These examples are merely representative of the many issues and conflicts that confront our current fragmented and egocentric governance system. The intelligence

mechanisms that exist under the current regime are sufficient to put us on notice that there are threats – some more tangible at the moment than others. Yet there is no movement to change, no educated public driven to stand up and say “enough.” Thus the status quo of intelligence in a piecemeal, agency-by-agency fashion will inevitably continue.

Which brings us, however briefly, to another characteristic of intelligence in our ideal model: Intelligence must be communicated to an accountable entity for analysis and coordinated action, i.e. a person, partnership, or other entity that has an obligation or responsibility to an authority, group, standard, mandate or behavior norm *external* to that person or entity. Intelligence and information must be made readily available to researchers, scientists and the public.

In the case of the Bay of Fundy/Gulf of Maine governance regime, most intelligence is performed by the agencies with responsibility to manage activities within their jurisdiction or by NGOs that have conferred upon themselves some portion of the overall picture. The information gathered via such intelligence is generally used within each agency or NGO in order to help achieve the mission and goals of the respective institution to satisfy the expectations of government overseers or, in the case of NGOs, to gather information relevant to their mission and make a case for increased donations. Intelligence, as exemplified by the data generated by Gulfwatch, is often made available by members to the GOMC. Unfortunately, as we have seen, the GOMC has no authority or responsibility to act upon whatever intelligence it might receive from Gulfwatch or any of its member agencies. Further, it is absolutely powerless to act upon anything

concerning the fishery, as this exchange with a veteran member of the Council's working group illustrates:

Q: You haven't got fish.

A: No, that's an explicit decision taken by the Council years ago. The effort, just don't go there. I think that's a practical reality of these initiatives. There's some things that you just can't tackle. Either you don't have the capacity or they're going to be divisive, or they're felt to be handled reasonably well elsewhere.

Q: Would it be a good thing to bring the fishery into this?

A: From an ecosystem governance perspective, in the definitional level, yes. To be that sort of comprehensive, I mean it's a pretty significant impact on the ecosystem, so yes, obviously. Practically given fisheries management in Canada and the U.S. and its history and current activities, I would say no. So, I think any ecosystem initiative will always fall short of the full ideal definition. There are some things practically you're not going to deal with. (Canadian Federal Employee 2)

So the requirement of our ideal model calling for intelligence to be turned over to an accountable authority, which translates into an entity that has the ability via enforcement or coercion to try and implement change in the face of challenge, is absent in this region. Furthermore, while a great deal of information is available to interested parties, there exists little reason for the public to seek out such information. There is little in the way of dedicated and aggressive outreach that might be capable of creating a knowledgeable citizen base capable of speaking for the public good.

The need for public pressure and political persuasion from the perspective of the integrity and resilience of the Gulf has never been more apparent. The question of what can be done brings us to the task of Promotion.

Promotion. Using data and information gathered as part of the intelligence function, recall that promotion, sometimes called estimation, involves the “thoughtful assessment of options and alternatives” (Brewer and deLeon 1983, 83). Promotion serves the function of recommending and mobilizing support for policy alternatives and serves to define and even limit the possible solutions to a problem. It is the stage where information and data gathered as a result of the intelligence task are debated and discussed and alternatives and options are recommended and debated (Clark 1997).

As we have seen, promotion under an ecosystem-based approach to governance differs markedly from the *status quo*; that is, expert-driven planning models that rely almost exclusively on science- and expert-based technology. We have noted that under the traditional view, generally only experts are qualified to make and implement sound management plans. Promotion is largely the role of bureaucracies – bureaucracies that are also responsible for enforcement of uniform rules and regulations (Fiorino 2006).

Promotion also includes politics, bringing with it an array of political parties, lobbyists, pressure groups, people, and powerful organizations of all types (including business and environmental groups) working to shape and share values. (Lasswell 1971; Brewer and deLeon 1983; Clark 2002; Clark 2008). While it has been noted that the participation of a broad range of promotional actors, many with opposing interests and values creates an “agitational intensity to the dissemination of a value demand”, it is nonetheless preferable to the totalitarian alternative of placing promotion exclusively in the hands of a single party that monopolizes and controls debate (Lasswell and MacDougal 1992, 29). Politics, as discussed earlier in Chapter III and reiterated in Chapter IV, need not be divisive and polarizing. Indeed, in an ideal world, healthy



politics that includes “policy relevant science, pertinent local information, constructive public involvement, and conflict resolution – can serve to clarify and secure the common interest in knowledge generation for environmental decision processes” (Ascher, Steelman et al. 2010, 8).

Table 53 Promotion

<b>Ecosystem-based Approach</b>	<b>BoF/GoM Approach</b>
<p>Promotion and politics involve honest debate using policy relevant science, pertinent local information, constructive public involvement, and conflict resolution in order to clarify and secure the common interests (as opposed to special interests) and secure knowledge generation for environmental decision processes. Hard questions are asked and “difficult” data is not neglected. Constructive, honest, debate helps to promote trust and cooperation and equitable outcomes are pursued through the open sharing of knowledge and open debate with broad participation.</p>	<p>The activities that impact the ecosystem of the region are governed by separate agencies, each responsible for some piece of the picture. Although the goals of the GOMC require joint action, promotion to actually develop and implement policies that would benefit the region as a whole and require binational action is unlikely. Hard questions, like fisheries are ignored and left to individual agencies. Constructive, honest debate that help to promote trust and cooperation is generally absent. No debate can be productive if no one takes the side of the resilience and integrity of the Gulf as a whole.</p>

The politics of promotion should include honest debate about what to do.

Further, in our ideal system, the overall decision process should provide “ a means of reconciling (or at least managing) conflict through politics in order to find a working specification of a community’s common interests” (Clark 2002, 57). (Table 53)

In the BoF/GoM region, promotion is largely accomplished through the agencies responsible for some component of the activities that impact the ecosystem or NGOs with an interest in changing the policies pertinent to some component of the same ecosystem. Promotion via fragmented agency and NGO initiatives does not bode well for the region’s ecosystem.

There is a fundamental paradox that exists with respect to the goals, objectives, and operating principles articulated by the GOMC in their most recent Action Plan. The paradox is that the goals and principles to which the membership of the GOMC has committed require a degree of coordinated action that existing institutional arrangements are unlikely to provide. Promotion of the resilience and integrity of the Bay of Fundy/Gulf of Maine ecosystem, and its interacting physical, biological, and chemical components, is the job of no one. There is not one overarching entity with the real or implicit authority to speak for the health of the ecosystem. Thus promotion is left to the individual GOMC members and, to some extent, NGOs who elect to involve themselves with issues pertaining to the Gulf. Each is ultimately responsible primarily to its own constituencies. So, and here paraphrasing Lynton Caldwell (1993), who speaks for the Bay of Fundy and the Gulf of Maine?

Promotion on behalf of the Bay of Fundy/Gulf of Maine is therefore, well, non-existent. The GOMC is without authority to mediate disputes or to hold member agencies accountable. There is no organized umbrella organization of NGOs determined to bring sanity to the deteriorating situation in the region. Promotion is therefore a one-way street with industrial and commercial interests attempting to exploit the resources of the region and regulatory agencies trying to enforce laws that require moderation at the risk of political retribution. Thus promotion in the BoF/GoM is at present a tool for a variety of special interests that include industry, agencies, and NGOs. No one, to my knowledge, is in a position to speak for the Gulf.

Prescription. In the prescription, or *selection*, phase, the data, values, and interests distilled from the intelligence and promotion tasks are used to select appropriate

law, policy, or management options appropriate to the targeted challenge. The activities and process used in this phase result in the establishment of new rules or guidelines to solve a problem or deal with an environmental conflict or issue (Clark 2002; Clark 2008).

Table 54 sets forth the characteristics of prescription using an ecosystem-based approach to governance. Without repeating them verbatim, the common thread is that prescriptions should transition to involve greater use of cooperation and collaboration in their enforcement and compliance processes. The process doesn't have to be as adversarial as they appear to be at present and more and more partnerships between industry, government, and communities could issue in an era of "softer" regulation to replace the adversarial legalism that marks compliance and deterrence efforts at present.

As has been discussed, there is no treaty in operation that currently governs the activities of the United States and Canada impacting the health and resilience of the Bay of Fundy/Gulf of Maine watershed. Each country, as we have seen, regulates activities through agencies and entities operating under their respective national, state, provincial, or local laws. Many, if not most, of the existing prescriptions were summarized in the Participants task of the Social Process.

Other major prescriptions have been liberally sprinkled throughout this chapter. This section will briefly outline the underpinnings of prescriptive development in Canada and the U.S. and briefly discuss the more major legislation and how the countries may differ in their approach to statutory creation and implementation.

Table 54 Prescription

Ecosystem-based Approach	BoF/GoM Approach
<p>A transition away from adversarial methods designed to punish violations toward greater emphasis on cooperation and collaboration between private and public entities to prevent pollution, reduce risk, and promote sustainability. New relationships, structures, and roles are fashioned by careful planning with broad-based involvement and implemented on a trial and error basis in order to facilitate learning</p>	<p>There doesn't appear to be any movement to transition away from traditional command and control agency strategies. There also doesn't appear to be the kind of broad-based involvement planning required by our ideal model, although that may be changing as provinces and states begin to plan for climate change impacts.</p>
<p>Adversarial strategies and deterrence are not the only way to influence behavior. Collaboration and cooperation with partnerships designed to achieve economic goals, can promote eco-efficiency, innovation, and sustainability.</p>	<p>Generally adversarial strategies and deterrence methods continue to be the main methods that agencies use to influence behavior. I see no movement toward more collaboration and cooperation, including public/private partnerships, designed with community assistance to achieve economic goals.</p>
<p>Community and regional involvement in the development and enforcement of environmental regulations can increase learning, inform the public, and lead to greater progress towards goals.</p>	<p>With some exceptions, community and regional involvement in the development and enforcement of environmental regulations is largely absent. Without this opportunity, we lose an important opportunity to build capacity and develop an informed a public that could promote the public good.</p>

Before any discussion of specific laws in Canada and the U.S. are discussed, however, it is incumbent on us to have some understanding of the sources of powers of government and rights of individuals. Organic acts, generally constitutions, are the painstakingly negotiated documents that define the rights of government and those of individuals. In the United States, constitutions created the federal government as well as all state governments. Local governments are generally created by charters (Sullivan 2001).

The United States government arose out of the smoke and fury of armed revolution. Suspicious of power and authority, the U.S. Constitution was carefully

negotiated so as to embrace strict separation between the executive, legislative, and judicial branches of government. No single branch of government may encroach upon the powers of another and, as we all learned in bygone days, a system of “checks and balances” is designed to keep government honest. Thus the U.S. president may not serve in Congress while serving in the office of the presidency. Indeed a U.S. president is often unable to control Congress when a majority of Congressional members may be from a political party different than the president. The system, the “checks and balances,” can make it very difficult for a president to implement the very programs that were promoted during a political campaign and probably formed the basis for his or her election. Again, this process is simply a reflection of the American suspicion and mistrust of the power of the state, and the preference for limiting or hobbling government as the best means to protect individual liberty (Wilson 2000; Monahan 2002; Plater, Abrams et al. 2004).

Further fragmenting the U.S. attempts at controlling ecosystem-impacting behavior through bureaucratic efforts is the federalism inherent in the U.S. system. Federalism is a way of organizing a nation so that two or more levels of government have formal authority over the same area and people. In the U.S., the same region and its residents are generally subject to several levels of government – federal, state, and local. The 10th Amendment to the U.S. Constitution makes it clear that “The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.”<sup>103</sup> We will now turn to some U.S. prescriptions relevant to governance in the BoF/GoM.

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<sup>103</sup> U.S. CONST. amend. X

The statutes implemented and enforced in whole or in part by the EPA most pertinent to the regulation of the human activities that impact the Gulf of Maine ecosystem are summarized below.

- The Clean Air Act of 1970, 42 U.S.C. §§ 7401 *et seq.* The focus of the EPA's Clean Air Act ("CAA") efforts is the National Ambient Air Quality Standards (NAAQS). State and federal regulation under the CAA has as its objective the attainment of air quality consistent with the NAAQS. Standards are set for "criteria" pollutants. The CAA is included in this report because the EPA has expressly recognized the nexus between air quality and the health of marine ecosystems. Currently many fish consumed in the Gulf of Maine region are subject to Food Consumption Advisories due to contaminants, including mercury, present in their tissues. Mercury is released into the air from coal-fired power plants and incinerators and is deposited onto land and water, working its way up the food chain through fish to people. The EPA has committed to a reduction of mercury released into the air from coal-fired power plants by 22 tons from their 2000 level of 48 tons (EPA 2003).
- Clean Water Act, 33 U.S.C. §§ 1251 *et seq.* Officially known as the Federal Water Pollution Control Act Amendments of 1972, the goal of the Clean Water Act ("CWA") is to "...restore and maintain the chemical, physical, and biological integrity of the Nation's waters."<sup>104</sup> The amendments attempt to achieve

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<sup>104</sup> 33 U.S.C. § 1251(a). The goals section of the act also provides, *inter alia*, for elimination of the discharge of pollutants into navigable waters by 1985 and the absolute prohibition of discharges of toxic pollutants (not an enforceable requirement but a rebuttable presumption that pollution prevention is the most desirable form of pollution control Plater, Z. J. B., R. H. Abrams, et al. (2004). Environmental Law and Policy: Nature, Law, and Society. New York, Aspen Publishers., 626 -627).

maximum “effluent limitations on point sources” of pollution as well as achieve acceptable water quality standards.<sup>105</sup> The CWA contains a broad range of regulatory tools designed to attain its regulatory goals and objectives. The statute prohibits discharges of any pollutant<sup>106</sup> unless authorized pursuant to the permit requirements of the National Pollution Discharge Elimination System.<sup>107</sup>

Implementation of the permit provisions and other sections of the CWA rely upon an express process for federal/state cooperation.<sup>108</sup> The EPA or approved State (or States if there is an approved interstate compact), and the U.S. Army Corps of Engineers, in consultation with USFWS, NMFS, and State resource agencies, also control the discharge or placement of dredged or fill material.<sup>109</sup>

The focus of the EPA’s CWA efforts has been the establishment of technology-based standards for the regulation of point source dischargers of pollutants (outfall pipes, municipal sewage treatment plants, vessels, etc.). States are now being required to turn their attention on non-point discharges and establish water

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<sup>105</sup> The U.S. Supreme Court has made it clear that States play a key role in the enforcement and implementation of the CWA. NPDES permits are secured in the first instance from EPA consonant with its policy “to recognize, preserve, and protect the primary responsibilities and rights of the States to prevent, reduce, and eliminate pollution.” States with an EPA approved CWA enforcement program may issue NPDES permits “for discharges into navigable waters within its jurisdiction.” Further, States play a key role in the determination of acceptable water quality standards, as “effluent limitation” is defined by the CWA as “...any restriction established by a State...on quantities, rates, and concentrations of chemical, physical, biological or other constituents which are discharged from point sources...including schedules of compliance.” Thus States may determine “how clean is clean” as well as the schedule for the clean-up of polluted waters within the state. U.S. Environmental Protection Agency v. California, 426 U.S. 200 (1976).

<sup>106</sup> 33 U.S.C. § 1311(a)

<sup>107</sup> 33 U.S.C. § 1342(a)

<sup>108</sup> 33 U.S.C. § 1342(b)

<sup>109</sup> 33 U.S.C. § 1344; <http://www.epa.gov/owow/wetlands/facts/fact10.html>

quality standards to upgrade waters that remain polluted after the application of technology-based requirements.<sup>110</sup>

Finally, amendments to the CWA since its enactment have added a variety of programs to the EPA's water quality regulatory arsenal. The 1987 amendments, augmented by the 2000 amendments, created the National Estuary Program ("NEP") to improve the quality of estuaries of national importance. The NEP is designed to promote the restoration of estuary habitat, develop a national estuary habitat restoration strategy, and provide the funds for the establishment, research and funding for NEP-designated estuaries.<sup>111</sup> The 2000 amendments also enacted the Beaches Environmental Assessment and Coastal Health Act of 2000 ("BEACH"). BEACH mandates that states with coastal recreation waters adopt water quality criteria and standards for designated pathogens and pathogen indicators. States must submit water quality criteria and standards to the EPA and demonstrate that the standards are sufficient to protect human health. Funding for the establishment of the plan and for monitoring and implementation are available through the Act.<sup>112</sup>

Thus, in terms of the Clean Water Act, the EPA sets the standard for states in the region by regulating point sources Do they have jurisdictional issues? A person

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<sup>110</sup> In brief, the CWA requires that states identify waters that are and will remain polluted after the application of technology standards; prioritize these waters based on the severity of their pollution; and establish 'total maximum daily loads' ("TMDLs") for these waters at levels necessary to meet applicable water quality standards. States are required to submit their inventory and TMDLs to EPA for approval. 33 U.S.C. § 1313(d); <http://www.epa.gov/owow/tmdl>.

