

# ECONOMIC REPORT

Economic Report ER 88-3

April 1988

## MANAGING THE GREAT LAKES COMMONS: AN EVALUATION OF RECENT INSTITUTIONAL CHANGES

Stephen Frerichs  
and  
K. William Easter



**Department of Agricultural and Applied Economics**

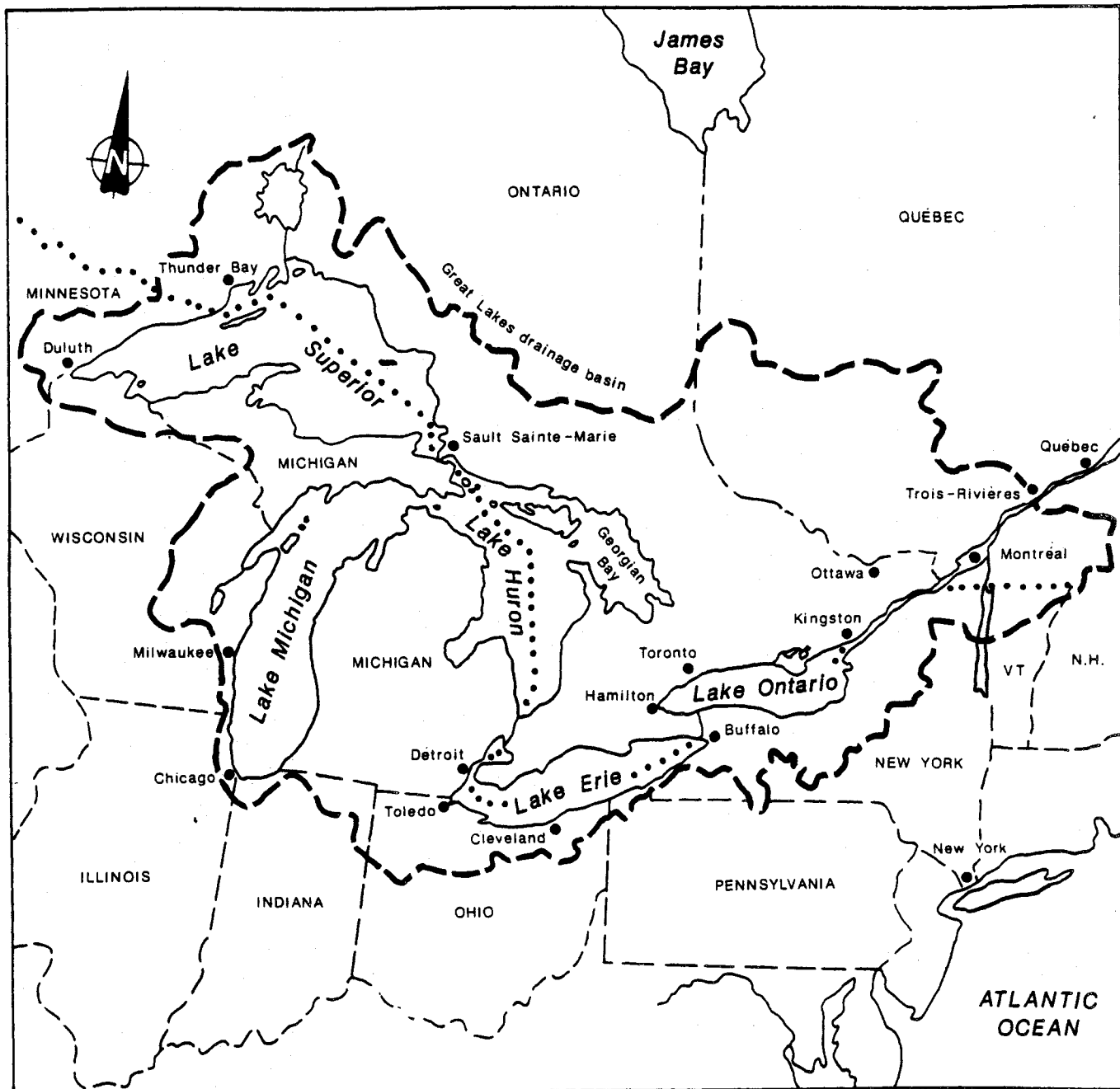
University of Minnesota  
Institute of Agriculture, Forestry and Home Economics  
St. Paul, Minnesota 55108

Table of Contents

Managing the Great Lakes Commons.....	1
The Great Lakes Basin .....	3
Limits on State Police Power .....	4
Access Rules .....	6
The Economic Theory of Open Access, Common Property, and the Role of Management Rules .....	10
Changing Individual Expectations .....	13
The Theory of Implementation of Water Management Rules.....	18
A Framework for Evaluation .....	19
The Sociopolitical Environment.....	20
Resource/Target Group Characteristics .....	22
The Formation of Institutional Arrangements .....	23
Implementation of Institutional Arrangements .....	24
Results of Implementation: Procedures, Organization, Regulation .....	26
The Decision to Abide by the Implemented Institutional Arrangements .....	26
Outputs of the Institutional Arrangements .....	27
Analysis of the Great Lakes Commons .....	27
Implementation of the Great Lakes Charter .....	29
The Sociopolitical Environment and Target Group/ Resource Characteristics .....	29
State/State Analysis .....	30
Formation of Institutional Arrangements .....	30
The Decision to Abide by Institutional Arrangements ...	31
Outputs of the Institutional Arrangements .....	33
State/Withdrawer Analysis .....	35
Formation of Institutional Arrangements .....	35
Implementation of Institutional Arrangements .....	35
The Results of Implementation Procedures, Organization, Regulation.....	39
Decision to Abide by the Implemented Institutional Arrangement .....	41
Outputs of the Institutional Arrangements .....	42
Conclusions and Recommendations .....	42
Recommendations .....	45
References .....	49

List of Tables

	<u>Page</u>
1. A Representative Individual's Decision Making Matrix .....	16
2. Implementing Common Property Rules: Flow Diagram .....	21
3. Summary of State's Implementation of The Great Lakes Charter .....	34
4. The Who and How of Implementation .....	37
5. Permit Approval Standards .....	40



**GREAT LAKES BASIN**

March 25, 1988

MANAGING THE GREAT LAKES COMMONS: AN EVALUATION  
OF RECENT INSTITUTIONAL CHANGES

Stephen Frerichs

and K. William Easter<sup>1</sup>

The Great Lakes are a common property resource<sup>2</sup>. Historically, water in the Great Lakes has been an open access, free good. With increasing demands, however, quality water has become, in an economic sense, scarce. The realization that supplies of Great Lakes water may be limited, coupled with several recent judicial decisions regarding the legality of water as a tradeable commodity, have created a growing political awareness of the importance of Great Lakes water resources. This phenomenon is particularly observable at the state political level<sup>3</sup>.

State governments have historically managed water under state police powers and developed water resources as they were needed. Now, unsure whether a state can prohibit interstate water sales, states are moving to

<sup>1</sup>The authors are Sea Grant Legislative Intern and professor in the Department of Agricultural and Applied Economics respectively. We would like to thank M.L. Livingston, Edward D. Lotterman and Kieth Kozloff for their helpful comments on an earlier draft of this report.

<sup>2</sup>For this paper, a common property resource is defined as a resource shared by a group of producers and/or consumers. Exclusion from the resource is difficult and beyond some level of user-resource interaction, additional users will adversely effect resource use of others. The eight Great Lake states are: Illinois, Indiana, Michigan, Minnesota, New York, Ohio and Pennsylvania. The Canadian provinces are Quebec and Ontario.

<sup>3</sup>See for instance the decisions: *Sporhase vs. Nebraska 1982*, *El Paso vs. Reynolds 1983* and *Colorado vs. New Mexico 1982*.

protect water supplies for future development. A new attitude of "bring the people and industry to the water rather than the water to them" prevails. This has led to strong misgiving and inflexibility about interstate and interbasin water transfers. (Howe, 1985) Often proposals are rejected not for efficiency implications or regional impacts but on the notion of setting a bad precedent. The Great Lakes basin and the Great Lakes states and provinces have been no exception to this trend.

Concern for protecting the Great Lakes basin from unwanted interbasin transfers, particularly southwestward, is the impetus behind the newest Great Lakes basin compact, the Great Lakes Charter of 1985, and U.S. Public Law 99-662. Both the Charter and Public Law create new management rules for the Great Lakes basin. The Charter establishes rules of access and conduct between states/provinces and between states and water users for water withdrawals and new or increased diversions and consumptive uses. In contrast, the Public Law assures the Great Lakes states that U.S. federal authority for an interbasin diversion will not be granted without the Great Lakes states consultation and approval.

This report will analyze the common management rules promulgated for the Great Lakes by the Great Lakes Charter. The new management rules will be analyzed to determine if management goals have a chance of being realized and what role implementation plays in the process of goal achievement.

## The Great Lakes Basin

An introduction to the Great Lakes would not be complete without reference to the abundance of water in the Great Lakes basin. General remarks regarding the vastness of the Great Lakes include:

- \* The Lakes contain 20% of the world's supply of fresh surface water and 95% of the U.S. fresh surface water supply (Task Force, 1985).
- \* The lakes contain enough water to flood the entire U.S. to a depth of 10 feet (Massey, 1985).
- \* Water retention of the Lakes varies from 191 years in Lake Superior to less than three years in Lake Erie (Donahue et al. 1986).

Hydrologically, the Great Lakes are composed of five lakes: Superior, Michigan, Huron, Erie and Ontario, which flow in a stairstep manner eastward through the St. Lawrence Seaway to the Atlantic Ocean. Large by any standard, the Lakes have relatively small but stable outflows. The small outflows combined with the vast surface area and large retention capacity of the Lakes drastically ameliorate short term lake level fluctuations (on average one to two feet per year) (IJC, 1985). Most Lake level fluctuations occur naturally, humans regulate only two of the Lakes outflows, Lake Superior at Sault St. Marie and Lake Ontario at the Moses Saunders Power Dam. Other human lake level influences come in the form of consumptive uses and diversions.<sup>4</sup>

Currently five diversions effect the Great Lakes basin. Two flow into Lake Superior from the James Bay river basin at Long Lake and Ogoki, Canada. One flows out of Lake Michigan at Chicago down the Chicago River

<sup>4</sup>An interbasin transfer (diversion) will be defined as a transfer of water from the Great Lakes Basin into another river basin and a consumptive use as that portion of water withdrawn or withheld from the Great Lakes Basin and assumed to be lost or otherwise not returned to the basin (Task Force 1985).

and eventually into the Mississippi River. Another, the Welland Canal, diverts water around the Niagara Falls from Lake Erie to Lake Ontario. The final diversion, the New York State Barge Canal, is an intrabasin diversion.

Consumptive uses, unlike diversions, tend to be small and not easily identifiable. Consumptive uses include; water for manufacturing, municipal purposes, irrigation, mining, power production and cooling purposes. Impacts on lake levels of individual consumptive uses tend to be small, however, considered cumulatively the lake level impacts are significant.

#### Limits on State Police Power

From a management perspective, Great Lakes states had assumed that under the state's police power a state could prohibit or regulate interstate transfers of water. However recent judicial decisions have changed this assumption. The Supreme Court ruled in *Sporhase v. Nebraska ex rel. Douglas* 1982 that ground water is an article of commerce and subject to the commerce clause of the U.S. Constitution. As a result Nebraska could not forbid the transfer of ground water across its state line. In the *Colorado v. New Mexico* case, which dealt with a dispute over the Vermejo River, an interstate stream, the Supreme Court held that the doctrine of equitable apportionment governs interstate streams (Utton 1983). The *El Paso v. New Mexico* case upheld the Sporhase decision and struck down a New Mexico prohibition of water exports. Thus it appears that any attempt by the Great Lakes states to legislatively embargo



interbasin water transfers would be held in conflict with the U.S. commerce clause.

The *Sporhase* decision established four guidelines to evaluate the constitutionality of a state statute that restricts interstate ground water transfers. They are: 1) the statute must have a legitimate local purpose, 2) the statute must regulate intra- and interstate diversions "evenhandedly", 3) local benefits must exceed the costs imposed on interstate commerce and 4) no less discriminating alternative against interstate commerce should exist (Massey, 1985).

Decisions in the *Sporhase* case did, however, allow the opportunity for a state to protect against unwanted diversions through legislative management. To unilaterally protect against undesired withdrawals, states could enact statewide water management programs that make preservation of state waters an integral part of the program (Tarlock, 1986). To achieve this a state must:

- 1) develop a comprehensive water allocation plan for a reasonable time period. This can be done under the state's police power,
- 2) tie applications for all new major water uses to allocation priorities established in the plan, and
- 3) assert power to deny any water use allocations which are not consistent with the plan. (Tarlock, 1986)

A state may then deny a present water use application to reserve water for future needs (Tarlock, 1986). This form of legislative management requires the establishment of a state planning authority.

The *Sporhase* decision considered health and welfare of a states citizenry as a legitimate purpose to prohibit interstate transfers, but protection for economic purposes was not deemed legitimate. (Massey, 1985)

Also, the "evenhandedness" principle of the *Sporhase* court decision plays a vital role in restricting what rules can be used to limit transfers out of the Great Lakes basin. Transfers within a riparian state must be treated the same as transfers out of basin to nonriparian states<sup>5</sup>.

Prior to the signing of the Great Lakes Charter four of the eight Great Lakes states established access rules for diversion out of the Great Lakes. Minnesota regulates any surface water appropriation in excess of 10,000 gallons per day (gpd) or 1,000,000 gallons per year through its statewide water permitting system. The permits are required for any ground or surface water appropriation; Minnesota is the only basin state with such a comprehensive water management system. Ohio and Indiana, both, have water embargo laws prohibiting diversions of Great Lakes water out of state. These are in the same spirit as the Nebraska law at issue in the *Sporhase* decision. Ohio also requires a permit for any water diversion in excess of 100,000 gpd out of Lake Erie. Illinois regulates the Chicago Diversion, by Supreme Court decree, at 3200 cfs. A permit and conservation program exists to allocate the 3200 cfs among Illinois users. Illinois also prohibits water diversions from Lake Michigan for use outside Illinois without prior consent of all other Great Lakes states and the International Joint Commission (IJC) (Michigan Lake Level Act of 1984).

#### Access Rules

The Great Lakes Charter (1985) and Public Law 99-662 (1987) establish rules of access to Great Lakes water for diversions and consumptive uses. The Charter's management objectives are:

<sup>5</sup>None of the Great Lakes states is completely within the basin.

"... to conserve the levels and flows of the Great Lakes ... to protect and conserve ... the Great Lakes Basin ecosystem ... to provide for cooperative programs and management of the water resources of the Great Lakes Basin ... to make secure and protect present developments within the region; and to provide ... for future investment and development in the region." (Task Force 1985)

The Charter is based on five principles: 1) Integrity of the Great Lakes Basin, 2) Cooperation among Jurisdictions, 3) Protection of the Water Resources of the Great Lakes, 4) Prior Notice and Consultation and 5) Cooperative Programs and Practices (Task Force, 1985).

The first principle, integrity of the Great Lakes basin, establishes the political recognition that the Great Lakes basin must be considered and managed as a unified system. Recognizing that the basin transcends political boundaries, the second principle, establishes the need for cooperation in management, i.e., common management rules. The third principle defines the attitude or orientation of the management approach.

"It is the intent of the signatory states and provinces that diversions of Basin water resources will not be allowed if individually or cumulatively they would have any significant adverse impacts on lake levels, in-basin uses, and the Great Lakes Ecosystem." (Task Force, 1985)

The fourth and fifth principles establish how the first three are to be accomplished. The prior notice and consultation (PNC) rule requires any state or province to consult and seek consent of all affected states and provinces prior to approving any major new diversion or consumptive use of Great Lakes water. The cooperative programs and practices (Principle 5) are the development of a common data base for basin water use and the

creation of a Water Resources Management Committee (WRMC) to develop a Great Lakes water resources management program.<sup>6</sup>

In February of 1987, the WRMC published its recommendation for management. Data collection is to be organized by water use category and aggregated by sub-basin<sup>7</sup> (WRMC report 1987). The WRMC found a wide variation between states regarding actual data collected and the state's authority to collect data. Few of the states collect water use data in all nine categories specified by the WRMC. A trigger level of 100,000 gallons per day in any thirty day average was set as a minimum water withdrawal required for data collection .

The WRMC also established guidelines for the prior notice and consultation process (PNC). The participation requirements for the PNC process are the authority: 1) to register any withdrawal in excess of 100,000 gpd, 2) to regulate any withdrawal in excess of 2 million gpd in any 30 day period, and 3) to notify all other affected states of a consumptive use or diversion in excess of 5 million gpd in any 30 day period. Few of the basin states had the capability to register or regulate any water withdrawal at these trigger levels prior to 1983. In order to institute these regulations a state must pass enabling legislation. The intent of the Charter's cosigners is for each state/province to legislatively implement the PNC and the water data collection processes,

<sup>6</sup>The WRMC is composed of representatives appointed by each governor and premier of the Great Lakes states and provinces. The committee was charged with developing and implementing procedures for the water use data collection system and the prior notice and consultation procedure.

<sup>7</sup>Categories are: public water supply, domestic self-supplied, irrigation, industrial, commercial self-supplied, mining, agriculture, thermoelectric and hydroelectric power. (WRMC report 1987)

making the non-binding compact legally binding through each state/province legislature.

Basin state congressmen also proposed bills in Congress to protect basin interests from interstate diversions. Although the language of the bills was later changed to interbasin diversion, the end result was P.L. 99-662. The Public Law prohibits any sized interbasin water diversion from the Great Lakes, unless such diversion is approved by the governor of each Great Lakes state (Omnibus Water-Projects Bill, 1987). The law also prohibits any federal agency from studying interbasin diversion from the Great Lakes basin.