<sup>111</sup> 33 U.S.C. § 1330; <http://www.epa.gov/nep>. Estuary programs within the Gulf of Maine watershed include the New Hampshire Estuary Program encompassing Great/Little Bays and Hampton Harbor, the Casco Bay Estuary Partnership in Maine, and the Massachusetts Bay Program encompassing Massachusetts and Cape Cod Bays. <http://www.epa.gov/nep>.

<sup>112</sup> 33 U.S.C. § 1313(i); <http://www.epa.gov/waterscience/beaches/act.html>



knowledgeable about the EPA's efforts in the Gulf of Maine region expressed some issues:

A: To get back to the jurisdictional point. In a nutshell, you know, we were largely concerned with stuff that's fairly close to shore, near coastal area. Obviously when we have dredging and remediation sites that are in federal waters, we have jurisdiction over those. But, NOAA...I think of NOAA as really more of an ocean agency and EPA as sort of more a coastal...if you had to really make some sort of distinction. But, then you have the Coastal Zone Management Act, and the fact that NOAA administers the Coastal Zone Management program with states. There are definitely areas where...there's probably inefficiencies in there, and I think the Ocean Action plan itself, but a court recommended either merging or that certain programs like the National Estuary Program be moved from EPA to NOAA. We didn't like that recommendation... (US Federal Employee 1)

And the EPA and NOAA are trying to collaborate on the US side of the Gulf of Maine as NOAA tries to funnel federal money into the states for improvement of water quality in the coastal margin – when there are funds available – as someone familiar with NOAA's efforts in the BoF/GoM relates:

We don't have any regulatory authority to tell them [states] how to manage water quality – that's really EPA. What's interesting is, and this sort of gets to the question ...a portion of the NOAA grant has traditionally gone to non-point source pollution. That's been zeroed out for the first time this past year. The irony is, the EPA, through their Clean Water Act, also has funds coming to the state to do non-point source pollution. It depends on the state whether or not they're coordinated. And there's some work being done at the national level between EPA and NOAA to coordinate these activities that are receiving funds from two different agencies. But at the end of the day it's really interesting to pool those funds and do something constructive although the funds from the NOAA side just dried up. (U.S. Federal Employee 4)

We started our analysis of the U.S. federal and state prescriptions with a brief introduction explaining the governance scheme set up by the U.S. Constitution with its insistence on separation of powers and federalism. Before we begin our discussion of

some of the more relevant Canadian laws or prescriptions, we should first examine the scheme set up by the Canadian Constitutional documents.

First it should be pointed out that government in Canada has little in the nature of separation of powers. Contrary to the U.S. scheme's seeming obsession with *limiting* the power of the executive branch, the Canadian (and British) approach is to *concentrate* political power in the hands of the executive. Under the doctrine of responsible government, both the legislative and the executive branch are subject to the control of the prime minister. The prime minister controls the executive branch since the governor general (the formal head of the executive branch of government) must exercise all of his/her powers on the basis of the prime minister's advice. Control of the legislative branch flows to the prime minister because the governor general is obliged to appoint as prime minister the leader of the party controlling the greatest number of seats in the elected House of Commons. In this manner, a Canadian prime minister with a majority in the House of Commons has a far greater ability to implement political programs than does an American president (Monahan 2002; Hughes, Lucas et al. 2003).

Federalism, or the division of powers between the federal and provincial governments is under the Canadian governance scheme is set out in the *Constitution Act, 1867*.<sup>113</sup> Rather than following the American 10<sup>th</sup> Amendment example of simply leaving all powers to the states not specifically designated in the U.S. Constitution, Canada's Constitution Act sets forth a list of powers in Section 92 dividing powers between federal and provincial powers that is meant to be exhaustive. Thus provincial governments are to be supreme with their own designated sphere. Pursuant to this list,

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<sup>113</sup> Constitution Act, 1867, 30 & 31 Vict. Ch. 3 (U.K.), as reprinted in R.S.C., No. 5 (Appendix 1985)

provinces can act on pollution that, at the risk of oversimplifying, is local in nature (s. 92(13); s. 92(16)). Given that a lot of pollution arises as a result of land use, pollution regulation is probably of a local and regional nature. Provinces do not, however, have the right to regulate out of province companies. Other sources of provincial regulation may be found in their control and ownership of their land, mines and minerals (s. 109) and non-renewable natural resources, forestry and electrical energy (s. 92A).

The federal power to legislate over environmental matters is clear where such matters have interprovincial and international effects. Parliament's jurisdiction to regulate the environment comes from a number of different sources and it is questionable that any one source gives Parliament the ability to play a strong role in providing national standards and policy. Still, section 92 gives Parliament certain *functional* powers over:

- Navigation and shipping (s. 91(10))
- Sea Coast and Inland Fisheries (s. 91(12))
- Canals, Harbours, rivers and Lake Improvements (s. 108)
- Federal Works and Undertakings (s. 91(29) and 92(10))

Parliament was also granted certain *conceptual* powers giving it general authority to legislate over broadly defined activities which could conceivably include environmental quality legislation:

- Criminal Law (s. 91(27))
- Peace, Order and Good Government (s. 91)
- Taxation (s. 91(3))
- Trade and Commerce (s. 91(2))
- Public Debt and Property (s. 91(1A))

It should be apparent that the Canadian governance system, while it consolidates power in the hands of the Prime Minister and the executive branch, requires a great deal of collaboration, communication and cooperation between parliament and the provinces.

To illustrate this point, the following exchange with a Canadian federal regulator speaks to the permitting of contaminant discharge in Canada:

Q: So, when it comes to for instance discharging of contaminants, does that require a permit from this agency?

A: Depending on the type of discharge. We have, under the Fisheries Act, we have a series of regulations for a number of industrial sectors. So there's the pulp and paper effluent regulations, chloro-alkali plants, a bunch of others. Municipalities would regulate sewage discharges on the domestic end.

Q: With no permit needed from federal.

A: Correct. With the uncertainty of where the line is and where the division of legal mandates and roles and responsibility, and the Canadian way of just avoiding the question, where we've come and the way we've been operating for years is by saying look, do both levels of government have an interest in this coastal area. Yes, absolutely. Will trying to resolve this and say someone wins and someone loses or someone gets A and someone gets B, going be helpful and productive? Not really, because we realize that you need at least both levels of government working together. So in the absence of that clear definition, we say they both have an interest in the near land and the near shore, and so let's just work together. (Canadian Federal Employee 2)

Thus we see that the legal/jurisdictional structure in Canada helps to promote dialogue between federal, state, and local governments in order to act on ecosystem-related prescriptions

As we did with U.S. laws, we can take a summary glance at the more significant Canadian environmental prescriptions.

In Canada, the Fisheries Act (1985) is federal legislation dating back to Confederation.<sup>114</sup> It was established to manage and protect Canada's fisheries resources. It applies to all fishing zones, territorial seas and inland waters of Canada and is binding to federal, provincial and territorial governments. As federal legislation, the *Fisheries Act* supersedes provincial legislation when the two conflict. Consequently, approval under provincial legislation may not necessarily mean approval under the *Fisheries Act*. This Act deemed the Government of Canada responsible for sea, coastal and inland fisheries, navigation and migratory birds and fiduciary responsibility to aboriginal people. Provincial governments were given the right to make laws governing property, public lands and property rights. While the Government of Canada has the authority to manage fish habitat, it has essentially no control over the use of inland waters, beds of watercourses or shorelines which fall under provincial jurisdiction. Alternatively, the provinces cannot make regulatory decisions concerning fish habitat.

Water quality prescriptions are generally set forth in the Canadian Environmental Protection Act, 1999 (1999) ("CEPA") and are the responsibility of Environment Canada (EC). The goal of CEPA is to contribute to sustainable development - development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. EC also has responsibilities for pollutants under the Fisheries Act (1985) as well as the other duties and responsibilities set forth in the Goal Clarification section above.

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<sup>114</sup> July 1, 1867, the day that three British colonies were formed into four Canadian provinces. The British Province of "Canada" was divided into the new Canadian provinces of Ontario and Quebec, and two other British colonies, New Brunswick and Nova Scotia, also became provinces of Canada.

The federal oceans policy in Canada is bolstered by prescriptions with strong language that promote integration, innovation, and collaboration in government of the oceans, including the development of Large Ocean Management Areas (“LOMAs”) (1996). The Oceans Act was followed by the Oceans Action Plan (2005 – 2007), then by a 2007 Health of the Oceans (“HOTO”) promising five years of funding which included cooperation between domestic and international partners as but one of its five initiatives. Curiously, the effect of the strong ocean policy in Canada has not been what one would have expected. The development of LOMAs under the Oceans Action Plan in general has been slow. Even the Eastern Scotian Shelf Integrated Management Plan (“ESSIM”), a LOMA that was in the advanced stages of formation off the coast of Nova Scotia, has stalled.<sup>115</sup> As a note of caution, one commentator has drawn attention to a 2005 Auditor General review of the Oceans Act which found that following its passage

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<sup>115</sup> The Eastern Scotian Shelf Integrated Management Plan (“ESSIM”) in Atlantic Canada involved over ten years of stakeholder involvement to develop a final draft plan. ESSIM was Canada’s pilot integrated management effort, and drew upon stakeholders to come up with a plan to deal with a coastal margin with competitive uses that included a Marine Protected Area (The Gully), “...protected areas of cold-water corals, multispecies fisheries including ground fisheries, small and large pelagic fisheries, crab, lobster, and an extensive Aboriginal Communal Commercial Snow Crab fisher, dragger, long line, oil and gas exploration, works, seismic activities, oil and gas pipelines, other oil and gas development projects, marine transport...” GOMC (2012). Action Plan 2012 - 2017, Gulf of Maine Council on the Marine Environment: 15.. With what I assume was a tail wind from the from the 2005 Ocean Actions Plan, which favored “Integrated Oceans Management” as one of its four pillars Ricketts, P. J. and L. P. Hildebrand (2011). “Coastal and Ocean Management in Canada: Progress or Paralysis.” Coastal Management 39: 4 - 19., and with the establishment of a 32 member Stakeholder Advisory Council (“SAC”) comprised of a diverse group of shareholders that agreed to share the responsibility for leadership toward the ESSIM vision, ESSIM stalled. Although a plan was drafted with SAC guidance and submitted to the government for approval in 2007, the plan has yet to be approved. A survey of SAC members places blame on lack of leadership by the government – and expresses the notion that whereas multiple stakeholders can work together, apparently governments cannot GOMC (2012). Action Plan 2012 - 2017, Gulf of Maine Council on the Marine Environment: 15.

the oceans ceased to be a government priority, and that government had failed to meet its obligations under the Act (Ricketts and Hildebrand 2011).<sup>116</sup>

With respect to coastal conflicts and issues, we have seen that the provinces work with the federal government, chiefly with DFO for aquaculture issues and Environment Canada for water quality issues.

With respect to how well the existing governance regime in the region matches up to ideals, let's look at our three model characteristics. First, there doesn't appear to be any movement to transition away from traditional command and control agency strategies. There also doesn't appear to be the kind of broad-based involvement planning required by our ideal model, although that may be changing as provinces and states begin to plan for climate change impacts. Second, generally adversarial strategies and deterrence methods continue to be the main methods that agencies use to influence behavior. Our ideal model requires a transition toward the using more collaboration and cooperation, including public/private partnerships, as a means of achieving economic goals and promoting innovation. Finally, community and regional involvement in the development and enforcement of environmental regulations is largely absent. Without this opportunity, we lose an important opportunity to build capacity and develop an informed a public that could promote the public good and, perhaps, begin to give a voice to the Gulf.

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<sup>116</sup> The Canadian experience may have lessons for the U.S. as the new U.S. Oceans Policy evolves. Clearly there has been institutional resistance at the various levels of government in Canada to the various initiatives under the Oceans Strategy and HOTO. There is no reason to think that there won't be the same kind of reaction to the national movement toward an ocean policy in the U.S. The resistance is likely to be worse in areas like the U.S. Northeast that never worked with a River Basin Commission and don't have a favorable history of collaboration.

Given the attention that has been paid to prescriptions in both countries throughout this chapter, largely because governance operates on an agency-by-agency basis, the significant prescriptions enabling government to attempt to control the human activities that impact the ecosystem have largely been covered where necessary throughout this chapter. To avoid redundancy, we will move on to discuss the task of Implementation.

Implementation. As we have discussed, implementation combines the policy analysis framework categories of invocation and application. Invocation includes the initial actions that communities and institutions to invoke, enforce, or otherwise implement a prescription. Application is the process that a community chooses to ultimately characterize the subject behavior and determine what behavior violates the prescription and how such behavior should be sanctioned (Clark, Willard et al. 2000; Clark 2002) .

Table 55 highlights the some of the “ideal” characteristics of implementation for an ecosystem-based governance approach. They can be summarized as requiring a need to move away from adversarial relationships toward more collaborative and cooperative processes designed to solve problems with strategies that are developed and shared with the input of scientists, regulators, the regulated community, and other interested parties.

As we are all too aware, implementation, as with enforcement, in the Bay of Fundy/Gulf of Maine region is completely the task of bureaucratic agencies. There is little in the way of transition away from the seemingly entrenched traditions of bureaucratic rationality adversarial legalism.



Table 55 Implementation

Ecosystem-based Approach	BoF/GoM Approach
<p>Transition is needed to move implementation toward more community-driven, more voluntary, cooperative systems. Government could assist with the identification and clarification of community goals as well as develop measureable standards. It would be up to regional or community efforts to develop solutions to bring environmental indicators into compliance with those standards</p>	<p>Implementation in the Bay of Fundy/Gulf of Maine region is completely the task of bureaucratic agencies. There is little in the way of transition away from the seemingly entrenched traditions of bureaucratic rationality adversarial legalism. Agencies continue to control behavior through a system of rules that prescribe uniform standards for diverse circumstances.</p>
<p>Adversarial relationships should give way to cooperative and collaborative ones with the emphasis on interactions designed to solve problems with strategies that are developed and shared with the input of scientists, regulators, the regulated community, and other interested parties. In consultation with industry, citizen groups, and government officials, plans created through collaboration can look beyond “end of pipe” discharges to “identify and change activities that cause pollution in the first place. Command and control could gradually be replaced with incentives and learning through trial and error.</p>	<p>Government sets the requirements that regulated rules must follow. Anyone failing to meet the requirements is faced with penalties of one sort or another. Deterrence is the primary motivational strategy. Communities and the public not meaningfully involved in the determination of standards and rules with which the community will comply. It also fails to permit meaningful community participation in the determination of what conduct should be considered sanctionable. In essence, the public is shut out of the implementation of compliance and deterrence standards.</p>
<p>More reliance upon facilitation, mediation, and other forms of alternative dispute resolution. If litigation is necessary there should be specialized courts with knowledge of science and environmental factors.</p>	<p>ADR is becoming more popular to increasing unavailability of judicial intervention due to budget cuts. Use of facilitation and mediation is increasing. No movement toward specialized courts for environmental issues.</p>

Agencies continue to control behavior through a system of rules that prescribe uniform standards for diverse circumstances. Government sets the requirements that regulated rules must follow. Anyone failing to meet the requirements is faced with penalties of one sort or another. Deterrence is the primary motivational strategy (Kagan 2001; Fiorino 2006). This scenario is a far cry from our ideal of involving communities and the public in the determination of standards and rules with which the community will comply. It also fails to permit meaningful community participation in the determination of what

conduct should be considered sanctionable. In essence, the public is shut out of the implementation of compliance and deterrence standards.

Our ideal model also calls for more reliance upon facilitation, mediation, and other forms of alternative dispute resolution. Perhaps this is a role that the GOMC could assist with developing as members might be able to create ways to resolve conflicts and differences and resolve disputes involving agency-agency and agency-public conflicts. In any event, from personal knowledge and experience, the use of ADR in all its forms seems to be on the rise, if for no other reason than the prohibitive costs involved in traditional litigation.

Finally, our model suggests that if litigation is necessary there should be specialized courts with knowledge of science and environmental factors. While this idea has caught on in a variety of nations, I have seen no movement in either the U.S. or Canada to create a specialized environment court. Indeed it appears that existing courts are having difficulty getting funding to hold onto the judges and staff that they have.

Thus there appears to be little movement in the BoF/GoM region towards a more ecosystem-based approach to the task of implementation.