The Public Law would appear to override the Charter, making it moot. However, the goals and objectives of the Charter and the Public Law are different. The Charter seeks to establish rules for all water withdrawals out of the Great Lakes while the Public Law regulates only diversions out of the basin.<sup>8</sup> The legality of the Public Law may also be questionable. One of the reasons purported for the law is adverse economic impacts, which the Supreme Court has decreed as insufficient reasoning to discriminate against interstate water diversions<sup>9</sup>.

In summary, two legal decisions, *Sporhase and El Paso* are the decisive impetus behind the new management rules for the Great Lakes. *Sporhase and El Paso* establish guidelines for legislative management of the state water

<sup>8</sup>The term "diversion" was not defined in the bill.

<sup>9</sup>Although an interbasin transfer out of the Great Lakes need not be interstate, the interests of the basin states in keeping basin water in their jurisdictions to collect associated secondary benefits could reasonably lead one to expect unanimous consent will be more readily granted to those interbasin transfers remaining within the basin states than to those leaving the basin states.

resources. Also, the court decision establishes criteria that the management rules must follow. Particularly of interest to the Great Lakes Basin is the "evenhandedness principle" which means all interbasin diversions must be treated alike, whether intra- or interstate.

The Great Lakes Charter was signed in 1985 by all Great Lakes states/provinces. The Charter creates a regional data collection agency and rules to manage Great Lakes diversions and consumptive uses. The U.S. Public Law 99-662 pertains only to the Great Lakes states and grants each state a veto power over any new diversion out of the basin. The Great Lakes are a commons that transcends jurisdictional boundaries. The theory of open access, common property resources is presented next as a model for analyzing the new management rules.

THE ECONOMIC THEORY OF OPEN ACCESS, COMMON PROPERTY,  
AND THE ROLE OF MANAGEMENT RULES

The classic "common property" problem characterizes a resource for which property rights are not clearly defined, causing a disjunction between individual and collective rationality. This disjunction, combined with nonseparable adverse externalities<sup>10</sup> tying the decisions and welfare of each individual resource user to other users, can lead to overinvestment, exploitation and eventual degradation of the resource. Examples of common property resources are: air, fishing grounds, oil and water pools, radio frequencies and outer space.

<sup>10</sup>Externalities will be defined where the utility of an individual resource user is influenced by a vector of activities under the individual's control and also by activities under the control of other resource users (noncompensated interdependencies), (Randall 1983).

For a common property, use and access rights may not be defined, (a *res nullis* right structure) or rights may be well defined for a group of users, (a *res communes* right structure) (Ciracy-Wantrup and Bishop 1975, Howe 1979). Ownership under *res communes* rights are generally vested in some form of collective, where access and use rights are established to mitigate overinvestment and overexploitation of the resource. Resource exploitation, however, is pervasive to *res nullis* resources. Whereas a *res communes* resource with well defined and implemented use rights, generally does not experience overuse.

In mathematical terms, N exploiters with cost function  $c_i(E_i)$  exist, where  $E_i$  is some standard amount of effort required to withdraw one unit of water<sup>11</sup>. If each exploiter faces an identical production function for withdrawals,  $W_i = f(L, E_i)$ , such that withdrawals are a function of effort and lake levels (L), a water mass conversion factor, then given a value for water, p, each appropriator maximizes short term profit  $\pi$ :

$$\max \quad pf(L, E_i) - c_i(E_i)$$

This occurs when the water withdrawer equates marginal revenues to marginal costs or:

$$(3.1) \quad \frac{\delta c_i}{\delta E_i}(E_i) = p \frac{\delta f}{\delta E_i}(L, E_i)$$

This equilibrium, however, is not a socially acceptable equilibrium because of the nonseparable externalities accruing as a result of withdrawing water from the Lakes. A social optimum would be:

<sup>11</sup>The following mathematical model closely resembles Conrad and Clark's fisheries model in Notes and Problems in Resource Economics 1987, particularly pages 130-134. Effort will be broadly defined to encompass pumping and transporting of water.

$$\max \int_0^{\infty} e^{-\alpha t} \Sigma_i \left[ pf(L, E_i) - c_i(E_i) \right] dt$$

$$\text{subject to: } \dot{L} = F(L) - \Sigma_i f(L, E_i)$$

where  $\alpha$  is the social discount rate,  $F(L)$  is the renewal rate of water into the Lakes and  $\dot{L}$  is the change in lake levels. The constraint simply states that the change in the levels must equal the Lake renewal rate minus the withdrawal rate. The corresponding current value Hamiltonian is:

$$H = \Sigma_i \left[ pf(L, E_i) - c_i(E_i) \right] - \theta(t) \left[ F(L) - \Sigma_i f(L, E_i) \right]$$

where the necessary conditions include  $\delta H / \delta E_i = 0$ , or in terms of the above equation:

$$p \frac{\delta f}{\delta E_i}(L, E_i) - \frac{\delta c_i}{\delta E_i}(E_i) - \theta \frac{\delta f}{\delta E_i}(L, E_i) = 0$$

or

$$(3.2) \quad \frac{\delta c_i}{\delta E_i}(E_i) = [p - \theta] \frac{\delta f}{\delta E_i}(L, E_i)$$

where  $\theta$  is the marginal value of water to society or the shadow price of water. It is assumed that  $\theta$  is positive, however, during periods of very high Lake levels a case could be made for a negative  $\theta$ .

A comparison of equations (3.1) and (3.2) shows that more effort is exerted by individual maximizers (3.1) relative to the desired amount of the cooperative/social optimum (3.2). The increased effort translates into overinvestment and overwithdrawal of water from the basin. If the value of water to the appropriators can be reduced by  $\theta$ , a reduction in withdrawals to a social optimum level should follow.



### Changing Individual Expectations

The tendency to overexploit *res nullis* resources when use or access restrictions to internalize adverse externalities do not exist, demonstrates the need for access or use rules (taxes, withdrawal standards or quotas, private property rights, etc). Any rules proposed for *res nullis* resources should be designed to affect the rate of resource use and entry and exit conditions (access) to the resource and the distribution of returns from the use of the resource. These rules must be formulated so that they change the rate of resource use or access by restructuring the expectations of individual resource users with respect to the rate of use or access by other users (Runge, 1981). The formulation must be done so that adverse externalities associated with resource use are internalized. In other words, the individual or firm generating an adverse externality must take into account its full cost, i.e., internalize the cost.

Implicitly or explicitly, by internalizing the externalities some management goal for the commons is recognized: conservation, preservation, maximum sustainable yield, etc. The management objective will associate with it some ideal rate of resource use over time. To structure the rate of resource use overtime, individual user expectations of what other users are or will be doing must be determined.

Manipulating the expectations of the resource users, recognizes the function of rules, i.e., forming the expectations of an individual concerning the behavior of others. For common property, which is affected over time by individual use rates, contributions to a social management goal will depend on whether the individual expects other users to contribute to the goal as well (assurance). A jointness of supply exists

when an individual chooses to contribute to the management goal of the commons. That is, when an individual chooses to contribute, by stinting on his/her rate of resource use, others will benefit, i.e., experience nonseparable externalities (Runge, 1981).

The decision to use the resource in an efficient manner is dependent on the expectation of what other users will do. Contributions will vary between individuals where contributions are a function of the information available to the individual user concerning the action of other users (Mueller, 1981; Runge, 1981). Information concerning the behavior of others, or an estimate of the behavior of others will be a function of the commons' institutional rules and the expected compliance of other users to those rules<sup>12</sup>.

To demonstrate the importance of rules in expectation formation, let  $P_i$  be a subjective probability attached by individual  $j$  to the possibility that others will withdraw at some net level  $i$ .<sup>13</sup> Also assume that individual  $j$  faces the same choices as all other users along a continuum bounded by the decision on one end to freeride (not contribute to the management goal) or to stint (contribute fully to the commons' management goal). Stinting is considered to be a contribution, which can be thought of as a cost to individual  $j$ . Contributions by  $j$  to the management goal may range from 0, no contribution or freeriding, to  $n$ , complete

<sup>12</sup>Obviously, compliance will be a function of the degree of coercive rule enforcement, the more enforcement, the larger the compliance by individuals. Economic theory and Western culture, however, agree that individual liberty and individual choice is preferred to "state control" (Bromley 1986). Minimum enforcement is preferred, i.e., rules should be structured such that voluntary exchange and cooperation mitigate resource overuse.

<sup>13</sup>This model and notation closely follow and are adapted from Runge 1981.

contribution. If the withdrawal pressure on the resource by all other users is known, and ranges from a value of 0, which represents complete resource depletion, to k, which indicates full management objective attainment, then individual j's contribution, a function of the expectations of what others contribute, can be represented by the matrix in Table 1.

In the matrix the cost and benefits of each alternative joint action are expressed in terms of utility. Net benefits to the individual withdrawing water from the Great Lakes equals the utility obtain from the consumption and/or production of goods and services related to water withdrawals minus the cost of abiding by the rules.

The columns of the matrix, 0 through k, indicate the range of possible contributions to the management goal of the commons which j expects of others. The probabilities at the bottom of each column correspond to the expected level (by j) of the possible contribution of others. The rows represent the range of possible contributions of individual j from 0 to n. Assume d to be the level of contribution by j, when j expects others to contribute at the ith level. Since j's contribution is thought of as a cost to j, the outcome for j in utility terms is  $U_{d+i} - C_d$ . This represents the net benefits to j given the ith contributions by others and the dth contribution by j (resulting in cost of  $C_d$  for j).

The expected utility for j of each alternative level of withdrawing is the summation of payoffs across each row. For example at d, expected utility  $U_d$  equals:

$$U_d = (U_d - C_d)P_0 + (U_{d+1} - C_d)P_1 + \dots + (U_{d+i} - C_d)P_i + \dots + (U_{d+k} - C_d)P_k.$$

or

$$U_d = \sum_{i=0}^k (U_{d+i}) P_i - C_d$$

Assuming  $j$  desires to maximize his/her expected utility,  $j$  will continue to contribute to the management goal as long as  $\delta U_d > 0$  and will stop contributing when  $\delta U_d = 0$  (assuming  $P_i$  and  $C$  are continuous and the second order conditions hold).

Given a commons' management objective, the role of the access rule(s) is to structure the interdependent expectations and utility functions of the individual users such that amounts contributed allow full attainment of the management objective. Ideally, the rules will structure positive expectations among users over time, i.e., positive expectations of reciprocity with a minimal need for external enforcement. Reciprocal expectations, (if I contribute you will do likewise), can only be established over time through user interaction. Reciprocity is not an immediate quid pro quo transaction (Oakerson, 1986). Reciprocity will create expectations of assurance among individual users. This assurance, that others will contribute, is a function of the rules.

Runge (1985) hypothesizes three decisions when innovating a restrictive rule for a *res nullis* common property resource: (1) the decision of which rule to institute to restrict use, (2) the decision to abide by the rule, and (3) the decision to continue to abide by the rule over time. An important step between decision one and two that is often overlooked is the implementation of the decision rule. Once a decision on the access rule has been formulated, it must be effectively implemented before it can effect the decisions of users. Rule implementation will effect both decisions (2) and (3) and could be the weak link in the

Table 1.  
A Model of an Individual's Decision Making Matrix

Others

i  
n  
d  
i  
v  
i  
d  
u  
a  
l  
j

	0	1	...	i	...	k
0	$U_0$	$U_1$	...	$U_i$	...	$U_k$
1	$U_1 - C_1$	$U_{1+1} - C_1$	...	$U_{i+1} - C_1$	...	$U_{1+k} - C_1$
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
d	$U_d - C_d$	$U_{d+1} - C_d$	...	$U_{d+i} - C_d$	...	$U_{d+k} - C_d$
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
n	$U_n - C_n$	$U_{n+1} - C_n$	...	$U_{n+i} - C_n$	...	$U_{n+k} - C_n$
	$P_0$	$P_1$	...	$P_i$	...	$P_k$

(adapted from Runge, 1981)

management process of implementing rules as the commons moves towards *res communes* management. To establish whether implementation is indeed a weak link, a theory of implementation will be employed to analyze the commons management rules as they are being implemented across the Great Lakes.

#### THE THEORY OF IMPLEMENTATION OF WATER MANAGEMENT RULES

Given the historical water management perspective of the Great Lakes states and the notion that the Federal Government may not be sympathetic to the Great Lakes basin interests (or rather more inclined to Western state interests) in applying commerce clause rules of trade; riparian state government officials decided that they must move to protect their own interests. In addition, with the constraints imposed by *Sporhase v. Nebraska* and *El Paso v. Reynolds*, any access rules to Great Lakes basin water must be applied "evenhandedly". The solution to this problem is, in part, one of implementing a "evenhanded" policy consistently across all eight states. However, a number of problems exist in implementing the policy and achieving policy objectives.

These problems emerge as government officials attempt to accomplish the objectives set forth in the Great Lakes charter. When policy outcomes do not resemble the original intentions of the policy makers, implementation becomes an issue. A crucial question is what factors have affected the attainment (or lack thereof) of the original policy objectives. Implementation analysis provides the conceptual framework for identifying these factors and for evaluating the implementation of the access rules across the Great Lakes states.

## A Framework for Evaluation

Any model or framework for analysis of implementation should organize information into patterns that are readily used and approximate the system as a whole. The framework needs to: (1) be dynamic to analyze the implementation of management rule changes for an open access resource, (2) capture the characteristics of the resource and the institutional structure affecting access to the resource, and (3) establish normative criteria for successful implementation of proposed rule changes. The criteria may be thought of as necessary but not sufficient conditions for effective implementation.

The basic framework or model consists of seven components. Two are descriptive in nature and five are analytical/normative. The model assumes that it is possible to distinguish between policy makers, policy implementors, and those affected by the policy (target groups). Making these distinctions allows one to differentiate between the responsibilities of policy makers and policy implementors and their distinct duties. Table 2 shows the components in a flow diagram.

The two descriptive components, the sociopolitical environmental and the resource/target group characteristics are intended to capture attributes which effect the technical and physical aspects of the resource. The attributes are more descriptive in nature as they tend to define the natural boundaries of the problem. The five analytical/normative components that form the heart of the analysis are: the formation of institutional arrangements, implementation of institutional arrangements, the outputs of the implementing agencies, the decision to abide by the new arrangements, and the outputs of the

institutional arrangements. They can be broadly likened to policy formation, policy implementation and policy outputs.

### The Sociopolitical Environment Element

The sociopolitical environment involves attributes that compose the setting within which any decision making arrangement is implemented. Environmental effects are broad and affect all other model components. Aspects of the environmental element include: socioeconomic conditions, prior institutional arrangements, public and political support, and the amount of media coverage.

Variation in socioeconomic conditions may effect the perception of the relative importance of the problem being addressed (Sabatier and Mazmanian, 1981). A resource price shift or a shift in the relative economic importance of a target group may diminish the need for a change in the institutional arrangements or induce an institutional change (Ruttan, 1978). A policy susceptible to changes in socioeconomic conditions must have flexibility incorporated within it to adjust to these changes. For example, access rules for water withdrawals out of the Great Lakes must recognize that lake levels fluctuate. The fluctuation of the lake levels will be correlated to the value of withdrawing water from the lake. At lower lake levels, the costs of withdrawing water may be exorbitantly high, whereas at higher lake levels there may be little or no cost involved in withdrawing water and, in fact, the action may be beneficial.

Prior institutional arrangements affecting the commons or related to the commons must also be identified. Changes or variation in these



arrangements, like changes in socioeconomic conditions, may induce the need for management changes. Inadequate institutional arrangements may be the cause of many management problems. For a commons, institutional arrangements should foster collective action and internalize externalities (Easter, 1986).

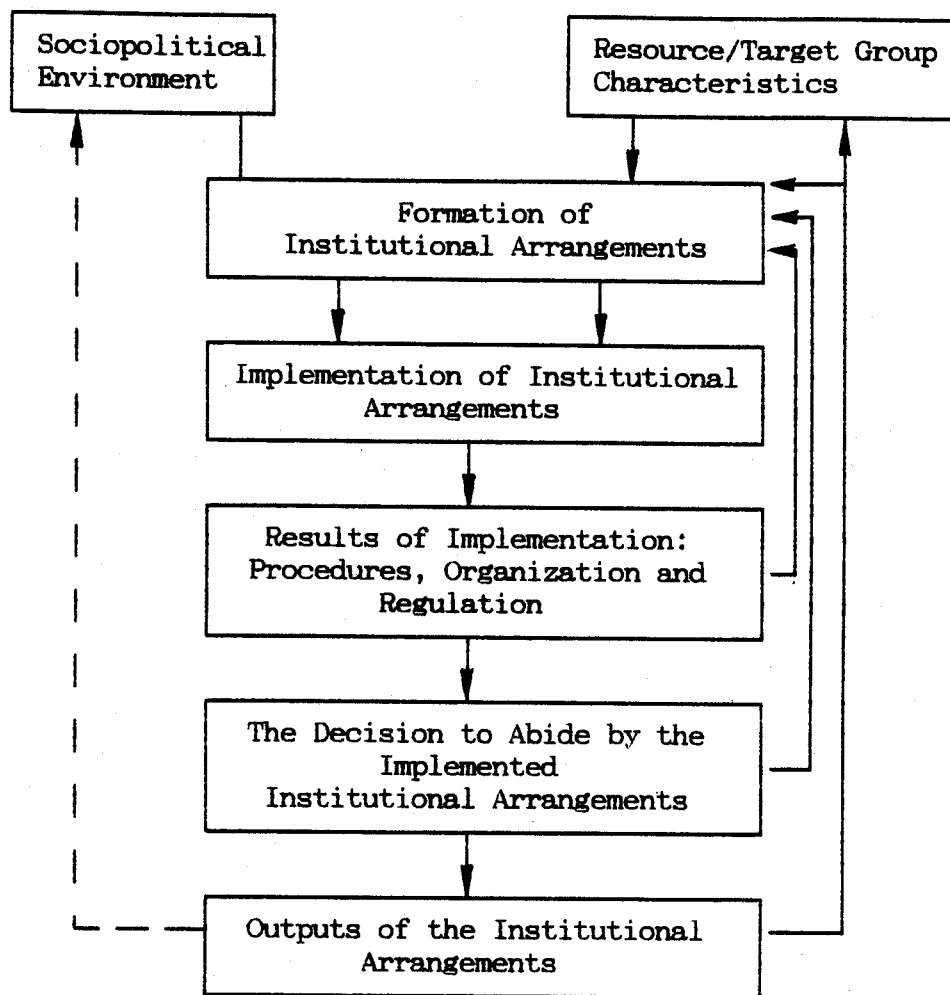
Public and political support for rule changes is also crucial for the policy to get to its implementation phase. Support will be influenced by socioeconomic conditions, and also by media coverage. The media links changes in the socioeconomic conditions to public and political opinions. Public opinions affect the political agenda and can change the implementation of a policy.