Appraisal. As discussed more fully in Chapter III, appraisal involves the task of assessing whether relevant prescriptions and their implementation have effectively met the goals set by the community and who is responsible and accountable (Lasswell 1971; Ascher, Steelman et al. 2010).

Table 56 sets forth the characteristics for appraisal under an “ideal” ecosystem-based approach to governance. At its most basic, the ideal model requires that there simply be a mechanism for appraisal of policies and actions to determine whether

progress is being made toward the prescribed goals. Further, appraisal should utilize trend data appropriate to the task and include a periodic public assessment of the state of the ecosystem. It is important that appraisal be performed by third parties to enhance the dependability and creditability of the conclusions. Finally, appraisal should be undertaken by an overarching body with the ability to use the knowledge gained to implement change in order to reverse adverse trends.

Table 56 Appraisal

<b>Ecosystem-based Approach</b>	<b>BoF/GoM Approach</b>
Appraisal provides a major opportunity for learning and course correction, for using the lessons of experience to adapt failing practices into future changes. The main criteria for appraisals are dependability, comprehensiveness, continuity and independence	No established mechanism for periodic appraisals in the region. The GOMC's 2010 State of the Gulf Report is written largely by agency employees, although appears to be excellent and comprehensive. Independence, however, could be questioned and impact credibility. Not clear if lessons can be learned or course correction can occur or is even possible.
Trend data from relevant scales must be available and transparent. Local knowledge and scientific efforts need to be combined and included in a periodic public assessment of the state of the ecosystem.	Unknown how trend data was accumulated for the 2010 State of the Gulf Report. If local knowledge and scientific efforts were combined to make the reports possible it is not apparent from the reports themselves.
It is critical that appraisals be carried out by third parties, i.e. not the agencies that are charged with programmatic responsibilities.	There are no third party appraisals in the region other than those carried out through peer-reviewed stock assessment processes by NMFS and the NEFMC.
Existence of a collaborative entity or single overarching body that can, formally or informally, accumulate the knowledge accumulated through appraisals and implement change to reverse adverse trends.	There is no single overarching body that, formally or informally, has the jurisdiction or inclination to accumulate knowledge from appraisals and implement change to reverse adverse trends.

The appraisal process is particularly confusing in the BoF/GoM region. With an ecosystem-based approach to governance, the appraisal process is designed to tell participants "...how well the selected alternative has solved the original problem and, in larger terms, how well the overall decision process has served in achieving common interest outcomes" (Clark 2008, 54).

In order to accomplish thorough and unbiased appraisals, trend data from relevant scales must be available and transparent. Local knowledge and scientific efforts need to be combined. One example is a periodic public assessment of the state of the ecosystem. This provides opportunity for meaningful public education and involvement. Further, it is critical that appraisals be carried out by third parties, i.e. NOT the agencies that are charged with programmatic responsibility (Lasswell 1971; Clark, Willard et al. 2000; Ascher, Steelman et al. 2010).

It is also important, as was stressed in Chapter III, to view the appraisal function as the philosophical and practical home of adaptive governance, which is frequently proposed as a tool to frame the management of the human activities that impact ecosystems (Holling 1986; Lee 1993; Gunderson, Holling et al. 1995). While appraisal is about the assessment of the success of prescriptions and implementation schemes, adaptive governance goes one step further to recommend that we have governance systems that are able to learn from the appraisal process and change course if anticipated results fail to materialize. Included in appraisal, therefore, is the need for trend data obtained through monitoring and other methods designed to inform governance of the status and change in key indicators over time as a result of management actions (Berkes, Colding et al. 2003; Armitage, Berkes et al. 2007; Ascher, Steelman et al. 2010; Steelman

2010). “As a given policy is implemented, information gained is quickly fed back so that it can produce midcourse corrections in the specific policy being studied, and the experience gained can add to the general stock of environmental knowledge” (Steelman 2010, 202). In short, if society is to insist on a shift from regulatory strategies based on bureaucratic control to strategies based on learning and trial and error, appraisal functions that involve a broad base of agency, stakeholder, and public monitoring and assessment will be critical to the quest to achieve common, as opposed to special, interests (Brunner, Colburn et al. 2002; Weber 2003; Fiorino 2006; Brunner and Lynch 2010b).

In the Bay of Fundy/Gulf of Maine region appraisal falls mainly to the same agencies that have programmatic responsibilities relevant to the activities that impact the ecosystem. Information and data, therefore, is collected by a variety of federal, state, and provincial agencies, as well as scientists, academics, and others. There is no mechanism or linked network where databases and information sources are available (Wells 2010). Even if information were readily available and reliable trend data existed from around the basin, there are no clear goals against which to measure the trends. Without clear goals, it is difficult to determine whether trends are moving in the right direction and, if they aren't what type of management or policy change might be needed.

A lot of the problems with appraisal in the region go back to the reality that there is simply no one group with the authority to coerce binational action. There is no one entity responsible for the gathering or accumulation and analysis of data from around the basin, examining the data to determine status and trends, and making accountable decisions to change course or implement new policies or limitations. We have seen that the GOMC has no interest in expanding beyond its “forum” status. There are no other bi-

national groups that have the participation of the agencies responsible for the sustainability of many of the components of the ecosystem. Adaptive governance simply is not possible in this or any other region without a move toward strategies based on learning and trial and error, appraisal functions that involve a broad base of agency, stakeholder, and public monitoring and assessment.

Finally, appraisal must be overseen by a third party – some entity that is not a program charged with administrative responsibility over the subject matter of the appraisal. The Gulf of Maine Council in 2010 began the publication of its State of the Gulf of Maine Report (2010). Despite the existence of many excellent reports over the years, this documents “...is the first Gulf-wide synthesis of pressures on the environment, biophysical and socio-economic status and trends, and responses to identified issues” (Thompson 2010, 1). The report provides several informative chapters, each chapter dealing with a separate issue of concern to the Bay of Fundy/Gulf of Maine watershed. Thus there are chapters on socio-economic issues (Thompson 2010), climate change (Nye 2010), microbial pathogens and biotoxins (Jones 2011), coastal ecosystems and habitats (Gustavson 2010), marine invasive species (Pappal 2010), as well as an excellent summary and explanation of emerging issues in the Gulf of Maine as of 2010 (Wells 2010).

The excellent articles contained in GOMC’s State of the Gulf Report are written variously by federal, state, and provincial employees as well as a consultant or two. There doesn’t seem to be any indication that the public was involved in the accumulation of information that led to the reports. Further, again many of the problems and issues confronting the region are binational – with no mechanism to galvanize a binational

strategy and little demonstration of any inclination to act in an accountable binational manner. Once again, the night seems to have written a check that the morning couldn't cash – or in this case problems and threats are highlighted for which there can be no binational response under the current regime.

Termination. This is the final activity of the decision process and occurs when a problem is either solved by a previously selected prescription or course of conduct or data analysis reveals that the prescription or course of conduct has been unsuccessful at moving the toward the goals of the community (Clark 1997; Clark 2008). As we noted in Chapter III, termination, like appraisal, relies upon the dependable conveyance of knowledge from intelligence generation through transmission, including thorough monitoring to assess whether the knowledge has proved that the original problem has been resolved (Ascher, Steelman et al. 2010). Thus much of the discussion of the Intelligence, Strategies, and Outcome functions earlier in this chapter is relevant to the termination task.

The termination function in an ecosystem-based governance regime requires that there be an independent bridging entity with overall knowledge of trend data that provides periodic public assessments of the status, progress, and need (or not) for the addition or elimination of policies and prescriptions intended to facilitate progress toward the goals specified by prescription (Table 57).

Table 57 Termination

<b>Ecosystem-based Approach</b>	<b>BoF/GoM Approach</b>
Ecosystem-based governance requires the periodic public assessment of the progress, status, and continued need for any environmental policy prescription or implementation scheme. The decision to terminate should be made by a bridging entity with knowledge of trend data.	Termination is the responsibility of whatever agency charged with carrying out a program. There is no periodic public assessment of the progress, status, and continued need for prescription in most agencies with the exception of fisheries management. There is no accountable bridging entity with the knowledge of trend data so no ability to terminate

In order to avoid redundancy I will just point out that agencies within each of the jurisdictions have programmatic responsibility in the BoF/GoM. No independent bridging authority exists with overall knowledge of trend data that provides periodic public assessments of the status, progress, and need (or not) for the addition or elimination of policies and prescriptions intended to facilitate progress toward the goals specified by prescription. Termination, therefore, must be left to the individual agencies as they assess the programs for which they have responsibility. Termination, therefore, is not a binational option.

### **Conclusion**

Chapter V compared the governance regime in the Bay of Fundy/Gulf of Maine watershed with the characteristics for an ideal ecosystem-based approach to governance using the framework provided by the Policy Sciences. Again as viewed through the lens of the framework the difficulties of creating, implementing, and continually appraising the policies and decision-making of bureaucracies of two nations and five states/provinces, and their results, are apparent.



The theme that is emerging through this research is the very real impediment of the fundamental paradox at work when trying to commit binational policy makers to goals and concerted efforts dedicated to the preservation and/or restoration of a shared body of water. Again in Chapter V we now see the interests and concerns of national sovereignty, jurisdictionally fragmented federal, state, and provincial governments, and bureaucratic interests distributed among all participants tend to limit the effectiveness of transboundary institutions. So again, the paradox: The goals of policy that may be best for the health and resilience of the ecosystem are only achievable through a significant degree of coordinated action that is typically absent in existing institutional arrangements (Regier and Baskerville 1986; Becker 1993; Caldwell 1993; Young 1998; Prelli and Becker 2001).

As with Chapter IV, the Policy Sciences framework was used to examine the Problem Orientation, Social Process, and Decision Process in the BoF/GoM. Laws, rules, and regulations were researched to the extent possible and primary documents were consulted. Literature was reviewed. Interviews with key participants in the governance scheme were also utilized.

An examination of the Problem Orientation function highlighted the questionable state of the water quality within the BoF/GoM. It also revealed the overharvested status of much of the region's valuable commercial fishery. The Bay of Fundy/Gulf of Maine is changing. Overharvesting has changed a food web into a food chain. The waters of the basin are freshening as increasing glacial melt waters rush over the banks and through the Northeast Passage, displacing nutrient rich deep slope water. Phytoplankton, the base of the food chain, are being altered as different species adjust to the changing conditions.

Water temperature is rising and the region is beginning to ready itself for eventual sea level rise due to global climate change. There is no question that changes are occurring and that there will be surprises and serious challenges for managers, scientists, and policy makers. There will need to be more than talk to deal with the challenges that are on their way.

An examination of the social process confirmed the importance of including a broad range of participants and understanding their values, perspectives, and strategies. It also highlighted the key element missing in the governance regime in the region: the public. With a few notable exceptions, the social process in the region completely lacks a knowledgeable, active public participant. In an ecosystem-based approach to governance, or even in a healthy democracy, there should be open participation by anyone with an interest in the issues. The social process analysis shows clearly that governance in the region is carried out by numerous federal, state, and provincial agencies using typical top-down command and control strategies to apply uniform laws to a variety of situations. The one institution that exists and brings together regulatory agencies from both countries for periodic meetings that allow for the exchange of ideas and information is the Gulf of Maine Council on the Marine Environment. GOMC basically provides a forum for the discussion of gulf-related issues by the heads of the responsible agencies. It also publishes and distributes excellent information about the Gulf and even the potential threats to the ecosystems of the regions. It has thus far declined to take the next step and become an accountable, if informal, overarching body with the capacity to accumulate data from monitoring efforts around the region, analyze the data, and act through its member agencies be able to change policy and learn by trial

and error – scaling up policies that work, scaling back policies that don't. There is really no other participant positioned to play this role.

Finally, the evaluation of the decision process confirmed that governance on a fragmented agency-by-agency basis is not doing the ecosystem in the region any favors. Participants even at the level of the Gulf of Maine Council have a primary loyalty to their agency or employer. They all have constituencies that demand satisfaction and the Bay of Fundy/Gulf of Maine ecosystem is unable to voice its demands loudly enough to get their collective attention. Without the ability to step away from nationalistic or bureaucratic self-interest, it is unlikely that participants in the governance regime through the GOMC will be freed to adopt a problem-solving approach that includes a free and open flow of ideas and the ability to take bold action to address problems without fear of retribution if failure results. Problem solving through trial and error, at least intentionally, does not appear to be a realistic option in the BoF/GoM.

The threats to the BoF/GoM are coming at it from all directions. Without a governance scheme that can handle the unpredictable surprises that most assuredly will occur, the prospects for the resilience and integrity of the region's ecosystem are not good. I have had the privilege to observe many of the meetings of the Gulf of Maine Council and, more often, its Working Group. I have come away knowing that the people who are involved in the Council, certainly in the Working Group, are extremely dedicated, hard-working people who care about the BoF/GoM watershed. If left up to them, I truly feel they could roll up their sleeves and roll out programs that involve the public and that transcend sovereign boundaries for the good of the ecosystem and its residents. There is frustration with jurisdictional constraints that tend to rob them of the

ability to act in the public interest as often as they'd like. It can still happen – but time is running out.

## CHAPTER VI DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

### Introduction

This study has attempted to gather data and information pertinent to the governance regime in the Bay of Fundy/Gulf of Maine watershed. As we have seen, current governance has failed to reverse ecosystem indications that are trending away from goals that may be assumed to include at minimum the need for clean water and healthy food, and the maintenance of biodiversity. There are stresses on the Bay of Fundy and Gulf of Maine, however, from a number of directions and sources. As we learned from Chapter V, overharvesting has turned a food web into a weak food chain. Pollution has been absorbed and, in the case of persistent organic pollutants and other chemicals that resist breaking down, passed along to a higher trophic level. Pollution and nutrients resulting from land-based activities are harming our estuaries and increasing the incidence of harmful algal blooms. Invasive species are essentially treated as a cost of business in an increasingly global market. Despite these negative trends, government organization and methods are pretty much the same as existed 40 years ago with the adoption of many of the environmental statutes in the U.S. and Canada.

In the Bay of Fundy/Gulf of Maine we have seen that there are stresses from human activities that are negatively impacting ecosystem resilience. Yet the management of those human activities that impact the ecosystem has remained relatively unchanged over the last 40 years. The more we manage the activities that cause the harm in the

same manner and expect different results, the worse the problems in the ecosystem become. And all around us there is a growing body of literature that explains that a new way of management, using an ecosystem-based approach, may improve the chances for ecosystem resilience. But there are a lot of participants, a lot of powerful interests, that rely on the *status quo* and are therefore aligned with the existing governance system. There is fear that the many special interests that stack the current governance system may lose power or wealth if a new governance approach is attempted. It seems that the drum beat marches on, ignoring reality, and pretending that the existing governance and management scheme was good enough forty years ago, so it should be just fine now.

Thus the goal of this research has been to examine whether the existing governance regime of the Bay of Fundy/Gulf of Maine has the capacity to implement an integrated, adaptable ecosystem approach to restore and sustain, over time, the integrity of the respective ecosystems, including the functions upon which the humans in the ecosystem rely. Questions related to this principle research question are set forth in Table 58.

Table 58 Related Questions

<b>Related Questions</b>
What are the current goals of the governance system (units and subunits) in relation to the human uses and anthropogenic threats to the ecosystem in the Gulf of Maine and how do these differ or resemble those of similar ecosystem restoration projects?
What are the barriers that may prevent the current governance regime in the Gulf of Maine and comparable ecosystem restoration areas from managing the living marine resources in the region in a sustainable manner?
What measures have been adopted in more veteran regions with more experience implementing ecosystem-based governance models to modify and improve the governance and management regime so that the critical functions of the ecosystem can be preserved or enhanced while at the same time competing interests can be harmonized in a fair and equitable manner?
How can these innovations be incorporated in the Gulf of Maine, if at all?
How can the policies, priorities, and actions of local, state, provincial and federal entities be integrated to assure a sustainable approach to the management, use and development of coastal ocean resources across political boundaries?

In order to examine the governance regime in the region, the framework provided by the Policy Sciences has been used to distill the various ecosystem-based governance and related concepts into characteristics that provides an opportunity to apply the concept of the ecosystem-based approach to real world regions.

Transitioning from traditional sector-by-sector governance to a more ecosystem-based approach entails change. The critical differences between the traditional approach and an ecosystem-based approach were summarized in chapter III. In some ways, the ecosystem-approach is basically democracy writ large. In chapter III, however, the literature was reviewed and seven characteristics were listed as components of an ecosystem-based governance regime:

- Management for resilience;
- Significant, meaningful public participation
- Integrated, collaborative government involvement;
- Adaptive governance;
- Mobilizing local knowledge;
- Overarching lead or joint institution, and
- A precautionary approach to uncertainty.