#### Resource/Target Group Characteristics

The resource and target group characteristics are inherent in any common property problem. Both the physical and technical features must be clearly described. In addition, the target group size and diversity, the need for requisite technology, the rivalry vs. nonrivalry in resource use, and the degree of exclusion in resource use<sup>14</sup> all need to be specified. The more diverse or larger the target group, the more difficult it will be to implement the management rule. Without the requisite technology it may be impossible to meet program objectives. Thus information concerning the resource and target groups is essential for the analysis of program implementation.

<sup>14</sup>The definition of rivalry and exclusivity follow Randall 1979.

Table 2: Implementing Common Property Rules: A Framework



## The Formation of Institutional Arrangements

Institutional arrangements structure individual and collective behavior with respect to the commons (Runge, 1981; Oakerson, 1986). Institutional arrangements are the "rules of the game". The rules dictate human behavior and help formulate expectations of the actions of others. Normatively, economic rules should coordinate behavior to increase benefits associated with economic behavior and ought to reduce uncertainty in human interactions (Runge, 1985). Commons' rules need not be formalized to exist. They can be cultural or traditional rules. For the purposes of this report the rules or proposed changes in the rules for the Great Lakes will be considered as given by the Great Lakes Charter and P.L. 99-662.

Ideally, commons' rules should represent a management objective, e.g., conservation or preservation of the resource. The management objective must be linked to the rules via an appropriate causal theory (Sabatier and Mazmanian, 1981). The objectives of the rules are important to the implementation process. A need to identify the objectives in order to know how or what to implement is self-evident. If multiple objectives are contained in the policy directive, concise ranking of the relative objectives should be established along with a decision rule for each objective (Taff and Runge, 1986). Precise and clear objectives aid in program evaluation, and provide implementors a resource to fall back on when adversities are met during the implementation phase (Sabatier and Mazmanian, 1981).

### Implementation of Institutional Arrangements

The fourth model component, implementation of institutional arrangements, assumes that a distinction between those who implement and those who use the resource exists. If no such distinction exists, this and the next section may be omitted and the framework collapses to Runge's three hypothetical decisions. However, in the case of a large diverse group, some type of implementing agency distinct from users is more apt to exist, particularly when interjurisdictional enforcement is required, e.g., air pollution.

The analysis of this component focuses on the *who* and the *how* of the implementation process. The *who* includes identification and analysis of the disposition, attitudes, commitment, financial resources and organizational capabilities of the implementors.

Any agency will tend to develop general orientations to problems and it may be slow to change these orientations (Easter, 1986, Sabatier and Mazmanian, 1981). Ensuring that the implementors are disposed or committed to the management objectives will facilitate more successful and consistent implementation. This can be accomplished either by creating a new agency to implement the policy changes or by assigning the task to an established agency with a known predisposition to the policy goals. The disposition or attitudes of the implementors can be conceived as aspects of the utility function of the implementors.

Organizational capabilities and financial resources of the implementing agency are also constraints to be considered when analyzing the implementation of a policy directive. (Sabatier and Mazmanian, 1981, Easter, 1986) Obviously, if organizational capabilities and/or financial

resources are inadequate to successfully implement and enforce the policy, objectives will not be met.

The *how* identifies the vehicle of enforcement, the "tool" of implementation, e.g., voluntary contributions, licensing, permitting, zoning, taxes, subsidies, prices, fines, etc. (Easter, 1986). An important aspect of the implementation process is the question of: How are things going to get done?.

"Many times no one asks the questions: What implementation tools would be the most effective in encouraging adoption of the desired resource management actions, and who should apply the tools?" (Easter, 1986 p. 107)

To determine what "most effective" means, some type of evaluative criteria needs to be stipulated. The concepts of efficiency and equity are generally referred to. Both concepts must be confined to a feasible set, e.g., it may not be feasible to price a resource. Within the set of feasible alternatives, which provide essentially the same outcome, the most efficient tool is generally the one with the least cost. In some cases, it may even be possible to find an alternative that equates the marginal cost of implementation with the marginal benefits.

Equity considerations are more difficult to define. Equity would dictate that all users get a fair return on their contribution to the collective effort to regulate the commons (Oakerson, 1986). To achieve this, all rules should be implemented and enforced fairly to and among all resource users. Fairness, i.e, consistency in implementation across all users is required to form positive expectations among users. This feeling of reciprocity depends on expectations and these expectations must be formed overtime through user/rule and user/user interaction. If negative

expectations are established through the institutional arrangements, i.e., I abide by the rules, but you do not, therefore I will not abide by the rules when given a choice; freeriding and resource degradation can be expected. Thus implementing management rules equitably is not only desirable from a social perspective but is also necessary if positive expectations between commons' users are to be formed.

#### Results of Implementation: Procedures, Organization, Regulation

As results from the implementation process do not always resemble proposed or intended results, the implemented commons' rules need to be compared for consistency with the proposed rules identified in the third component of this framework. Three scenarios may occur: 1) the results will not deviate from intended effects, 2) the results will deviate marginally from intended effects and no change may be needed, or 3) results deviate from intended effects such that reimplementation is necessary. The analysis of this component will focus on the procedures, organization and regulation decisions of the implementors (implementing agencies) to determine whether the results of implementation deviate from intended institutions promulgated in the Charter. The analysis of this component need not be retrospective, it can be prospective and prescriptive as well.

#### The Decision to Abide by the Implemented Institutional Arrangements

The decision to abide by rules will be a function of the expectations of actions by other users (assurance), and the expected benefits and costs associated with others contributing. These expectations are based on the commons' rules. The actual rules are a function of the process of their

implementation. The objective of the *res communes* managers is to formulate and implement rules such that the management objectives are fully attained. To attain management objectives, rules must be promulgated and the rules must be implemented successfully such that the decision to abide by the rules is made by a critical mass.

### Outputs of the Institutional Arrangements

The outputs of the entire process are determined by the promulgated institutional arrangements, the implementation of those rules and the summation of individual user decisions to abide by the rules. This final component involves analyzing the outputs of the entire process. When the analysis shows output below expectations, three basic questions should be addressed. Do the implemented rules structure expectations and incentives to ascertain enough rule compliance to achieve management goals? Do outputs internalize externalities? Are expectations of reciprocity and assurance fostered overtime? The problem may also lie in the actual rules themselves, perhaps a lack of understanding of the underlying causal theory linking the rule changes to behavioral changes. Or, the problem may lie in the implementation process, perhaps the implementors have no interest in or disagree with the management objectives. Thus once outputs or expected outputs are found to fall short of goals, the reasons for the shortfall should be determined.

### ANALYSIS OF THE GREAT LAKES COMMONS

The problem of formulating and implementing commons' management rules is not unique to the Great Lakes. The presented framework is broad enough

to analyze the implementation of commons' management rules for most *res nullis* resources. The purpose of the following analysis is two-fold: 1) to verify the framework and 2) to analyze the newly promulgated Great Lakes management rules during implementation.

The uniqueness of the Great Lakes commons results from the vast nature of the resource and the somewhat arbitrary geopolitical boundaries humans have defined around it. Any common management rules promulgated for the Great Lakes will be constrained by international, federal and state/provincial laws. The promulgation of Public Law 99-662, granting Great Lakes states governors veto power over any proposed diversion out of the Great Lakes can be seen as the result of states seeking assurance from the Federal Government. Since paramount federal authority subjugates state authority in like matters, the states sought and obtained assurance from Congress that congressional approval of a diversion out of the Great Lakes basin would not be granted without approval by the Great Lakes states.

The Public Law will only be invoked in the case of diversion out of the Great Lakes basin. Because the Public Law is binding and grants virtual veto power to each Great Lakes governor for any new diversion out of the Great Lakes basin, the riparian states should be assured that no unwanted diversion will occur without their approval. Still, the Public Law does not pertain to intrabasin diversions nor to consumptive uses although it does represent the Federal authority governing matters of diversion out of the basin.



## Implementation of the Great Lakes Charter

### The Sociopolitical Environment and Target Group/Resource Characteristics

Changes in socioeconomic conditions, perceived rising demand for Great Lakes water, and changes in the institutional arrangements, forced states to reevaluate the institutional structures for managing water withdrawals from the Great Lakes. The rights structure of the Great Lakes did not allow the states to use police power to prohibit interstate transfers, or regulate consumptive uses. Any entity could withdraw water from the Lakes without much consideration or notification of others. For the Lakes, the water withdrawals can be conceptualized either as rival, with noncompensated interdependencies (externalities) or as a congestible good, with the cost of congestion broadly defined to encompass costs accruing to other uses such as navigation, hydropower and the Basin's ecosystem. The rival/externality framework is used since it does not require recognition of prior rights and is less restrictive.

The target group, those effected by the rules, can be conceptualized as all current and all prospective water withdrawers. This group, although quite diverse, is easily identifiable. The states are also effected by management rules and can be considered as one of the target groups. Indirectly, they reap secondary benefits from entities that consume water, e.g., in taxes. Thus, the states or more specifically the political leaders of the states, have a distinct interest in the commons' rules and their implementation.

If states are one of the target groups, they also are the policy makers (at least the elected officials) and the implementors of the policy (state agencies). Since a distinction is made between the target groups

and the implementors, the analysis must be done at two levels: the state/state and the state/withdrawer level. For the state/state analysis, the implementation collapses to one of promulgating the new access rules and deciding, as a member of the commons, to abide by the new access rules. In the state/withdrawer analysis, the full framework applies but only to those states that have decided to implement the commons' rules. The analysis will proceed by component as depicted in Table 2. The state/state relationship will be analyzed first followed by the state/withdrawer analysis.

### State/State Analysis

#### Formation of Institutional Arrangements

The management objectives embodied in the Charter are quite clear. They focus on conserving the levels and flows of the Great Lakes and on protecting and conserving the Basin ecosystem. One could interpret this language as the management's desire to prevent resource degradation. Above, it was demonstrated that to prevent resource degradation of an open access resource, externalities had to be internalized. For the Great Lakes, to conserve the levels and flows, externalities caused by water withdrawals must be internalized. Other stated objectives include: making secure and protecting present developments within the region and providing for future investment and development in the region.

Thus the Charter's management objective is to conserve lake levels and provide for future development. Presumably, future development will entail water withdrawals from the Lakes. The two objectives, conservation and development need not be at odds. However, at some Lake level further water

withdrawals will damage the Lake ecosystem and associated economic activities.

The underlying spirit of the Charter is cooperation. The answer to the open access problem promulgated within the Charter is cooperative regulation, with regulation conceived as a permitting authority. A permitting authority grants the state the right to deny access to the Lake Waters and to stipulate the rate of water withdrawal from the Lakes. The permit allows the state to control the aggregate level of water withdrawals within the state. For large scale withdrawals ( $\geq 5,000,000$  gpd in any 30 day period) the prior notice and consultation (PNC) process will be initiated. Through the PNC process, the states plan to cooperatively manage and regulate the total level of water withdrawals incurred through consumptive uses and diversions. However, because the process is non binding, the state where the withdrawal occurs makes the final decision. Thus externalities, incurred by others from changes in the Lake levels, may not be internalized, particularly when development within a state receives high priority relative to conservation objectives.

#### The Decision to Abide by Institutional Arrangements

For the states, the focus is on the decision to abide by (implement) the institutional arrangements. Abiding by or implementing the arrangements would entail legislating the authority: 1) to collect/register data for any water withdrawal in excess of 100,000 gpd in any thirty day period, 2) to regulate any new or increased diversion or consumptive use in excess of 2,000,000 gpd in any thirty day period, and 3) to require notification and consultation of all Great Lakes states/provinces of any

new or increased diversion or consumptive use in excess of 5,000,000 gpd in any thirty day period. Implementation also includes providing data on withdrawals to a regional data collection agency.

As stated, the decision to abide by the rules is based on expected contributions of others (decision to implement) and expected benefits and costs of abiding by the rules. Benefits of implementation would include the ability to register and regulate water withdrawals, i.e., collect data on water withdrawal effects, stipulate rate of water use and deny access if desired, and provide for a systematic development of the water resources. Costs would include legislative costs, political costs of supporting legislation, regulatory costs, operations costs, and loss of secondary benefits that might occur when some entity is denied water as a result of the process.

The decisions of political leaders in each state to implement the Charter rules are summarized in Table 3. The decision to implement should not be confused with the actual implementation of the rules. Reasons abound for draft legislation (the decision to implement) which is never enacted.

To date, five states (Illinois, Minnesota, New York, Ohio, and Wisconsin) have drafted legislation to implement the Charter. In New York, Assembly Bill 6257 was defeated in the General Assembly in 1987. The Bill would have implemented all of the Charter's requirements; a new bill is expected to be drafted in the near future (Tobe 11/9/87). In Ohio, legislation to implement the Charter's provisions will be introduced at the end of November 1987 (Bartz 11/9/87). In contrast, Illinois, Minnesota,

and Wisconsin have successfully enacted legislation to modify their existing authority to meet the Charter's provisions.

Neither Indiana nor Pennsylvania have drafted legislation to implement the Charter. Government officials in both states do not expect any such legislation (Hebbenstreit, 11/9/87; Hoffman, 11/10/87). Perhaps the legislative, political, and regulatory costs of implementing the Charter outweigh the benefits of regulating such a relatively small coastline.

Michigan is the anomaly of the eight states. Any interbasin transfer Michigan would or could approve of, would have to go outstate (except for a small stretch,  $\approx$  2 miles, in the southwestern corner). All states bordering Michigan are Great Lakes states, making it difficult for Michigan to export Great Lakes water out-of-basin or out-of-state. However, Michigan has the longest coast line of any Great Lakes state and is virtually surrounded by the Great Lakes. Arguably, Michigan would have the most to lose from lowering Lake levels in periods of low Lake levels and the most to gain by lowering Lake levels in times of high Lakes levels (mitigating shoreline damages). Currently, Michigan has not drafted any legislation to implement the Charter's provisions<sup>15</sup>.

#### Outputs of the Institutional Arrangements

Do the implemented rules structure expectations and incentives to ascertain enough rule compliance to achieve management goals? Does the

<sup>15</sup>All of the states that have not yet implemented the Charter's provisions are expected to abide by the agreement. Excluding the newly elected governor of Pennsylvania, all of the governors of the states that have not implemented the Charter's provisions, signed the Charter agreement. However, one cannot be certain that ensuing governors will abide by past promises without legislation.

nonbinding cooperative regulation process internalize externalities to prevent overinvestment and/or resource degradation? To provide a complete answer to these questions, the analysis must be extended to the state/withdrawer relationship.

### State/Withdrawer Analysis

#### Formation of Institutional Arrangements

The institutional arrangements for this part of the analysis are the rules which have been successfully enacted by the state legislatures. The language enacted is identical to the Charter's, including the objectives. The analysis focuses on Illinois, Minnesota, New York and Wisconsin.<sup>16</sup> New York is included even though the proposed legislation did not pass the New York General Assembly.

#### Implementation of Institutional Arrangements

How the legislation passed, what political trading took place, etc, is beyond the scope of this paper and best left to a political scientist. Thus the focus is on the *who* and the *how* of the implementation process. Both are summarized in Table 4.

All of the agencies designated to implement the institutional arrangements are established agencies, i.e, no new agencies were created. The fact that the DNR or equivalent agencies have been designated as the

<sup>16</sup>At the time of analysis a copy of Ohio's draft legislation had not been received, otherwise it also would have been included.

TABLE 3: Summary of State's Implementation of the Charter

	Illinois		IN		MI		MN		NY		OH		PA		WI	
	Before	Present	B	P	B	P	B	P	B	P	B	P	B	P	B	P
Ability to register any water withdrawal from the Great Lakes $\geq$ 100,000 GPD	Yes	Yes	Y <sup>3</sup>	Y	N	N	Y	Y	N	N <sup>5</sup>	Y	Y <sup>6</sup>	Y <sup>7</sup>	Y <sup>7</sup>	N	Y <sup>8</sup>
Ability to manage or regulate water division $\geq$ 2 million GPD from G.L.	Yes	Yes	N	N	N	N	Y	Y	N	N	Y	Y	Y <sup>7</sup>	Y <sup>7</sup>	N	Y
Ability to manage or regulate a consumptive use $\geq$ 2 million gpd from G.L.	No	Yes <sup>1</sup>	N	N	N	N	Y	Y	N	N	N	N	Y <sup>7</sup>	Y <sup>7</sup>	N	Y
Legislative language requiring notification for a water withdrawal $\geq$ 5 million gpd	No	No <sup>2</sup>	N	N	N	N	N	Y <sup>4</sup>	N	N	N	N	N	N	N	Y
Meets charter eligibility requirements for PNC process	No	Yes	N	N	N	N	Y	Y	N	N	N	N	N	N	N	Y

<sup>1</sup> Change occurred under Level of Lake Michigan Act 1984.

<sup>2</sup> Legislative language requires approval of all other Great Lakes states for a diversion only. For approval notification would be required.

<sup>3</sup> Since 1983, under Indiana Code 13-2-6.1.

<sup>4</sup> Enabling Legislation passed 1987, H.F. 1507, Chp 159.