These characteristics do not fit within neatly bound boxes separated from each other and there is no precise order or prioritization. There is instead overlap, redundancy, and complexity. The characteristics also do not materialize out of the mist. Using the framework analysis of the Policy Sciences, we can see how these characteristics are formed from the tasks found within the Policy Orientation, Social Process, and Decision

Process functions laid out in the framework. We will conclude this study by tracking through each of the common characteristics of ecosystem-based governance and describing how they are nested within the framework. It is important to understand how these characteristics emerge out of the framework so that we have knowledge of where we can apply leverage for change i.e. where in the Policy Sciences framework, the Problem Orientation, Social Process, or Decision Process or some combination.

Once we understand how the framework components combine to contribute to the ecosystem-based characteristics (i.e. management for resilience, adaptive governance, etc.), we can look at the comparative case studies of the Great Lakes Basin under the GLWQA and the current governance in the BoF/GoM. In essence, the tasks as executed by the governance within each case contribute to the existence, or not, of each ecosystem-based characteristic. If, for instance, we are looking at the characteristic of adaptive governance as a necessary component of ecosystem-based governance, the tasks as executed within the Problem Orientation, Social Process, and Decision Process, can be examined to determine whether the tasks within each case study add up to some version of adaptive governance, and if not, what tasks are missing. In this way, we are better able to focus on augmenting the tasks that are absent and can make recommendations that go further than the traditional literature in this area.

### **Discussion: The Framework, Ecosystem Based Governance, and Case Comparison**

Returning to the Chapter III characteristics of ecosystem-based governance, we will begin with the need for management for ecosystem resilience and integrity by



describing it, assessing what tasks with the Policy Science framework are encompassed within the characteristic, and then comparing the cases based upon those tasks.

### **Management for resilience.**

Governance must take the perspective that its task is to find common ground on policies that advance the *common interest* (Brunner 2002). The common interest of maintaining and supporting ecosystem integrity should outweigh parochial interests in preserving bureaucratic turf or command and control hierarchy. The critical component of ecosystem-based governance is that management focuses on the relationship between people and the natural processes necessary to sustain ecosystem structure and function, the life support systems, while recognizing the need for human and institutional involvement at every level of the ecosystem (Sutinen, Clay et al. 2000).

As the analysis set forth in chapters IV and V make clear, the governance regime extant in the Great Lakes in the early years of the GLWQA managed for the resilience and integrity of the ecosystem. The current governance in the BoF/GoM, despite the best intentions and efforts of the Gulf Maine Council, does not.

The analysis from the framework perspective starts with Problem Orientation.

The *goal clarification* task requires:

- 1) Meaningful community participation in the goal clarification process;
- 2) Strong public outreach and education efforts devoted to raising awareness and understanding of ecosystem issues and governance options, and
- 3) Multiple goals that overall embrace human dignity and equal access to governance with a premium placed on maintenance of the integrity and resilience of ecosystem functions.

Further, goals should no longer be based on single targets or economic need. Conditions should be trending toward widely accepted goals.

In the Great Lakes Basin in the early years under the GLWQA, goals were provided by two powerful sources – the GLWQA and the Clean Water Act, after a growth of public concern about pollution and an explosion of demonstrations and campaigns in the 1960s and 70s. The effect of the GLWQA goals was binational. We have seen that public outreach and education, through the Lake Michigan Federation, Great Lakes Tomorrow, Decisions for the Great Lakes, and other, promoted and advocated for active and knowledgeable public participation. The IJC actively promoted public involvement. Further, the word “integrity” as used in the Clean Water Act and the GLWQA meant a great deal to those who participated in the governance regime under the IJC and encompassed gender and racial integration and justice.

*Conditions and trends* in the early years of the GLWQA trended toward the binational goals with the construction and improvement of municipal water treatment facilities and the banning of phosphorus from detergents. As we have seen, the water cleared up, and a fishery was restored. Trends were openly communicated through several vehicles, including biennial meetings of the IJC, annual meetings of the International Association of Great Lakes Researchers, and on-line through the Great Lakes Information Network.

While public input and ecosystem integrity were important in the early years under the GLWQA in the Great Lakes Basin, the story was different in the Bay of Fundy/Gulf of Maine region. There is no overarching entity with the authority to coordinate the goals, promotion, and implementation and evaluation of regulatory efforts.

The Gulf of Maine Council operates as a forum for agency heads to share information and ideas, but no consolidated management decisions can come from the GOMC. Thus policy is left to fragmented, bureaucratic regulation by two federal and 5 state/provincial government agencies. Policy development thus by-passes the first requirement for goal clarification – meaningful involvement by the public and/or community participation and input into the goal process. Further, goals are set agency-by-agency and rulemaking is often the result of compromise between resource conservation and economic special interests and not necessarily focused on the Gulf of Maine itself. Conditions in the region are displaying stresses from coastal development, pollution, overharvesting, and global climate change. Trends are often not moving toward the goals of the individual agencies, and transparent periodic communication is frequently absent.

The Social Process is also critical to management for resilience. Social process tasks in an ideal ecosystem approach are largely geared to the building of a knowledgeable public capable of meaningfully partnering with government, scientists, industry, NGOs, and other participants with the perspectives necessary to secure common interests, most critically the common interest of ecosystem integrity and resilience. The first requirement is that anyone with an interest in participation may do so. Participants, of course, come with values. The base values required by our ideal model to be the predominant goals are the values of knowledge and rectitude. Speaking broadly, the values of power and wealth should not end in themselves with an ecosystem-based approach, but must instead be utilized to press demands for common interests of human dignity, ecosystem integrity and resilience (Holling 1995; Holling and Gunderson 2002a; Berkes, Colding et al. 2003). Thus the Social Process in our ideal system is characterized

by resource sharing and collaborative efforts designed to bring a broad base of the public and regulated interests together in a variety of situations with regulators to share ideas, develop knowledge, and gain mutual respect to identify goals, threats to those goals, and possible actions to take in order to preserve and restore ecosystem resilience.

The social process in the early years of the GLWQA demonstrates many of the components of our ideal ecosystem governance model. First, public participation is mandated by the 1909 Boundary Waters Treaty (1909). Formal public participation blossomed when in 1975 the IJC and its Boards began to recognize the need for public support in order to implement the terms of the GLWQA and build infrastructure. It then took affirmative steps to galvanize citizen involvement (Becker 1993). The meetings between the boards and the IJC, formerly internal matters, began to be made public in 1975 and "...in time presentation of the board reports to the IJC in public meetings became a mechanism for increased public understanding of Great Lakes problems, as well as for citizen activism" (Botts and Muldoon 2005, 23). Further, NGOs banded together to try and bring the full brunt of the binational NGO community to bear on issues related to the Great Lakes watershed (Jackson 2005). This study also talks extensively about the PLUARG process under the GLWQA, where involvement of the public was stressed and there was open and transparent communication by the IJC and its Boards to a public made more knowledgeable by extensive and effective outreach efforts. There was also laudable opportunity for community members to be involved with scientists and regulators in the assessment of trends through panel meetings, regular annual (then biennial) meetings of the IJC, and participation of knowledgeable citizens on IJC Boards and panels (IJCIRG 1978). The Lake Michigan Federation and Great

Lakes Tomorrow traveled around the basin to educate members of the public about Great Lakes and IJC-related issues. Decisions for the Great Lakes was created to deliver 40 hour courses geared toward creating citizen leaders in the GLB. Collaborators and partners in this program included the IJC, the USEPA, Environment Canada (through the Canada-Ontario Agreement), the Great Lakes Fisheries Commission, and others. The base values among many who participated stressed the values of knowledge and rectitude.

The perspectives of the participants is also important as part of the social process and provides perhaps the starkest contrast between governance in the Great Lakes Basin versus governance in the BoF/GoM.. The governance regime under the GLWQA between the late 1960s and early 1990s thrived on a perspective that included a dedication to collaboration, cooperation, inclusion, and a desire to do good for the Great Lakes Basin that was stronger than the desire to profit or otherwise drain it of resources or resilience. The IJC commissioners took an oath that they would make decisions independent from consideration or interference from national interests. Another important operating principle was that each member of the IJC, its Boards, and working committees was to operate “in his (or her) own professional capacity and expertise” rather than as a representative of an agency, NGO, or other special interest. In this manner, attention was focused on the resilience and integrity of the Great Lakes Basin ecosystem without worrying about agency interests and limitations. The requirement that persons serving on the IJC’s advisory boards did so in their own capacities as citizens and experts, not in the capacity of representing the organizations that employed them, “helped

draw the best, least selfish, least compromised advice from its advisors... (Dempsey 2004, 192-93).

Given the public nature of the IJC and its Boards, and the significant public involvement, strategies and situations were relatively straight forward. With strategies, the custom and practice of being open to all ideas helped instill a collaborative attitude and allowed for diplomatic efforts. Litigation played a role early in the GLWQA years on the U.S. side until polluters got the message. Litigation was coordinated by a single NGO and targets were often kin key cities involving major corporations (e.g. GE, US Steel, Dow Chemical). Situations where participants could interact were frequent in the Great Lakes Basin, with public IJC biennial meetings, Great Lakes United, the International Association of Great Lakes Researchers, and the Great Lakes Information Network.

In the Bay of Fundy/Gulf of Maine region, public participation has seldom been a priority. Policy-making, as we have seen, often by-passes the first requirement for goal clarification: meaningful public and/or community participation and input into the goal setting process. Goal clarification is determined piecemeal by the legislative process or the rulemaking processes of the relevant regulatory bodies and agencies with jurisdiction over those human activities that impact some component of the ecosystem. The goals of most of the relevant agencies in the Bay of Fundy/Gulf of Maine were examined in Chapter V – but there is little evidence that governance participants in the region would ever set aside their national or agency allegiances in favor of the public good. Simply put, the notion seems substantially at odds with the administrative culture observed in the

region. So with little public input with respect to the goals in the binational<sup>117</sup> BoF/GoM, and with governance participants that are a fragmented collection of federal and state/provincial agencies with differing, and sometimes competing, goals, there is little about the social process in the region that would likely promote management decisions that would favor the resilience of the ecosystem as a whole over the special interests of the agencies involved in governance.

Perspectives in the Bay of Fundy/Gulf of Maine governance regime differ significantly from those highlighted during the early years of the GLWQA participants in the Great Lakes Basin. Frequently it appears that powerful political and economic pressures on agencies force them to take special interests into consideration to the detriment of the resilience of the ecosystem. In Chapter V comments from a fisheries management participant made it clear that reduction of fleet capacity was made very difficult because of pressure from industry as well as political pressure.

The Gulf of Maine Council on the Marine Environment, as we have seen, is the only organization that attempts to get as many agencies from both Canada and the U.S. involved in a forum within which they may share ideas and exchange information. The members of the GOMC have agreed to three goals and four governing principles that, if clearly followed by all agencies, would prove beneficial to overall ecosystem integrity. But the Council has no authority to bring pressure to bear on its members to step-up their efforts or even to adhere to its own principles. It is clearly difficult for the GOMC to play a leading role when there is so much difference in goals, values, and perspectives

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<sup>117</sup> As an observation, there is little recognition outside of fisheries and the Gulf of Maine Council that the Gulf of Maine is a *shared* binational resource.

from jurisdiction to jurisdiction. One of the messages about the Council that came out of interviews highlighted in Chapter V was the fact that information generated through the Gulf of Maine process rarely changed or impacted the decision-making of its members.

What we see, therefore, is that the Social Process in the BoF/GoM region is jurisdictionally fragmented and that agencies are often so pressured and constrained by legal limitation and politics that the goal of ecosystem resilience must often take a back seat to nationalistic concerns or agency limitations. The Gulf of Maine Council must avoid fisheries issues, and the New England Fishery Management Council must look the other way when pollution impacts are on the table. Politics and pressure are brought to bear by special interests and, with no reliably consistent overarching body providing political cover, the participants in the region must frequently appease both agency politics and special interest pressures – sometimes to the detriment of ecosystem resilience.

There is also a distinct difference in perspectives between participants in the GOMC and those from the early days under the GLWQA. In the former, some participating agencies have goals, e.g. to get industry, and “if it doesn’t happen, we walk.” In the Great Lakes, as we have seen, participants were obligated to make the resilience and integrity of the Great Lakes Basin their primary function, with nationalistic and agency constraints checked at the door. Of course, in the Great Lakes Basin there is an international treaty that helps to enable federal, state, and provincial implementation.

Finally, we look at the role that the Decision Process plays in the two case studies in order to determine their effectiveness at prioritizing ecosystem resilience. Recall that in our ideal ecosystem-based governance model, the Decision Process uses the tasks of intelligence, promotion, prescription, implementation, appraisal, and termination to



promote human dignity and the fair distribution of values in order to gain the willingness of a community to pitch in and become an active part of the effort to clarify and secure common interests that can lead to the restoration of our ecosystems to healthy, functional, and resilient systems.

Intelligence is the process of obtaining and processing information and making it available to decision makers, stakeholders, members of the public, and others (Clark 2002). The purpose of intelligence is to provide reliable data and information that permits an understanding of whether conditions in the ecosystem are trending toward or away from the goals of the region (Busch and Trexler 2003). Reliability and credibility of the data matters and it should be collected from appropriate scales in order to detect trends and changes in ecosystem resilience and function and it should be open honest debate. Public participation in the debate as well as communication of the results to the public is critical to the maintenance of a knowledgeable and connected base of citizen involvement.

In the Great Lakes Basin in the early years of the GLWQA governance, water sampling began long before the passage of the Clean Water Act – and in fact led to the reference that resulted in the negotiation of the GLWQA. Beginning in the early 1970s, the IJC and its Boards began work on a basin-wide surveillance plan. With help from Pollution from Land Use Activities Reference Group (“PLUARG”) and agencies working on both sides of the border, 1975 Great Lakes Surveillance Plan was adopted through the Water Quality Board and the IJC (WQB 1975). The IJC and its Boards monitored the results of the surveillance plan, and with increasing evidence of toxic contamination challenged the parties to buttress the plan and increase funding for basin-

wide biological monitoring. The plan was revisited and revised often to keep pace with developing threats. The results of the surveillance activities were reported out each year in a various forums, including annual meetings of IAGLR, the biennial IJC meetings and formal reports to the Parties, and beginning in the late 1980s on-line through the Great Lakes Information Network (GLIN). The active and at times raucous involvement of the public at IJC meetings has been described in prior sections. It extended to promotion, also accomplished under public scrutiny and basically a “bottom up” process involving a wide variety of actors, including government agencies, NGOs, citizens, and related institutions.

There was significant appraisal of how the policies were doing. Every two years the IJC issued a report that reviewed the progress, or not, of ecosystem factors toward the goals of the GLWQA. The report was aired publically every two years at the biennial meetings, where from 1975 through the 1990s the IJC publically questioned its Boards and working committees on the status of the ecosystems in the Great Lakes. In addition, the public had an opportunity to question the IJC and its boards. This is in addition to the other public outreach referenced previously.

The Decision Process in the Bay of Fundy/Gulf of Maine watershed is different. With no overarching governance entity, the decision process in the BoF/GoM is a crowded field. Understanding the collective decision process, however, can be a way of reconciling or at least productively managing competing interests and policies through politics. There are inevitable agency turf battles and politics plays a role in their outcome. Politics will always be with us because people seek different policies that reflect their particular, or “special”, interests. The ideal, of course, is for participants to

reconcile interest differences in order to clarify and secure their common interest. In the BoF/GoM governance regime, we have seen that it is not really clear who establishes what the common interests are or should be, and even what the community believes is in their common interests.

The intelligence task in the region is carried out by individual agencies. Data collected by separate agencies may or may not wind up with the Gulf of Maine Council or its working group. There also may still be issues with how data is collected and whether the same standards are followed by all agencies.

While intelligence is collected by various agencies at various times for a variety of purposes, we are still not very knowledgeable about the resilience and integrity of the BoF/GoM. It became clear in Chapter V that in many ways we don't know the status of the ecosystem in the region. The way agencies manage their jurisdictions, data is largely stove piped and the overall picture of the health of the system is still relatively unknown. There is a real need for more consistent indicators, collaborative monitoring, joint interpretation, and data sharing.

While the “fragmented incrementalism” process persists, the Gulf of Maine Council has demonstrated that it can work together to publish valuable and informative information about the region – like its Tides of Change report (Pesch and Wells 2004) and the new State of the Gulf (Thompson 2010) series. The Gulfwatch Contaminants Monitoring Program has been using mussels from some 38 locations around the Gulf since the early-1990s to monitor dozens of chemicals and metals in the mussel tissue.<sup>118</sup> There are still gaps, of course. Endocrine disrupting chemicals, pharmaceuticals, and

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<sup>118</sup> <http://www.gulfofmaine.org/gulfwatch/>

some of the more harmful persistent organic pollutants which can be found in the tissue of pinnipeds and humans are not monitored (De Guise, Shaw et al. 2001; Wells 2010). The bottom line is that we haven't a clue how pervasive these harmful emerging contaminants are in the sediments and water column of the Bay of Fundy/Gulf of Maine.

So what happens to the information that is collected from the various member agencies around the region? To an outside observer, it's not clear. Presumably its primary use is to move an agency forward with its mission. Some, maybe most, information gets posted on the web site of the Gulf of Maine Council where it is easily accessible to the public. Which brings us to the next fundamental problem: Why would members of the public in the region ever look on the GOMC web site? There is little in the way of dedicated and aggressive outreach that might be capable of creating a knowledgeable citizen base capable of speaking for the public good. Promotion, like intelligence, is largely done within agency and between agencies and legislators and Members of Parliament. Promotion does not tend to involve the citizens, unless you consider advertising by special interests as promotion.

Prescriptions in the region, thoroughly reviewed in chapter VI, are many and varied and do little to promote integrity and resilience as the primary driver for governance decision making in the BoF/GoM region. Rather, as we know, they focus on some component of the ecosystem. Further, concepts like human dignity, economic well-being, fair distribution, and justice appear nowhere in the lexicon of the BoF/GoM prescriptions or governance.

Thus it would appear that ecosystem resilience is not the highest priority in the regional governance regime. It may be that the cumulative effort of all of the agencies

enforcing their regulatory interests has a positive impact on the ecosystem. I am unable to determine that from the information that I have seen. Ultimately, if ESIP can agree upon a meaning suite of indicators, and if the reports and data produced by regulatory agencies, NGOs, and others relevant to the ecosystem can be accessed easily and in one place, it might be possible to better understand the state of the integrity and resilience of the Bay of Fundy/Gulf of Maine watershed.

**Significant, meaningful public participation.**

Any ecosystem management regime must provide the opportunity for meaningful participation and input of a broad representative segment of the population in decision making processes (Costanza, Norton et al. 1992; Pauly and Maclean 2003). Significant, meaningful public participation is required (Becker 1993; Cortner and Moote 1999; Jackson 2005). Participation must be open to almost any person or group with a significant interest in the issue (Brunner, Steelman et al. 2005). Citizen involvement and partnership must be sufficient to build “civic science” instead of the traditional public information programs designed to inform passively (Gunderson, Holling et al. 1995). Together we must “pay the price of civilization through multiple acts of good citizenship...” (Sachs 2011, 5) In the Policy Science framework, meaningful public participation is called for in Problem Orientation (especially goal clarification), Social Process (throughout), and the Decision Process.

With respect to the degree of public involvement in the Great Lakes Basin under the GLWQA, I believe enough has been said. We have seen that meaningful public participation and the building of a knowledgeable citizen base was a priority of the IJC in the early years. Numerous efforts at outreach and education were sponsored by the IJC

and undertaken by the Lake Michigan Federation, the Great Lakes Basin Commission, and Great Lakes Tomorrow, through Decisions for the Great Lakes. We've also seen how NGOs and other entities from around the basin came together under the banner of Great Lakes United. During the early years of governance under the Great Lakes Water Quality Agreement, the process it sparked was designed to promote significant, meaningful, public participation.

In the BoF/GoM watershed, meaningful public participation has seldom been a part of the governance process. This is not by design but instead more a weakness of the laws underpinning federal, state and provincial governance in the region - which largely takes the form of traditional regulatory legislation. There are many that believe the culture of "independence" as characterized by state mottos like that of New Hampshire ("Live Free or Die") mentally drives a culture of regulatory "hands off" and discourages innovation, collaboration, and cooperation. Thus traditional regulatory activity ushers in legislation that relies on scientific management which attempts to use the latest scientific knowledge and expert, disinterested personnel. This makes the key participants in the region's resource management process the experts and scientists, with government relying upon their divination and implementation of the best available science. If the public is involved at all, it is generally limited to an opportunity for comments or participation in a hearing after the experts and scientists have drafted a proposed plan of action. Further, the "iron triangle" is alive and well in the region as pressure groups concerned with single interests, e.g. navigation, fishing, energy, join with administrative agencies in charge of individual programs as well as congressional committees to defeat any attempt at an integrated approach. Courts, as we have seen, are common participants

in traditional natural resource management and are called upon to provide conflict resolution. Although there is evidence that in some parts of the region, Great Bay, NH, and Casco Bay, Maine, for instance, there are changes occurring, top-down, command-oriented, fragmented natural resource and environmental policy management is the rule in general in traditional governance and, typically, the rule in reality in the BoF/GoM region, leaving little room for meaningful public involvement.

**Integrated, collaborative government involvement.**

In an ideal ecosystem-based approach, regulatory agencies participate in a coordinated and integrated fashion. The approach is applied within a geographic framework determined primarily by ecological, not political, boundaries. Thus the process must overcome the fragmentation inherent in both the sectoral management approach and the splits in jurisdiction among levels of government (Regier and Baskerville 1986; Berkes, Colding et al. 2003; Folke, Lowell Pritchard et al. 2007). In an ideal system, government acts less *on* other actors and more *with* other actors in a collaborative and communicative way. There is, therefore, more frequent, collaborative contact (i.e. not just during crisis). Thus government would require less of the local, state, or federal governments exerting control over others in society and more of a partnership-like interaction among them (Fiorino 2006).

In the ideal ecosystem-based approach model collaboration is highlighted in a variety of areas. It is found in the Conditions task where collaboration between scientists, regulators, and citizen participants is required in order to jointly work to identify causes and conditions responsible for negative trends. It is also found in a number of tasks within the Social Process. A task within the Social Process consistent with ecosystem-

based governance is that regulatory agencies should participate in a coordinated and integrated fashion and allow softer local and regional input into governance. There is also a need for collaborative processes to be iterative and ongoing – not simply single-play problem solving efforts. Collaboration is also called for as part of the intelligence and appraisal feedback mechanism, meaning that there needs to be collaborative and cooperative partnerships with scientists, regulators, and the public to collect data as well as a collaborative entity or overarching body that can accumulate knowledge from appraisals and implement change to reverse adverse trends.

In the Great Lakes Basin, integrated, collaborative government involvement was critical to the ecosystem approach built under the IJC GLWQA arrangement. Interlocking directors, acting on behalf of the good of the Great Lakes and not necessarily on behalf of a participant's agency, played a critical role in the ability of the IJC and its principle boards, together with the Great Lakes Fisheries Commission, to solve problems. As some of those who were interviewed for the Great Lakes study related, many of the participants in the early years under the GLWQA held offices, served on boards, or otherwise participated in several of the management entities. A member of the IJC's Science Advisory board might also be a Commissioner of the Great Lakes Fishery Commission and participate in the Great Lakes Basin Commission. Knowledge was freely shared. The point is, collaboration was an important aspect of the Great Lakes Basin governance regime.

Collaboration in the GLB took a number of forms, including commissioners and board members who put the good of the Great Lakes, an *esprit d' corps*, in front of allegiance to national government, agency, or special interests. It also came in the form



of working with the public and being open to all ideas – the free market of concepts and ideas. Biennial IJC meetings provided valuable engagement between the SAB, the WQB, and the press with the public present in a very public discourse in open sessions. These efforts were buttressed by an interdisciplinary Great Lakes science community. In the late 1960s concern about fishery and lamprey eel problems and the reference on phosphorus spawned the establishment of the International Association for Great Lakes Research (IAGLR) in 1967. Its journal and well-attended annual meetings became venues for a greater flow of information within the binational Great Lakes community. Although begun by physical and biological scientists, by 1971 academic political scientists and others interested in natural resource management issues began to participate in earnest. Thus collaboration and cooperation between government agencies was common in the early years of the GLWQA.

In the Bay of Fundy/Gulf of Maine region, cooperation and collaboration has been slower to come. The history of the governance efforts tends to show that collaboration and cooperation between government, NGOs, stakeholders, and the public has been a bit of a hit or miss story. The Gulf of Maine Council, as we know, provides an excellent forum for government agencies from both sides of the Hague Line, but their collaborative efforts may extend only as far as the sum of its parts allows, and collaboration in the form of the sharing of ideas and exchange of information does not often translate into significant cooperative *action*.

There have been excellent examples of collaboration discussed in the body of this report; namely, the Saltwater Network and ACAP. Another government attempt at collaboration in Canada has not fared so well. The Eastern Scotian Shelf Integrated

Management Plan (“ESSIM”) in Atlantic Canada involved over ten years of stakeholder involvement to develop a final draft plan. ESSIM was Canada’s pilot integrated management effort, and drew upon stakeholders to come up with a plan to deal with a coastal margin with competitive uses that included a Marine Protected Area (The Gully), “...protected areas of cold-water corals, multispecies fisheries including ground fisheries, small and large pelagic fisheries, crab, lobster, and an extensive Aboriginal Communal Commercial Snow Crab fisher, dragger, long line, oil and gas exploration, works, seismic activities, oil and gas pipelines, other oil and gas development projects, marine transport...” (GOMC 2012, 5). With what I assume was a tail wind from the from the 2005 Ocean Actions Plan, which favored “Integrated Oceans Management” as one of its four pillars (Ricketts and Hildebrand 2011), and with the establishment of a 32 member Stakeholder Advisory Council (“SAC”) comprised of a diverse group of shareholders that agreed to share the responsibility for leadership toward the ESSIM vision, ESSIM stalled. Although a plan was drafted with SAC guidance and submitted to the government for approval in 2007, the plan has yet to be approved. A survey of SAC members places blame on lack of leadership by the government – and expresses the notion that whereas multiple stakeholders can work together, apparently governments cannot (GOMC 2012).

This result may unfortunately be consistent with the findings of a 2005 Auditor General review of Canada’s Oceans Act which found that following its passage the oceans ceased to be a government priority, and that government had failed to meet its obligations under the Act. There may be a cautionary lesson for the U.S. as its Oceans Policy gets closer to reality. The Canadian experience may demonstrate that the policy

and its various collaborative and cooperative measures may not be welcomed with open arms by federal agencies currently responsible for ocean and coastal management.

The resistance may likely be strongest in areas like the U.S. Northeast that have no history of working with a River Basin Commission and that don't have a notable history of collaboration.

Whether it is the lack of a River Basin Commission, the independence and “hands off” attitude inscribed by some states on their license plates and which oozes into the attitude toward governance in general, there seems to be a culture in the region that discourages meaningful collaboration and cooperative problem-solving. There are numerous excellent examples of collaboration that are sprinkled around the region, but in general collaboration, or the sharing of power in any manner, is hardly on the top of any regulator's “to do” list. With some meaningful exceptions described earlier, and others, cooperative and collaborative governance is generally not present in the Bay of Fundy/Gulf of Maine region.

**Governance is adaptive.**

There must be a realization that stewardship cannot wait on science to achieve a full understanding of ecosystem structure and function. Thus an ecosystem based approach in any region must be prepared to cope with the uncertainty inherent in complex natural and institutional systems (Sutinen, Clay et al. 2000; Sherman, Kane et al. 2002). Adaptive governance is a mode of learning that allows for decision makers with a poor understanding of the connection between their actions and the consequences to learn by doing (Ludwig, Hilborn et al. 1993; Holling 1995; NRC 2009). Ecosystem surprises stemming from delay in feedback, and/or rapid feedback, are normal ecosystem dynamics

and require adaptive governance. Recall that the purpose here is not to design a flawless governance process capable of coping with multiple, complex systems. All that can be done is attempt to design a system that operates under rules that allow sufficient information to be generated over time to enable participants to learn from their mistakes and continually adapt and improve the institutional system to operate within natural limits (Costanza, Low et al. 2001). Under an adaptive governance regime, policy choices and interventions are treated as experiments (NRC 2009), relying explicitly on monitoring, evaluating, and terminating failed policies instead of expert-driven planning that relies primarily on science-based technology rather than trial and error (Brunner, Steelman et al. 2005).

Translated to the policy sciences framework, the Social Process tasks of “Inventing, Evaluating, and Selecting Alternatives” are requirements of adaptive governance. This is where the ability for trial and error is nested. Confronted with uncertainty, participants must have the capacity and the courage to invent, evaluate, and select alternatives. The Decision Process requires: (1) reliable intelligence, honest promotion, prescriptions and implementation that are often experimental, (2) appraisal in the form of monitoring and other feedback, and (3) the ability to terminate policies that aren’t working and scale up policies that are successful in moving the community toward its goals. An overarching institutional entity is necessary in order to evaluate the data and select policy alternatives when there is a need to try and reverse negative trends.

Chapter IV taught us that in the early days of governance under the there was an effort to coordinate intelligence and accumulate data relevant to the goals set forth in the GLWQA. Specific water quality standards were part of the original 1972 Agreement.

With the input of the citizen panels from Pollution from Land Use Activities Reference Group (“PLUARG”) and with recommendations from Canadian agencies, and with pressure from the public to understand whether ecosystem conditions were trending toward the goals, the Great Lakes Surveillance Plan was approved by the Water Quality Board and the IJC in 1975. In 1976, with the increasing threats posed by toxic contaminants and the development of new technology, the IJC challenged the Parties to commit to increased funding to include basin-wide biological monitoring (IJC 1976). Similar challenges to buttress surveillance monitoring were issued the following year in anticipation of the adoption of an ecosystem-based approach to governance for the entire Great Lakes Basin – which would include land-based activities due to the findings and recommendations of PLUARG (IJC 1978). The fact that the IJC and its Boards continued to alter and amend the Surveillance Plan demonstrates both adaptability and accountability.

Consistent with the notion of promotion in an ideal ecosystem-based governance regime, during the first decade of the GLWQA there was strong support by the IJC and its Boards and panels to pursue common interests and the health of the Great Lakes Basin ecosystem were paramount. The problem-solving approach of the Science Advisory Board and related IJC panels and working committees was to solicit and listen to all ideas being promoted from multiple interests – a universal approach – in order to make sure no potential innovation was overlooked. IJC, Science Advisory Board, and other Great Lakes Water Quality Agreement participants shared an implicit commitment to the basin and to the equity and justice. Equity, fairness, and human health reached operational levels under the GLWQA and were significant factors in the early years. Also,

information and input was gathered from broad base of participants, overlapping board members, and knowledgeable citizens.

As we learned in Chapter IV, participants in the decision process of the IJC and its boards made decisions in the face of uncertainty. In terms of prescription, they asked both parties to ban the use of phosphates in the basin. The measures ordered by the IJC were accepted by the parties with the assistance of a knowledgeable public. As a result, the water cleared up. The Great Lakes Fishery Commission also took some courageous action when it elected to work with states to begin a new fishery for Pacific salmon in the Great Lakes. During this time, of course, the public was kept informed through the public IJC biennial meetings, the Great Lakes Basin Commission, Great Lakes Tomorrow, annual meetings of the International Association of Great Lakes Researchers, periodic meetings and publications of Great Lakes United, and the Great Lakes Information Network.

The story in the Bay of Fundy/Gulf of Maine region is quite different. Adaptive governance is difficult if not impossible without an overarching institutional entity. As we know, adaptive governance is a process – and it needs to be a process capable of integrating valid and appropriate interests into the policy process to advance the common interest. We have seen that the IJC in the early years of the GLWQA had a series of management principles that enabled the Parties to make decisions for the public good without regard to national interests or other interests. Their role was to make decisions that were good for the Great Lakes Basin ecosystem.

Currently there is no equivalent system or process in the BoF/GoM. Recall that under an adaptive governance regime, policy choices and interventions are treated as

experiments (NRC 2009), relying explicitly on monitoring, evaluating, and terminating failed policies instead of expert-driven planning that relies primarily on science-based technology rather than trial and error (Brunner, Steelman et al. 2005). Without an accountable overarching entity, there is no entity capable of organizing a monitoring design, evaluating the results, or changing policies in order to reverse ecosystem components that are trending away from the goals of the community. There is no entity tasked with the function of making decisions for the good of the ecosystem. There is also no way to learn from trial and error as there is no entity willing to confront uncertainty to learn by taking a chance. It also means that processes that work will not be recognized and cannot be scaled up for use across the Gulf. A case in point is ACAP, the Atlantic Coastal Action Program that has involved the public in meaningful ways and provides the opportunity for communities to make decisions about their own future. There are 14 ACAP communities in the Canadian Maritimes. From the audits that we discussed in chapter V, the ACAP program has saved Environment Canada some \$70 million by performing tasks and functions that would have ordinarily been executed by regulators within the agency. Despite the successes of the ACAP model, attempts by Environment Canada to get agencies in the U.S. to look at it and perhaps scale up the program and adopt it for the United States have been unsuccessful (Personal Correspondence 2010).