<sup>5</sup> Draft legislation, Assembly Bill 6257, would have implemented all facets of Charter, defeated in General Assembly 1987.

<sup>6</sup> Ohio S.B. 360, passed in 1983-1984 session.

<sup>7</sup> Since 1939, for Public Water Supplies only.

<sup>8</sup> Wisconsin Act 60, enacted 1985.

B = Before 1983; P = present (December 1987)

implementing agency instead of the Departments of Commerce, suggests a conservation orientation by the state politicians regarding the Lakes.<sup>17</sup>

Organizational capabilities and financial resources should not be a limiting factor. All of the agencies have prior experience in issuing permits and adequate resources to do the job.

The implementation tools are registration and permitting. With registration the state does not deny or approve water withdrawals. The permit, however, could establish authority to:

- suspend, modify, grant or deny a permit (access)
- establish withdrawal rates (rate of use)
- require periodic reporting
- require metering devices and water conservation
- require a processing fee
- determine priority of appropriation among users
- specify the duration of the permit

(Maxwell and Waelti, 1978)

The permit system serves several important purposes. The permit system for water withdrawals places water rights under executive regulation. Water rights are defined, but by a state regulatory agency.<sup>18</sup> The permit system allows the state to control the aggregate level of permitted withdrawals out of state waters. If all the states implement the permit system at the specified trigger levels, the states believe that the total aggregate level of permissible withdrawals from the Great Lakes can be regulated. That is, the PNC process is perceived as a medium to cooperatively manage future development.

<sup>17</sup> IDOT, the exception, was appointed in 1964 as the regulatory agency of Lake Michigan withdrawals in Illinois.

<sup>18</sup> This was the sticking point for New York's proposed legislation. (Tobe 11/9/87)



The open access problem of externality is not internalized by the permit system as currently implemented. No limit is set on the number of permits issued nor on the total amount of water withdrawals. A permit issuing state will notify and consult with other states. But given the incongruent nature of conservation and development and the predisposition of elected officials to promote development within their state, it is likely that the current rules will not suffice to achieve conservation nor to prevent overuse of the resource. From an efficiency standpoint the permit system has appealing potential, however, since the permits as structured do not internalize externalities, they are not efficient.

The permit system, at first glance, would seem to be quite fair, i.e., equitable. When implemented, the permit applies to every one in the state desiring to consume water in excess of established trigger levels. However, equity would also dictate that an appropriator filing for a permit would have a similar chance of receiving the permit whether they file in Minnesota or New York, i.e., the permit should be consistent across states.<sup>20</sup> Table 5 summarizes permit approval criteria for the four states.

The language of the approval criteria is, at best, ambiguous. How the different agencies will interpret "reasonable" and "consistent" for example will vary between agencies. The only criteria that is common to all four states is public health, safety and welfare. This criteria is a direct outgrowth of the state's police power which is exercised to preclude the creation of public harm. Only Illinois includes reasonable and beneficial use as one of the criteria. In general, the varying criteria between

<sup>20</sup>This becomes especially critical if permits are transferable across state lines.

Table 4: Implementation of the Charter

States	Who implements	How are rules implemented
Illinois	Illinois Department of Transportation (IDOT)	Permit required for any sized diversion and for any c.u. $\geq$ 2,000,000 gpd.
Minnesota	Minnesota Department of Natural Resources (MNDNR)	Permit for any water withdrawal $\geq$ 10,000 gpd or $\geq$ 100,000 gpy.
New York <sup>19</sup>	New York Department of Environmental Conservation (NYDEC)	Registration for any water withdrawal $\geq$ 100,000 gpd. Permit for any c.u. $\geq$ 2,000,000 gpd. and a permit for any sized water diversion
Wisconsin	Wisconsin Department of Natural Resources (WDNR)	Registration for any water withdrawal $\geq$ 100,000 gpd. Permit required for any c.u. and diversion $\geq$ 2,000,000 gpd.

Source: Personal interviews with State Water Policy Personnel.

c.u. = consumptive use  
gpd = gallons per day  
gpy = gallons per year

<sup>19</sup>Draft legislation 6257, defeated in General Assembly 1987.

states and the ambiguous language of the permits, could mean that permit approval will not be inconsistent between states. Although the discrepancies may not be large, the differences could lead to an undermining of cooperation, i.e., reciprocity overtime. If a state suspects another of having "loose" or "easy" approval criteria and, therefore, not contributing adequately to the management goal of conservation, it may adjust its own criteria to facilitate "easier" approval. This may foster negative expectations among states.

To summarize, agencies sympathetic to the management goal of conservation with adequate organizational capabilities and financial resources have been designated as implementors/administrators of the management rules in three Great Lakes states. However, as implemented, the permits are inadequate for internalizing externalities and fostering mutual expectations of reciprocity overtime. The fault lies within the promulgated institutional arrangements of the Charter, as the proposed system gives no incentive to states to stop issuing permits or to establish an over all maximum level of withdrawals. Also, the process has instituted ambiguous permit criteria that are not consistent across states. The inconsistency may result in negative expectations and undermine cooperation. This may be a fault of the implementation process, alternatively, it may be attributable to the desire by states to retain their sovereignty in establishing permit approval criteria.

#### The Results of Implementation: Procedures, Organization, Regulation

Do results of the implementation process deviate from the intended

effects desired by the Charter's drafters? The answer would have to be no for those states that have implemented the Charter's rules thus far. Illinois, Minnesota and Wisconsin have implemented the Charter's rules faithfully. This may be attributed to the fact that the policy formulators had a keen interest in implementing the policy and were involved in both policy formulation and implementation.

#### Decision to Abide by the Implemented Institutional Arrangements

Are the rules structured to facilitate the decision to abide by the institutional arrangements? The individual resource users will base their decision on the state's implemented rules. If the state decides to implement the Charter's rules, the state can structure financial penalties for withdrawing water without a permit to exceed the cost of purchasing a permit or registering the withdrawal. The decision by a rational individual withdrawer will then be to abide by the rules and full compliance is attainable<sup>21</sup>. The crucial decision to determine whether management objectives are attained lies not with the individual resource user but with the state's decision to abide by (implement) the Charter. The state decision is the important initial decision, as it is voluntary. The analysis thus, returns to the final component, where the state/state relationship analysis left off.

<sup>21</sup>Wisconsin already has issued permits for withdrawals under its permitting authority. (Shea Wisconsin, 1987) Minnesota and Illinois had been issuing permits for surface water withdrawals before 1983. Thus withdrawer compliance can be expected.

Table 5: Permit Approval Standards

The Consumptive Use or Diversion must:	ILL.	MN.	NY. <sup>1</sup>	WI.
1) be of reasonable and beneficial use	X			
2) incorporate reasonable conservation practices	X		X	X
3) be consistent with public health, safety and welfare of the state	X	X	X	X
4) have legislative approval		X <sup>2</sup>		
5) not conflict with future water resource needs		X		X
6) enough available water must be in proposed area		X		
7) be consistent with State and other water management plans		X	X	X
8) not conflict with competing users		X		
9) not have a significant adverse impact on the environment and ecosystem of the Great Lakes			X	X
10) not adversely effect public water rights in navigable waters				X

<sup>1</sup>New York draft legislation, Assembly Bill 6257, did not pass Assembly in 1987.

<sup>2</sup>For all c.u. and diversion  $\geq$  2,000,000 gpd except for those pertaining to domestic water supplies, irrigation and agricultural processing.

Source: Personal Interviews of State Water Policy personnel and State documentation.

### Outputs of the Institutional Arrangements

What behavior might one expect as a result of the promulgated and implemented access rules? Expectations of cooperation and reciprocity are currently high among the states. There is a strong unified cooperative spirit among the basin states to prevent interbasin transfers of water out of the Great Lakes states. Given this cooperative spirit and the Public Law, the promulgated rules may be effective in preventing interbasin water diversions out of the Great Lakes. Certainly, given the federal veto power any interstate, interbasin diversion may be particularly difficult to accomplish. But the Public Law does not pertain to consumptive uses nor to intrabasin transfers and, here, management rules may fall short of achieving goals. The Charter and implemented state management rules do not internalize externalities that occur when Lake levels drop due to water withdrawals. Because of the conflicts between conservation and development and the fact that no provisions exist to internalize externalities, overuse and overinvestment from within the Basin are likely to occur. At some point the overuse and overinvestment may begin to erode existing cooperation.

### CONCLUSIONS AND RECOMMENDATIONS

Unregulated open access resources typically suffer from overinvestment, overexploitation and eventual degradation. The theory of open access resources demonstrates the need for their management, where management rules can be constructed to facilitate either a "private" or a "public" solution.

The Great Lakes basin is an enormous, complexly integrated, interjurisdictional commons. With respect to consumptive water use, the basin was essentially an open access resource prior to the promulgation of the Great Lakes Charter and P.L. 99-662. Changes in institutional arrangements, the *Sporhase and El Paso* court decisions, combined with changing socio-economic conditions forced state political leaders to promulgate and implement rules to manage the Great Lakes basin with respect to water withdrawals.