This is not a promising message that would lead to risk-taking and innovation. Adaptive governance is clearly not something that can be counted on any time soon in the Bay of Fundy/Gulf of Maine. While there are many caring, hard-working people involved in tasks related to governance, they are for the most part working in governmental agencies, institutions, or NGOs that have their own cultures, interests, and

values. In this region there is an extremely strong allegiance to traditional expert-driven scientific management. With the many threats that are looming over the BoF/GoM ecosystem at present, practically guaranteeing changes that will no doubt surprise and surpass the coping mechanisms of existing governance systems, there will be no adaptive governance process to understand, detect, warn or react when conditions hit a tipping point and strange things begin to happen.

### **Mobilizing local knowledge**

Social and cultural memory and contemporary local knowledge must be mobilized by developing links between key persons and providing a direction for adaptive governance. This is a way of building social capacity for resilience in social-ecological systems (Holling 1995; Berkes, Colding et al. 2003; Steelman 2010).

This factor is being used as a separate category that includes more than just public participation. This category involved more the intelligence, promotion, and prescription tasks of the Decision Process. We saw how citizen panels were used by the IJC through PLUARG to examine the possible impacts of land-based activities on water quality. One important part of those panels was the local knowledge brought to the table by many of the farmers and residents of the regions where there were panels. This local knowledge helps to round out scientific knowledge and give a more holistic vision to rising problems and potential solutions. Further, participation by citizens into the Decision Process will inevitably get a better buy-in from the public should citizen action be required for any potential actions. There was no doubt that citizen participation in the decision process in the Great Lakes Basin helped to get the phosphorus ban through every state in which it was introduced over industry objection.



In the Bay of Fundy/Gulf of Maine there are numerous programs that link fishers with scientists for research related to fish populations and distribution. Local knowledge is being brought to the table currently in Exeter, NH, as part of the process that is ultimately deciding whether a bridge in that town is removed. There are active watershed organizations that work hard to maintain and restore riverine systems in their communities. The Annapolis River Watershed is home the Annapolis River Guardians, one of the longest running volunteer water monitoring programs in Canada. Starting in 1992 its over 90 volunteers have collected more than 4000 water samples. The group annually publishes score cards giving citizens an overview of the status of the river.<sup>119</sup> There are other sources of local knowledge in the many other watershed associations, land trusts, and related organizations that surely can be tapped by regulators as sources of information for use by future governance.

Local knowledge, however, is still used on a piecemeal basis. While there are excellent examples of local groups in the region empowering themselves and participating in decisions that affect their future, more often than not such decisions are made in the tradition of scientific management. Government agencies use purportedly impartial experts and scientists to make decisions and develop plans, with local knowledge generally overlooked until the final comment stages.

### **Overarching lead or joint institution**

Governance must have a lead or joint institution able to adapt to new information and understanding (Christensen, Bartuska et al. 1996). This requirement is found in the *Social and Decision Processes* and is considered critical to the existence and

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<sup>119</sup> [http://www.annapolisriver.ca/downloads/Report\\_Card\\_2011.pdf](http://www.annapolisriver.ca/downloads/Report_Card_2011.pdf)

implementation of adaptive governance. Any overarching lead or joint institution must have the authority (formal or informal) and means to carry out systematic scientific research to understand system response and status, to track compliance with policy goals and objectives as well as to make changes when necessary. The obvious need is for transparency and fairness as perceived by the public and regulated community. More pertinent, however, may be the existence of informal or voluntary venues for dispute resolution that gives the public and stakeholders an opportunity to work together toward resolution of local or regional problems. This may be especially important where, as in this study area, the problems we are having with environmental degradation are the result of the cumulative impact of activities that are entirely (or mostly) legal under our existing laws and regulations (Brunner 2002; Fiorino 2006).

It is important to note that the lead or overarching institutional entity need not have formal authority in order to be effective. The IJC and its boards do not have formal authority to enforce its decisions and directives with respect to water quality.<sup>120</sup> This is not uncommon in international law. It simply needs to be able to investigate, monitor, and lead or direct any changes required in order to adapt to new conditions as well as to make recommendations directly to governments.

In the governance of the Bay of Fundy/Gulf of Maine, the Gulf of Maine Council could conceivably act as the lead or overarching institution with the ability to guide the adaptation of government responsibilities in the region. There have been times in the past when members actually challenged each other to put pressure on recalcitrant

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<sup>120</sup> Under the 1909 Boundary Waters Treaty the IJC has regulatory authority over matters related to diversions and consumptive use of waterways shared by the U.S. and Canada. (1909). *Treaty Relating to the Boundary Waters and Questions Arising Along the Boundary Between the United States and Canada. U.S.-Gr.Brit.* 36 Stat. 2448.

jurisdictions to up the *ante* and take more effective measures to help achieve the shared goals articulated in the Council's Action Plans. Of course, without participation of fishery management even if the Council was willing to pressure reluctant jurisdictions into better environmental performance there would still be a huge gap in efforts to restore and preserve the integrity of the ecosystem.

Given the above, it should be clear that a key element necessary for effective ecosystem-based governance is missing. Thus far in the Bay of Fundy/Gulf of Maine there is a lack of will – or lack of courage - to act in the public interest by making some arrangement to be accountable to an entity with the authority and capacity to monitor developing trends and guide policy change in order to prepare for and react to negative trends and surprises.

#### **A precautionary approach to uncertainty**

Finally, the Decision Process of governance in the Bay of Fundy/Gulf of Maine not only needs to have an overarching entity, but that entity needs to have management principles that apply flexible principles to its decisions. Certainly it is necessary that any lead entity in the region would need to have principles that enables an independence and *esprit d' corps* similar to the spirit that guided the IJC, its boards, and working committees in the early years under the GLWQA.

A precautionary decision-making approach must be incorporated into the Decision Process and management principles in the Bay of Fundy/Gulf of Maine in order to account for the great degree of uncertainty inherent in complex natural resource issues (Sherman 1994; Sutinen, Clay et al. 2000; Costanza, Low et al. 2001). Principle 15 of the Rio Declaration makes it clear that where there are threats of serious or irreversible

damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation (Sitarz 1994). Thus ecosystem management in the region must be prepared to cope with the uncertainty inherent in complex natural and institutional systems ((Sherman, Kane et al. 2002; Whiteside 2006), Clay et al. 2000; Sherman, Kane et al. 2002). Rapid feedback and appropriate decision-selection mechanisms must be in place to compensate for lack of knowledge by decision makers – or what we have called adaptive governance (Costanza, Low et al. 2001). This becomes a more compelling need as climate change accelerates and adaptive governance and management is forced to become increasingly nimble.

Historically, environmentally harmful activities have only been stopped after they have manifested extreme environmental degradation or exposed people to harm. In the case of DDT, lead, and asbestos, and commercial fisheries for instance, significant regulatory intervention took place only after disaster had occurred. The delay between first knowledge of harm and appropriate action to deal with it can be measured in human lives cut short or in the serious, often permanent, environmental degradation that has occurred.

In contrast to the traditional management approach of reacting only when human health has suffered or environmental harm has occurred, precautionary planning may be used to prevent or address problems *before* they occur. The 1992 Rio Declaration specifically laid out the foundation for the precautionary approach in Principle 15:

In order to protect the environment, the precautionary approach shall be widely applied by States, according to their abilities. Where there are threats of serious or irreversible damage, lack of scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation” (UNCED 1992).

While decision making using a precautionary approach recognizes that the absence of full scientific certainty must not be used as a reason to postpone decisions where there is a risk of serious or irreversible harm, there is a need for some level of guidance. Guidance and assurance are required as to the conditions governing the actions that will be taken. Guidance and assurance are particularly needed when a decision must be made regarding a risk of serious or irreversible harm about which there is significant scientific uncertainty.

Who makes these decisions? How does an agency determine whether a threat has the potential for “serious or irreversible” damage? What should the guidelines be for the determination of whether a proposed measure is “cost effective?” Finally, who should bear the burden of proof for any of these issues?

What may make the precautionary approach unique (i.e. different from traditional risk analysis) is the notion that the burden of proof be on the proponents of any actions that might prove harmful to human health or the environment to show that the impacts will be benign, or at least that the harm caused will be outweighed by a ‘greater good.’. It still begs the question of when the actors have to submit such actions to an administrative body and what standards should apply to the decision process thereafter. One key will be the level of protection that society chooses. The threats can then be compared to society’s expressed level of protection (e.g. ranging from zero tolerance for toxic or persistent organic pollutants to some form of threshold limit values combined with monitoring and control rules with prearranged management actions in response to

unanticipated monitoring results – for instance if a target Total Allowable Catch (“TAC”) is hit, by prior agreement the fishery shuts down).

Involvement of the public in the determination of the desired level of protection, through outreach and education, could be developed so that transparency and full public input could give credibility to regulatory efforts. The bottom line is the need for overarching law that applies the precautionary approach to all relevant aspects of regulation. Guidelines and regulations developed in an agency-by-agency fashion would have to meet certain requirements as defined by the legislation. I would assume that the approach would be flexible, that it would provide a “balancing of interests” approach so frequently found in law, that is, the magnitude of the threat of harm or irreversible damage would be weighed against the value to society of the actor’s planned act. The greater the uncertainty, the more conservative would be the criteria before actions are permitted. For example, the burden of proof may be difficult for industry to demonstrate that the risk of irreversible harm of the release of dioxins by the pulp and paper mills into the waters of Canada and the U.S. outweighs the social value of toilet paper that is whiter in appearance than toilet paper manufactured without the need to discharge dioxins. The test may come out differently if we weigh the benefit of oil and gas exploration and exploitation on Browns and Georges Banks against the threat of harm to the ecosystem and, by inference, the fishery. Again – who decides? Are these incredibly significant decisions to be left to the typical array of scientists and experts or do we establish meaningful partnerships with stakeholders, communities, and the public to arrive at resolution of these conflicts?

It is apparent that governance in the BoF/GoM does not include management or rule-making principles that in any way resemble a precautionary approach. It is also apparent that future governance must include the precautionary approach to decision-making as part of a package with other management principles, like independence and freedom from agency and national interests when decisions are made that pertain to the resilience and integrity of the Bay of Fundy/Gulf of Maine region.

### **Conclusions**

We have seen that all is not well with the Bay of Fundy/Gulf of Maine ecosystem. The Conditions section of Chapter V makes it clear that the stresses that are picking away at the ecosystem are not going away – in fact they may be worsening.

In order to determine whether the existing governance regime of the Bay of Fundy/Gulf of Maine has the capacity to implement an integrated, adaptable ecosystem approach to restore and sustain, over time, the integrity of the respective ecosystems, including the functions upon which the humans in the ecosystem rely, several logical steps were followed. From a thorough review of the literature there was the ability to learn about the modern manifestation of traditional government and the differences between traditional scientific management and the ecosystem-based approach to governance. The seven characteristics of ecosystem-based governance developed in chapter III and discussed immediately above were gleaned from the literature. Obviously, in an evaluation of the existing governance in the study region, the more characteristics that can be found in existing institutional and related governance regime, the better are the chances that there exists the capacity to implement an ecosystem-based

approach to the management of those activities that impact the environment. No governance regime is perfect and improved governance or the capacity to implement a more ecosystem-based approach to governance does not require that all seven characteristics be present. It only requires that there are enough characteristics present with sufficient strength to create a process that can foster change that results in measurable ecosystem components trending toward the goals of the community.

To better assess the existence and strength of the ecosystem-based approach to governance the framework developed by the Policy Sciences was utilized. Using the framework, it was possible to examine the problem orientation, social process, and decision process to better understand the differences, task by task, between traditional government and an ecosystem-based approach to governance.

Once the ecosystem-based approach to governance was broken down into its functional components with the framework approach, Chapter IV used the framework to assess the governance regime under the Great Lakes Water Quality Agreement in the first 20 years after the Agreement was entered into between the United States and Canada. Using the framework, the governance regime in the Great Lakes Basin between roughly 1972 and 1992 was compared with the “ideal” ecosystem-based governance framework criteria. As demonstrated in Chapter IV and immediately above, the analysis revealed that that the governance system in the Great Lakes Basin in the early years of the GLWQA compared favorably to the ideal model. Therefore it became evident that the characteristics of ecosystem-based governance were present as revealed by the framework analysis.



Chapter V then used the framework analysis to compare the existing governance in the Bay of Fundy/Gulf of Maine watershed to the ideal. From the analysis of Chapter V and the summary of the ecosystem-based characteristics above, there is no escaping the conclusion that the *existing* governance scheme in the Bay of Fundy/Gulf of Maine watershed does not have the capacity to implement an ecosystem-based approach to governance. The reasons for this conclusion become apparent when the framework analysis is used to examine the existing governance regime and the existing problem orientation, social process, and decision process are compared with the ideal framework from Chapter III. The conclusions may be summarized using the seven characteristics of ecosystem-based governance discussed above. The “related questions” are addressed in the summary of conclusions that follow.

The first characteristic that was proposed for the existence of an ecosystem-based approach to governance was the priority that must be place on management for resilience. Without repeating what has been already been discussed, the governance regime in the Bay of Fundy/Gulf of Maine does not have ecosystem resilience as a priority. The framework analysis demonstrated that the basics of problem orientation, which include meaningful community participation in the goal clarification process and strong public outreach and education efforts combined with multiple goals that embrace human dignity with a premium placed on the maintenance of integrity and resilience were not readily recognizable in the study area. The goals in the study region are fragmented among a diverse array of agencies at the local, state/provincial and federal levels in two countries. There is no goal or even multiple goals that all participants strive to achieve. The social process analysis disclosed that public participation was not a priority, and that the

perspectives and values of government and other institutions in the region appeared to focus more on the preservation and/or increase of power and wealth as a way to protect or increase agency influence and budget. The integrity and resilience of the region's ecosystem seems to be less of a priority than the well-being of the agencies and other participants involved in governance. Finally, when the Decision Processes present in the region are examined and compared with the ideal, it is clear that they are not supportive of the need to prioritize ecosystem integrity in the management of human activities that impact the environment. In the ideal ecosystem-based governance model, the Decision Process uses the tasks of intelligence, promotion, prescription, implementation, appraisal, and termination to promote human dignity and the fair distribution of values in order to gain the willingness of a community to pitch in and become an active part of the effort to clarify and secure common interests that can lead to the restoration of our ecosystems to healthy, functional, and resilient systems. In Bay of Fundy/Gulf of Maine region, intelligence is gathered agency-by-agency, with little input from an informed public and without significant community or local knowledge. The information that is collected is not readily available to the public. Finally, there is no overarching entity in the region capable of reviewing the existing data and implementing policy changes based on trends reflected by the data. Other, more veteran, jurisdictions have by various forms of agreement managed to get past these barriers. The International Joint Commission used the Great Lakes Water Quality Agreement to enable greater collaboration although the 1909 Boundary Waters Treaty provided the basis for the Agreement. The Great Lakes Commission is a compact between states within the Great Lakes watershed, but Canadian provinces are included and their votes, though legally non-binding, are treated as binding

by the Commission. In any event, there are ways to create an accountable body able to oversee and guide policy development in the region – all that is needed is the political will.

In sum, the existing governance regime in the Bay of Fundy/Gulf of Maine watershed does not demonstrate the ecosystem-based governance characteristic of managing for resilience and integrity.

The next characteristic, the significant, meaningful public participation in the governance regime is also, with some exceptions, not generally present in the region. The combination of fragmented governance and a cultural bias favoring independent or “hands off” regulatory approaches lead to governance by traditional top-down scientific management. Government enforces uniform rules across the board using experts and scientists to divine the best available science. The public often resents regulation and frequently resists implementation or uses courts (at least in the US) and other delay tactics to avoid compliance. Thus significant, meaningful public involvement is generally not present in the region. This situation is a far cry from the education and aggressive outreach insisted upon by the International Joint Commission and others during the early years of governance under the Great Lakes Water Quality Agreement.

Integrated, collaborative government involvement is also characteristic of an ecosystem-based approach to governance. While there are examples of integrated, collaborative governance efforts in the Bay of Fundy/Gulf of Maine watershed, these efforts are still the exception. There generally is little if any collaboration between scientists, regulators, and citizen public to identify conditions, document scale-relevant trends, and cooperating to determine the causes and conditions responsible for negative

trends. Again, the fragmented nature of governance in the region is a very high hurdle to effective collaboration. There also is no significant history or culture of collaboration in the region. Fisheries management, for instance, has ignored the impacts of land-based activities just as collaborative efforts to control such impacts have largely been ignored by entities that regulate fisheries and ocean-related activities. Agencies within the region are generally unable or unwilling to collaborate to any significant degree. Indeed it may be the unwavering allegiance shown by participants to their national and agency interests that prove to be the biggest barrier to transition to an ecosystem-based approach to governance. So long as there are agencies and government representatives who are unwilling to put the public interest in the integrity and resilience of the Bay of Fundy/Gulf of Maine ecosystem ahead of agency and national power and protection can be no significant change in traditional government processes and certainly no capacity to transition into a more holistic ecosystem-based approach to governance.

Adaptive governance, mobilizing local knowledge, an overarching lead or joint institution, and a precautionary approach to uncertainty are the final characteristics of ecosystem-based governance. The discussion above has already highlighted the fragmented governance structure in the Bay of Fundy/Gulf of Maine with no overarching institution and the lack of meaningful public or community involvement. These factors act as barriers to the final four characteristics as much as they did to the first three. Thus any further discussion at this point would be redundant.

Therefore, given all of the above, an examination of the existing governance system in the Bay of Fundy/Gulf of Maine reveals that it currently does not have the capacity to implement an integrated, adaptable ecosystem approach to restore and sustain,

over time, the integrity of the respective ecosystems, including the functions upon which the humans in the ecosystem rely.

The capacity to govern the human activities that impact the ecosystem in the region using an ecosystem-based approach would be possible with some changes. Some of these changes are set forth in the recommendations that follow in the next section.

### **Recommendations and Next Steps**

In Voltaire's *Candide*, published originally in 1759, the young protagonist is booted (literally) from the Baron's castle paradise in Westphalia after being discovered in an amorous embrace with the Baron's daughter and goes on to encounter a truly dizzying series of brutal, calamitous, and unfair adventures. His tutor, mentor, personal philosopher, and companion at a young age and at critical junctures throughout the tale, Dr. Pangloss, continually teaches his young ward that regardless the situation or danger, he must remember that he is always in "this best of all possible worlds." This is so, Pangloss explained, because "it cannot be otherwise." (Voltaire 1956, 111).

Voltaire, however, used the character of Pangloss to poke fun at those who espouse impractical speculations on unknown topics. Dr. Pangloss, you see, was an expert. His expertise was in metaphysico-theologo-cosmolonigology. He spent all of his time theorizing. He talked without doing. When starvation was at hand and all around him were tending a garden, Pangloss talked. As Candide lay near death after surviving a

shipwreck and crawling into Lisbon only to be injured in an earthquake begged for water before losing consciousness, Pangloss talked.

In the Bay of Fundy/Gulf of Maine region, there has been enough talk. While debate and discussion about environmental threats and possible causes and solutions are absolutely critical, there comes a time when action is needed. Given the characteristics that we know are generally present for an ecosystem-based approach to governance to take hold, the next part of this study will briefly suggest changes that could change governance in the Bay of Fundy/Gulf of Maine so that is more holistic, adaptive, and inclusive.

### **Recommendations**

As we know, governance in the region is comprised of various agencies are charged with the responsibility of enforcing uniform rules and laws across the wide array of circumstances presented around the Bay of Fundy/Gulf of Maine watershed. In this manner, compliance is thought to be achieved – albeit in piecemeal fashion. However the current governance arrangement in the region is described, the fact remains that it is not working and is unable to stand up to special interests and clarify and secure common interests. Existing governance is simply unable to keep up with the threats that are posed to the ecosystem of the Bay of Fundy/Gulf of Maine. Governance in the region must figure out how to navigate the dynamic nature of multilevel and interconnected socio-ecological systems. In most of the world, this translates into “collaboration among heterogeneous actors with diverse interests, institutions that are flexible and nested across scales and levels, and analytic deliberation that develops understanding through multiple knowledge systems; builds trust through repeated interactions; and fosters learning and

adaptive responses through continuous feedback” (Dietz, Ostrom et al. 2003; Folke, Lowell Pritchard et al. 2007; Armitage and Plummer 2010, 5). Not surprisingly, these recommended requirements are captured in various ways in our suite of ecosystem-based governance characteristics, to wit:

- Management for resilience;
- Significant, meaningful public participation
- Integrated, collaborative government involvement;
- Adaptive governance;
- Mobilizing local knowledge;
- Overarching lead or joint institution, and
- A precautionary approach to uncertainty.

As we know, and before specific recommendations are presented, it deserves to be reiterated that the characteristics itemized above are set forth in no particular order and the list is not intended to imply priorities. They are not neatly packaged and there is overlap. Redundancy and complexity go with the territory. It is truly unknown how many characteristics must be present and to what degree before governance is able to turn the corner and begin to reverse negative trends and foster positive trends.

As this study demonstrates, increasing threats to the region’s ecosystem have stressed conventional institutional assumptions and arrangements with demands for action beyond the competence of existing agencies to respond. Thus these recommendations are designed to increase the capacity for governance to respond to increasing stress – with a full understanding that there will be many who will be reluctant

to change from for a variety of reasons, including those who foresee possibilities for binational political embarrassment.

This study concludes that the region does not have the capacity to implement an ecosystem-based approach to governance. It can't be stressed enough that time is running out: capacity-building must begin soon and involve the active participation of a generally committed and informed public. Hard choices will have to be made, and sacrifice by some may be unavoidable (Smil 1993). Given the above, there are steps that can be taken that do not involve a major change in legislation but can give Canada and the U.S. the ability to implement an ecosystem based approach to governance. The measures called for in this paper will not be without cost or sacrifice.

First it should be clear from this study that our current regime of top-down, "leave-it-to-the-expert," administrative rationalism governance is simply not working. There is a need for significant change. The recommendations that follow are based on a these legitimate conclusions. The recommendations are also designed to help achieve the characteristics of ecosystem-based governance. Fundamental to the ecosystem based approach are a few basic propositions. As so many commentators have now noted, there must be a rational approach to problem solving that involves learning through experimentation. Further, the problems we face are so complex that relevant knowledge can no longer be centralized in the hands of *any* government or agency structure but, rather, should be accessible to all. The governance process must also be flexible and involve many voices and a broad variety of perspectives (Dryzek 1997; Fischer 2000; Berkes, Colding et al. 2003; Weber 2003; Daly and Farley 2004; Brunner, Steelman et al. 2005; Folke, Lowell Pritchard et al. 2007). Finally, these recommendations contemplate



a movement away from centralized, command and control governance toward more emphasis on community-based efforts. The task of managing the impacts and threats posed across the entire Bay of Fundy/Gulf of Maine watershed are simply too daunting for most of us to understand. The magnitude and complexity of the issues are so immense that we feel disempowered – the feeling is often “why bother.” That’s why there is a real need to approach these problems at a local or watershed level – think local and act local (Dryzek 1997; Suzuki and McConnell 1997; Fischer 2000; Weber 2003; Brunner, Steelman et al. 2005; Steelman 2010).

Given the above, we may now set forth some recommendations that, if adopted, might help move governance in a direction that is more responsive, democratic, and ecosystem-based. The first requirement we will discuss is the need for an informed public. There simply needs to be a purposeful and articulate transnational constituency with the ability to pressure governments on both sides of the border toward a common course of action (Caldwell 1988). It would be easy enough to mandate that K – 12 the curriculums taught in schools around the basin include a focus on the resources, ecology, and threats in the watershed. In addition, we know that in the Great Lakes Basin an informed citizen base was critical to the implementation of measures that were opposed by special interests, including Proctor and Gamble and others who objected to the phosphate ban. The Joyce Foundation in the United States and, in Canada, the Max Bell Foundation and, later, the Center for the Great Lakes/Great Lakes Trust Funds provided the financial resources to support the kind of aggressive public education and outreach carried out by Great Lakes Tomorrow, Decisions for the Great Lakes, the Lake Michigan Federation, and others. Chapter IV discusses the numerous efforts to involve

communities and the public. PLUARG was part of the original reference to the IJC and involved community panels in an attempt to determine the extent that land-based activities played a role in water quality issues. It also relates the fact that citizens were included in IJC boards and working committees.

In the Bay of Fundy/Gulf of Maine, there needs to be funding devoted to the establishment of an organization of facilitators, not unlike the efforts of the Lake Michigan Federation, Great Lakes Tomorrow and its offspring Decisions for the Great Lakes. Facilitators need to have the ability and flexibility to identify individuals around the basin and travel to areas that are supported by watershed councils and begin to knit together the interests of those in the watershed and prepare them for some level of self-determination. Facilitators should be recruited from communities and watersheds around the region and should be trained extensively in the existing governance of the region, the threats to the ecosystem, and the importance of education and outreach as part of a program to get citizens involved in decisions that will impact their futures. I would envision a first step, after participants are recruited, would be to hold conferences in order to use facilitators and other scientists, regulators, and academics to help clarify the goals and outcomes for the communities around the watershed. The Gulf of Maine Council and Fishery Management officials in both the U.S. and Canada should work closely with the chosen facilitators. It would be logical, upon identification and recruitment of participants, to develop the ability of groups to work together by first holding regional meetings focusing on the development of goals and outcomes. Thereafter conferences in each country could broaden the involvement and experience of the participant groups. Finally there should be an international conference with all groups from the United States

and Canada focus again on goals and outcomes and bring it all together and develop a plan that everyone could take back to their communities. Certainly this effort must include an effort to identify those groups around the basin who are already involved in some part of governance, i.e. Saltwater Network, ACAP, Annapolis Basin, and other existing community or watershed groups, and include them and their knowledge in this basin-wide effort. Other important participants would be representatives from NOAA's National Estuarine Reserve Research System (NERRS), EPA's National Estuary Partnerships (NEPs), and other government or NGOs with experience working with communities around watershed.

Another requirement for meaningful change in the existing governance is that there needs to be an *overarching institutional entity* capable of collecting ecosystem-wide data, analyzing the data, and deciding upon measures that need to be implemented through the agencies on both sides of the border and implementing such measures. The ideal system would recognize that uncertainty plays a role in every decision made by the overarching institutional entity and that the results of policy decisions and changes must be monitored to determine whether policy changes result in ecosystem components that begin to trend in favor of goals that buttress the public good. The easiest way to accomplish this would be by reference to the International Joint Commission. There is no question that the Bay of Fundy and the Gulf of Maine are boundary waters within the meaning of the 1909 Boundary Waters Treaty. Through the Gulf of Maine Council membership, a reference could be negotiated that leaves the GOMC and Fishery Management as jointly coordinating organizations at the operations level (although these entities have not worked together in the past, I know of no historical animosity that would

prevent them from greater cooperation in the future). The IJC, or a panel or committee formed pursuant to the 1909 Boundary Waters Treaty, could oversee and recommend policy measures for the region and periodically appraise and report on trends in the region through written report and biennial public meetings.

It would take both parties to join the reference to the IJC for the formation of a Board within the IJC structure devoted to the Bay of Fundy/Gulf of Maine watershed. Agencies and bureaucracies around the basin need to finally have the courage and tenacity to admit that the way that management agencies must deal with the stresses that threaten the very health and integrity of the ecosystem no longer works. We simply can no longer keep doing the same thing over and over and expect different results. It is not going to happen. Yet institutional innovations must be appropriate and responsible to the environmental problems of the region and to their qualitative enhancement. There may be disagreement over the amount and kinds of power that an overarching institution should have, but given the situation in the region currently some agreement should be worked out to provide some accountability for the results (or not) achieved by agencies in the region. The medicine may taste awful, but it may save our future.

Management for resilience is another characteristic that needs to be strengthened in the Bay of Fundy/Gulf of Maine watershed. The 'fragmented incrementalism' that is the hallmark of management in the region will never be able to manage for resilience. Too many substantive and procedural levels and segments of jurisdictions can never allow for the collaboration and cooperation required in order to manage for resilience. The only way that the Bay of Fundy/Gulf of Maine can turn the management system around and manage for resilience is through a reference to the IJC. Even with a

reference, care must be taken that the reference requires a Bay of Fundy/Gulf of Maine Board with management principles that requires participants in Board activities to set aside national and agency interests and act solely for the good of the ecosystem. Further, all participants must pledge to participate in his or her personal and professional capacity and not as a representative of the agency or government that provides his or her employment. As part of the Bay of Fundy/Gulf of Maine Board there should be a Research Advisory Board within the structure that includes scientists, academics, regulators, citizens, watershed organization members, and other community members who monitor trends in the region and make recommendations to the Bay of Fundy/Gulf of Maine Board about potential policies and actions. The management principles described above would apply to the Research Advisory Board activities, and experimentation with learning by trial and error must be encouraged.

There is a need for integrated, collaborative governance in the region. The need for coordinated scientific work, including research, monitoring, interpretation and those aspects of evaluation amenable to scientific inquiry can no longer be seriously questioned. There are a variety of measures that could strengthen this characteristic. The existence of Bay of Fundy/Gulf of Maine Board by reference must include integrated and collaborative governance that mandates collaboration and cooperation between fishery management other ocean, land, and coastal margin-related agencies. To continue to stove pipe these critical regulatory functions is simply absurd and needs finally to change and begin to communicate and work together. Fishery management trends, already monitored, with significant uncertainty, by federal governments in Canada and the U.S.,

should be accountable to the same overarching institutional entity as other governance efforts in the region.

Adaptive governance is non-existent in the Bay of Fundy/Gulf of Maine watershed. The changes recommended here would make it possible. The existence of an overarching institutional entity overseeing and guiding the regulatory efforts in the region and able to monitor environmental data collected by the various agencies and to make recommendations based on that data would be a huge step. Also needed is for closer links to communities and watershed residents so that intelligence can be gathered at a variety of scales and communities can be involved in an increasingly transparent effort to assess community goals, work more *with* stakeholders than *on* them, and ultimately be able to rapidly implement policy change to react to negative trends or unexpected surprises with the help of a knowledgeable public and informed communities. This will require the significant outreach and education efforts described above.

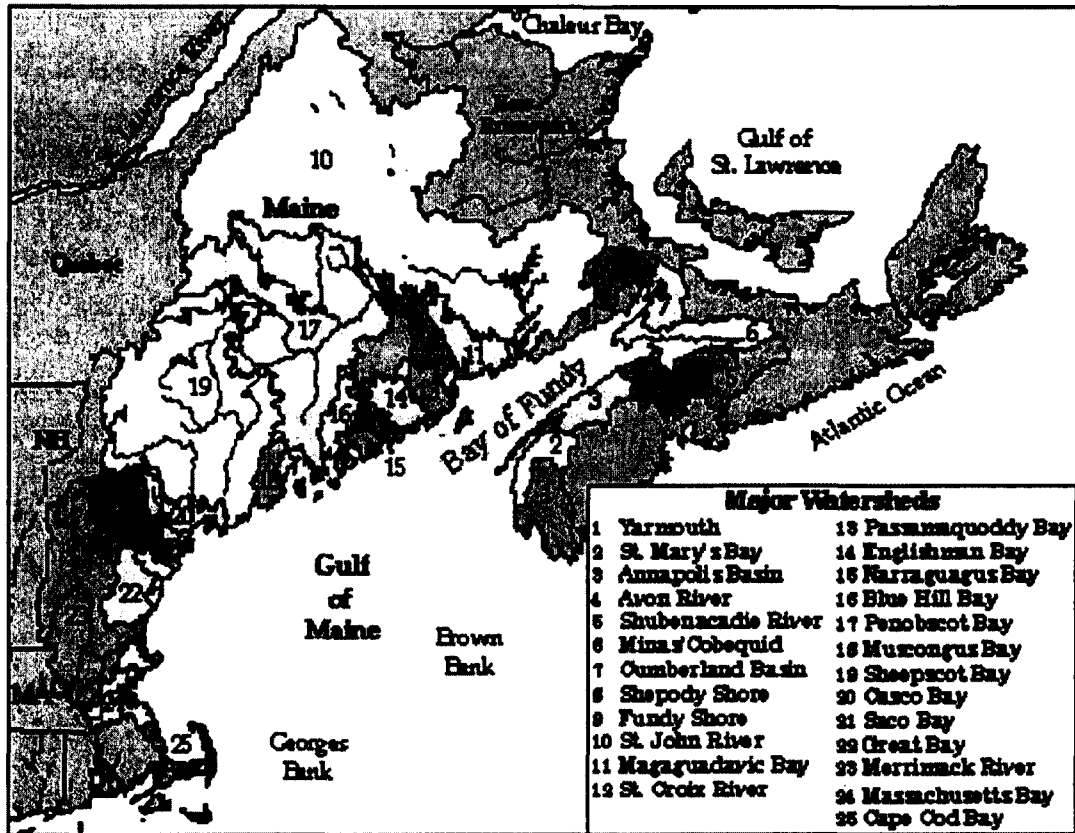


Figure 23 The Major Watersheds that drain into the BoF/GoM (from The Gulf of Maine Environmental Data and Information Management System)

As depicted in Figure 25 there is no lack of watersheds around the Bay of Fundy and the Gulf of Maine. It is somewhat sad that the recommendations of John Wesley Powell and others in the late 1800s that the U.S. adopt a watershed-level approach to the governance of the expanding West were ignored. Instead the United States continued to draw political lines that resulted in the fragmentation of natural functions and the division of the governing entities that oversaw them. Governance was further frustrated by fragmentation between federal, state, and local as well as between the branches and levels within each of the branches at every level. Integration and collaboration was made nearly impossible (Steelman 2010).

This study has demonstrated that current governance in the Bay of Fundy/Gulf of Maine watershed is too fragmented and divided to effectively manage the human activities that impact the environment or react to surprises that are without doubt on the horizon. The only real hope for the region is for communities around the basin to pull together, become knowledgeable about the ecosystem and its threats, and assume some significant portion of responsibility for the environmental well-being of their watershed. Building on a sense of place, the watershed approach replaces expert-driven control and command and control agency administration with an arrangement of power sharing among public and private actors, collaborative, ongoing, consensus-based processes, results-oriented management, and broad civic participation by a knowledgeable and interested public (Berry 2000; Berry 2002; Weber 2003; Steelman 2010).

It will also require agencies responsible for some portion of ecosystem resilience or integrity to get out of their offices and get out into the watershed. In both nations, more time and effort needs to be expended away from regional or national headquarters. Employees should live and work mostly in the field – attending meetings of community groups at night and acting more as a resource and partner in the community during working hours. Existing watershed groups and community efforts need to be nurtured and expanded at the watershed and community levels. Indeed these proposals rely to some degree on advancing watersheds as a greater influence for local governance.

Clearly efforts need to be fostered. This can't be done from Boston, Washington, D.C., Halifax, or Ottawa. It also can't be done from state or provincial capitals. It requires employees to live and work in the communities they serve. The Oregon Plan provides an exceptional example of the success of this approach as regulators moved out



of their state capital headquarters and into watersheds around the states to act as resources and support for watershed groups attempting to restore habitat after the ESA listing of several species of Pacific Salmon (Coe-Juell 2005)

With the characteristics described above, the door opens further for input by local knowledge. As the public becomes more knowledgeable, and communities more involved, governance will be more welcoming of local knowledge. With more appreciation of local knowledge, there may be a positive feedback mechanism that sets in and more citizens may become willing to get involved and bring their knowledge to bear on environmental issues that impact the community.

The final characteristic that must be address is the use of the precautionary approach to uncertainty. This concept has been fully explored – what is needed is some idea of how it can become a part of the decision making scheme in the region. The precautionary approach should be utilized and it could be part of the decision making landscape if it is incorporated in the management principles at all levels. Any reference to the IJC should, by agreement, include the precautionary approach as a management principle. Recommendations of the IJC or Bay of Fundy/Gulf of Maine Board, whatever entity is developed to provide overall guidance and accountability should be implemented by existing governance using a precautionary approach to the inevitable uncertainty that will be encountered.

Fortunately, the kind of change that is needed in the Bay of Fundy/Gulf of Maine governance is not new. Changes away from expert driven scientific management regimes are becoming more and more common. The changes proposed above rely upon an educated and active public, collaborative governance, coordinated scientific work with

input from local knowledge, an accountable overarching institutional entity, all of which result in an increasingly adaptive governance process better able to deal with inevitable surprise. Given the above, we will now briefly look at next steps.

### **Next Steps**

Given the nature of the threats confronting our ecosystem, and the degree of change advocated by the recommendations set forth above, there are a few steps that should be taken to begin down the road toward meaningful change in the region.

First there needs to be an assessment of the community outreach efforts, existing watershed groups, and other related movements that can be identified and incorporated into the first steps of a plan to link such efforts around the basin. As mentioned above, those watershed groups and associations, as well as government (e.g. NERRS, and NEPs) and NGO- sponsored coastal community partnership efforts, must be consulted and included in new governance efforts around the watershed.

There needs also to be an assessment of funding sources that might be available to fund a watershed-wide public outreach and education effort utilizing existing community resources wherever they may be found.

With the assistance of an increasingly educated public that has some knowledge of the threats posed to the region's ecosystems, discussions need to be started with government agencies at all levels to better understand the needs and willingness to move in the direction of collaboration and coordination. The concept of an overarching institutional entity needs to be discussed as well.

Finally, some thought should be given to holding a series of open public conferences on both sides of the border that includes watershed groups and communities

along with scientists and regulators to present the findings of the GOMC's State of the Gulf report to get local and public to review monitoring results and get broad input into the findings and the potential directions that governance could take to address the threats raised in the report. As discussed above, this will go a long way toward establishing the goals and outcomes desired by communities in the watershed. These conferences should culminate in a binational conference that brings all groups and anyone with interest in watershed governance issues to further explore goals and future directions.

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## APPENDICES

**APPENDIX A: INSTITUTIONAL REVIEW BOARD APPROVAL**



UNIVERSITY of NEW HAMPSHIRE

November 1, 2004

Coon, John R  
Natural Resources, James Hall  
63 Bayview Road  
Dover, NH 03820

**IRB #:** 3302  
**Study:** Can we get there from here? Toward an integrated ecosystem  
approach to the management of the Gulf of Maine  
**Approval Date:** 11/01/2004

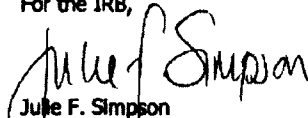
The Institutional Review Board for the Protection of Human Subjects in Research (IRB) has reviewed and approved the protocol for your study as Exempt as described in Title 45, Code of Federal Regulations (CFR), Part 46, Subsection 101(b). Approval is granted to conduct your study as described in your protocol.

Researchers who conduct studies involving human subjects have responsibilities as outlined in the attached document, *Responsibilities of Directors of Research Studies Involving Human Subjects*. (This document is also available at <http://www.unh.edu/osr/compliance/IRB.html>.) Please read this document carefully before commencing your work involving human subjects.

Upon completion of your study, please complete the enclosed pink Exempt Study Final Report form and return it to this office along with a report of your findings.

If you have questions or concerns about your study or this approval, please feel free to contact me at 603-862-2003 or [julie.simpson@unh.edu](mailto:julie.simpson@unh.edu). Please refer to the IRB # above in all correspondence related to this study. The IRB wishes you success with your research.

For the IRB,

  
Julie F. Simpson  
Manager

cc: File  
Mimi Larsen Becker

Research Conduct and Compliance Services, Office of Sponsored Research, Service  
Building, 51 College Road, Durham, NH 03824-3585 \* Fax: 603-862-3564

**APPENDIX B: INFORMED CONSENT FORM**

# Written Consent Form

## Can We Get There From Here: Toward an Integrated Ecosystem Approach to the Management of the Gulf of Maine

To Participants in this study:

The purpose of this research is to evaluate the institutional capacity in the Gulf of Maine region to implement an ecosystem-based management regime in the Gulf of Maine watershed. The goal of these interviews is to gain a better understanding of the laws and prescriptions governing the human activities that impact the Gulf of Maine ecosystem, the institutions that develop, implement and influence those laws and activities, and to evaluate the capacity of the existing institutions, agencies and organizations to develop and implement an ecosystem-based approach to management in the region. The information gained through the course of this research will be used to evaluate the current capacity of the legal/institutional regime in the Gulf of Maine and to suggest options that might lead to a more effective ecosystem-based approach to the management of human activities that impact the ecosystem of the Gulf of Maine.

Participants in this research include public officials in the U.S., Canada, and New Zealand. The views of officials in professional, regulatory, scientific and administrative capacities in federal, state, provincial and local institutions, the regulated community and NGOs will also be sought.

You are being asked to participate in a focused interview lasting approximately one hour. Further contact might prove necessary in order to ensure that your responses have been accurately interpreted. I will take written notes during the interview, but I also request your permission to record the interview by audio recorder. You will be free to cease the interview at any time. The information received will be treated as confidential, and participants will not be identified in reports or articles without their prior written permission. All audio tapes will be destroyed/erased at the conclusion of the study. Please understand that you will not be compensated for your participation in this research.

My advisor, Dr. Mimi L. Becker and I can be reached for future questions and/or clarifications, at the University of New Hampshire, Department of Natural Resources, 215 James Hall, Durham, NH 03824. We can also be contacted by phone at (603) 862 3950 or email [mlbecker@cisunix.unh.edu](mailto:mlbecker@cisunix.unh.edu) or [jrcoon@cisunix.unh.edu](mailto:jrcoon@cisunix.unh.edu). If you have any questions about your rights as a research subject you can discuss them with us or you may contact Julie Simpson in the UNH Office of Sponsored Research at (603) 862 2003 or [Julie.simpson@unh.edu](mailto:Julie.simpson@unh.edu).

I have read the above statement and agree to be interviewed under the conditions stated above. I am aware that my participation is voluntary and that I may discontinue participation at any time without penalty.

Signature \_\_\_\_\_ Date \_\_\_\_\_  
Printed Name \_\_\_\_\_

I agree with the use of audiotape recorder under the condition that I may request that it be turned off at any time during the interview.

Signature \_\_\_\_\_ Date \_\_\_\_\_



## **APPENDIX C: FOCUSED INTERVIEW QUESTION OUTLINE**

# Focused Interview Questionnaire

Code \_\_\_\_\_

## Background

1. Background questions to identify the participant?
  - a. What is your name, business phone and email address?
  - b. By whom or by what agency/institution/NGO or regulated entity?
  - c. What are your duties and responsibilities?
    - i. Are they set forth in a written job description?
    - ii. Is there a difference between the duties described in the job description and those that you actually perform?

## Problems and Goals

2. What role does your agency play in the management of human activities that may tend to impact the ecosystem?
  - a. Who or what do you regulate?
  - b. How have decision makers in your agency/institution identified the environmental problems and the significant threats to the ecosystem in your region?
3. Are there goals set out for your agency designed to address the problems identified above?
  - a. How are those goals determined (who, what, where, how, when)?
  - b. Are there additional or specific biological, social, or community goals incorporated in the goals of your institution?
  - c. Are any attempts made to determine the goals or ends of the community (or regulated community, industry, etc.)?
  - d. What goals or ends, both biological and social, does the community want?
  - e. Are values of the people or regulated community clear? Do the goals of the community or regulated community differ from those of your agency?
4. What anthropogenic factors have the greatest impact or pose the most significant threats to the health or integrity of the [GoM, GL, NZ] ecosystem?
  - a. What are the goals of your agency in terms of the *governance* system used to regulate the human uses of your region's resources?
  - b. What are the indicators that are being used to tell you what progress is being made toward those goals?
  - c. What are the measurements or indicators that you believe *should* be used to monitor the health of the ecosystem?
5. Looking back at the history of your institution's efforts, can you identify the key resource trends in your area of involvement?
  - a. What are the historical trends in terms of management and governance over the human activities that impact the ecosystem in your region?
  - b. Have events moved toward or away from the goals you specified previously?

- c. Does trend information help us understand why policy and governance have succeeded or failed (e.g. is decreased diversity a result of policy or governance or is something else at work)?
- d. How has your approach to governance changed over time?
- 6. Does your agency/institution have a view of what a healthy [GoM, GL or NZ] ecosystem should provide or what it would look like?
  - a. What is needed to restore the ecosystem to health?
- 7. What are the desired goals for the future (i.e. the goal being to rehabilitate the ecosystem so that it is resilient to human demands)?
  - a. Based on current trends and conditions, what is likely to happen in the future?
  - b. What scenarios can you project?
  - c. Which is most likely?
- 8. Are trends moving toward the goals?
  - a. If trends are not moving toward the goals (then a problem exists and alternatives must be considered), what other policies, rules, norms, institutional structures, and/or procedures might cause trends to move toward the goals?
  - b. Can we evaluate one or more alternatives in terms of the goals?
  - c. How could the alternative be implemented?
  - d. Who would need to be involved?
- 9. Who or what agencies are the principle participants in terms of the governance of human activities that impact the [GoM, GL, NZ] ecosystem?
  - a. Are there others who should be participating?
  - b. Are there groups that are demanding to participate who have been somehow shut out of the governance issues?
- 10. Can you describe the perspective of your agency?
  - a. By perspectives I mean
    - i. What are your *demands*, or what they want in terms of values or organization?
    - ii. What are your *expectations*?
    - iii. On whose behalf are demands made (i.e. *identifications*)?
- 11. In your opinion is an “ecosystem approach” different from the traditional approach for solving the region’s environmental problems?
  - a. How have you defined the concept of “ecosystem approach” and what changes have been made in your agency on institution to implement an ecosystem approach to the way in which you solve environmental problems?
    - i. Pollutant-by-pollutant, media/activity or species specific management vs. integrated management?
    - ii. Increased participatory decision making vs single agency or jurisdictional decision making?
- 12. In your opinion, does the geographical scope of your institution’s jurisdiction encompass the major sources of stress to the [GoM, GL, NZ] ecosystem?
  - a. Why or why not?
  - b. Do you think these limitations will affect the feasibility of making progress on ecosystem restoration goals?
- 13. In your opinion, does the substantive legal jurisdiction of your institution or agency encompass the major sources of stress to the [GoM, GL, NZ] ecosystem?
  - a. Why or why not?
  - b. Do you think these limitations will affect the feasibility of making progress on ecosystem restoration goals?

14. Which of the following base values are most important in the development of goals and decisions concerning the regulation of human activities that impact the [GoM, GL, NZ] ecosystem?
  - a. *Power* – or the ability to carry out decisions
  - b. *Enlightenment* – the quest for knowledge
  - c. *Wealth* – money or its equivalent
  - d. *Well-being* – to have or obtain physical or psychological health
  - e. *Skill* – to obtain special abilities
  - f. *Affection* – the effort to have family, friends, and warm community relationships
  - g. *Respect* – to show and receive respect
  - h. *Rectitude* – to have ethical standards
15. For each of those you have identified that play roles in governance, which of these base values comes most into play or provides the strongest motivation for their actions?
  - a. What political pressures, values, and motivations must be recognized as powerful drivers into the current governance systems?
  - b. What values provide the greatest barriers for the implementation of an ecosystem approach to governance?
  - c. How can these barriers be lowered or shuffled to increase the likelihood of greater ecosystem-based decision making?
16. What is the principle strategy used by your institution or organization to achieve your goals?
  - a. By strategies, we mean:
    - i. *Diplomatic* (negotiation)
    - ii. *Litigation* (binding resolution by impartial third party)
    - iii. *Economic* (achieve goals through economic power or threats of economic harm)
    - iv. *Ideological* (achieve goals through spreading of scientific, social, economic or research, ideas and education)
  - b. From your experience, what strategies are the most successful?
17. If you have noted a transition from the traditional sectoral approach to management and an ecosystem-based approach, have new institutions emerged in the governance efforts?
  - a. If so, who are they?
  - b. What values do they represent (from the list of 7 above)?
  - c. What strategies do they employ (from the list of 4 above)?
  - d. Have they been successful?
    - i. Why or why not?
  - e. Have new practices been put in place?
  - f. Is there a resistance to innovation in governance?
    - i. Do you have an opinion as to the source of the resistance?
18. Are you satisfied with the quality, credibility and/accuracy of the data and information you receive that pertains to the problems you are facing?
  - a. What are principle sources of your information?
  - b. Is the public or regulated community involved in any way in the development of information?
  - c. Do you believe that the information you receive is comprehensive?
  - d. Is the information available to everyone?

19. Have you ever had to build support and capacity in order to implement a desired change in the way information is obtained or analyzed? If so, how did you go about building support?
20. How do you communicate your ideas, findings or decisions?
  - a. To whom do you pass along your recommendations, findings or ideas?
  - b. Do you have the authority to make your ideas binding upon the regulated public or other interests?
  - c. Do you seek input from the public before your findings, ideas or decisions are finalized?
  - d. Are stakeholders involved in the decision making process in any way?
21. Overall, what would you say are the strengths and weaknesses of your institution's current approach to the management of the human activities that impact the health of the [GoM, GL, NZ] ecosystem.
22. What changes would you recommend that might increase the chances for successful restoration of the [GoM, GL, NZ] coastal ecosystem?
23. Do you have any additional specific concerns or comments?