Undoubtedly, the intent of political leaders from the Basin states and provinces is not to manage all withdrawals but only to protect the basin against unwanted interstate diversion. However, given the constraints placed on legislative water management by the *Sporhase and El Paso court decisions*, management rules have to be broadened to include all withdrawals from the Basin. Because the basin encompasses international, federal, and state/provincial jurisdictions, state political leaders are pursuing management rules at the U.S. federal and the state/provincial level.

The Great Lakes Charter is a positive first step towards basin management. The common property nature of the Great Lakes is recognized within the Charter. All commons' members are involved in management decisions that significantly alter Lake levels or water quality. The recognition by political leaders in the Great Lakes region that the Great Lakes basin is a commons, implies that it should be managed as such. Management of a commons requires management rules to be applied consistently to all users to develop expectations of reciprocity and assurance. In addition the rules should internalize externalities. On

both of these counts the Great Lakes Charter, as promulgated and implemented, fails.

The implementation tool, the permit, is not consistent between or among states. Approval criteria vary between states and are vague and ambiguous. Also, the permit system as designed does not internalize externalities, i.e., permits do not take into account Lake level fluctuations. Because of the inherent goal conflicts within the Charter between conservation and development, no incentive exists within the permit system or the prior notice and consultation (PNC) process for a state to discontinue issuing permits.

Because Lake levels have been high (1980-1986), the fact that permits may not be consistent between states or do not internalize externalities has not concerned policy makers. But the Lakes are dynamic, i.e., Lake levels fluctuate. In fact, a significant drop occurred in 1987. The ability to regulate water withdrawals by permit will become important as Lake levels recede or withdrawals increase. The current role of the permits is one of gathering information about withdrawals. If states and provinces simply desire to collect information, registration would accomplish this goal and would be more cost effective. As the regulatory role of permits increases, the shortfalls inherent in their structure will become more apparent and important. If states and provinces desire to manage the basin with respect to water withdrawals, changes in the permits need to be considered. To this end, evolution towards a transferable and divisible permit would be a positive next step.



## Recommendations

Management rules for water withdrawals from the Great Lakes Basin need to recognize:

- the unified system of lakes and their interdependencies.
- the political, common property nature of the basin.
- the states and provinces desire to manage the Lakes as opposed to federal or international regulation.
- the political significance attached to secondary benefits captured by the states or provinces from entities consuming water within their jurisdiction.
- the need to be consistent and fair overtime to form expectations of reciprocity and assurance among all commons' members.
- the need to internalize externalities associated with water withdrawals.

The current permitting system as implemented in Illinois, Minnesota, and Wisconsin and proposed in New York recognizes the first four of these points. A transferable, divisible permit, if structured properly would achieve all six points.

A transferable permit establishes a property right for the permit holder to consume a certain amount of water.<sup>22</sup> Once the permit has been granted, it may be transferred among entities as a property right, i.e., the permit is not an appurtenance to land. Examples of transferable permit markets are: BOD discharge permits, taxi cab medallions, and liquor licensing (Hahn, 1983).

The transferable permit system for water withdrawals from the Great Lakes commons requires the definition of a minimum Lake level (MLL) . The MLL would represent the minimum desired Lake level. Creating a MLL standard would remove the ability to continue to issue permits indefinitely

<sup>22</sup>Permits should be defined as a consumptive use, not as a withdrawal, to facilitate the determination of externalities associated with the actual water loss (Johnson and Gisser, 1981). Also, to achieve water quality goals, discharge quality could be included in the permits.

since a maximum amount of water for withdrawals would be established. The MLL could be set based on the effects of withdrawals on other activities in the Basin such as navigation, hydropower, and the Basin's ecosystem.

For Lake levels above the MLL, permits would be issued for the difference between the Lake level and the MLL which will be called the surplus. The number of permits issued for the surplus would be fixed. Once the surplus is allocated any entity desiring to withdraw water would have to buy, rent, or lease permit shares from permit holders. The permit could include a priority ranking, where the priority rank is based either on use, or time, or a combination of the two. When Lake levels drop below the MLL or some other predetermined level, the consumptive use right of a permit would be reduced. The amount of reduction in the use rate for each permit would depend on the relative priority ranking of a permit and how low the Lakes levels had fallen. For example, a permit issued in 1900 might have priority over a permit issued in 1950 or a municipal use permit may have priority over an industrial use permit. As Lake levels fall and the surplus is reduced, the price of the permit share should rise. For rising Lake levels, the price of a low priority permit would fall and could approach zero at high surplus levels.

The definition of MLL must be an international decision for the Great Lakes made by all commons' members and users. The decision will necessarily be hydrologic, economic, and political. The agreed upon MLL, by definition, will probably have to recognize prior rights such as the Basin ecosystem, navigation, hydropower, and shoreline property owners. The decision on the MLL should be designed to prevent degradation and overuse, i.e., it should recognize the physical limits of the Great Lakes

and its ecosystem. Basing the MLL on a long term average, for example, is one possibility. The MLL need not be fixed once and for all but should, probably, be flexible and reevaluated periodically.

Permits would not have to be transferable within the entire Basin since transferability within each lake would suffice. The MLL could be established for each of the five lakes separately, taking into account downstream effects for the lakes as a group.

If permits are transferable, they should be consistent among states with identical criteria for approval. Indeed, a state might have other states represented on the body approving the states permit, i.e., the Minnesota board approving Lake Superior permits might include members from New York and Illinois as well as members from Wisconsin and Ontario. All states and provinces as a minimum should agree on the criteria for approving permits. Other decisions concerning permits that would have to be made on an international level would include: 1) the basis for defining permits such as quantity and quality of water and the type of use, 2) the procedures for allocating and exchanging permits, 3) the duration and number of permits to be issued, 4) restrictions on exchange, 5) the arrangements for implementing the permit system, including what agency issues the permits and who enforces and monitors compliance, and 6) the division of permits among states (Eheart, et al., 1983).

The recommendation to move towards a transferable, divisible permit is intended to stimulate discussion of the permit system. Obviously, the discussion here is inadequate to highlight all of the advantages and disadvantages of a transferable permit for Great Lakes water withdrawals.

But it does suggest a change in the current permit system and a direction for that change.

Finally, conclusions regarding the implementation framework and the role of implementation need to be drawn. The framework for implementing common property rules functioned reasonably well for the Great Lakes. The framework helped highlight the goal conflicts inherent in the Great Lakes Charter and the inadequacy of the permits. Implementation of the Charter, for Illinois, Minnesota, and Wisconsin appears to have been relatively successful. This is partly attributable to the high degree of interaction of the implementors in the policy formulation process. The problems that New York had in passing the Charter legislation through its General Assembly may be indicative of the problems other states will have.

## References

- Bartz, Richard, 1987. Special Assistant for Lake Erie, Ohio Department of Natural Resources, Division of Water. Telephone Conversation November 9.
- Ciracy-Wantrup, S. V. and Richard C. Bishop, 1975. "Common Property as a Concept in Natural Resource Policy." Natural Resources Journal. 15 (4), 713-728.
- Colorado v. New Mexico, \_\_\_\_ U.S. \_\_\_\_, 103 S. Ct. 345 (1982)
- Donahue, Michael J., Alicia A. Bixby and David Siebert, 1986. "Great Lakes Diversion and Consumptive Use: The Issue in Perspective." Case Western Reserve Journal of International Law. 18, (1), 19-49.
- Easter, K. William, 1986. "Program Implementation." in Watershed Resources Management: An Integrated Framework with Studies From Asia and the Pacific. eds. K. William Easter, John A. Dixon and Maynard M. Hufschmidt. Studies in Water Policy and Management, No. 10. London and Boulder: Westview Press.
- Eheart, J.W., E. Downey Brill Jr., and Randolph M Lyon, 1983. "Transferable Discharge Permits for Control of BOD: An Overview." in Buying A Better Environment. The Proceedings of a National Conference on "Regulatory Reform, Transferable Permits and Enhancement of Environmental Quality" eds. Erhard F. Joeres and Martin H. David. Madison, Wisconsin: the University of Wisconsin Press. p. 163-197.
- Great Lakes and Water Resources Planning Commission, 1987. "Water Resources for the Future: Michigan's Draft Action Plan." February 24.
- Hahn, Robert W., 1983. "Designing Markets in Transferable Property Rights: A Practitioner's Guide." in Buying A Better Environment. The Proceedings of a National Conference on "Regulatory Reform, Transferable Permits and Enhancement of Environmental Quality" eds. Erhard F. Joeres and Martin H. David. Madison, Wisconsin: The University of Wisconsin Press. 83-99.
- Hebbenstreit, James, 1987. Assistant Director of the Division of Water, Department of Natural Resource, Indianapolis, Indiana. Telephone Conversation, July 10.
- Hoffman, Joseph, 1987. Assistant Director, Bureau of Water Resources Management, Department of Environmental Resources. Harrisburg, Pennsylvania. Telephone Conversation, July 10.

- Howe, Charles W., 1979. Natural Resource Economics. New York: John Wiley and Sons. Chapter 12.
- Howe, Charles W., 1985. "Economic, Legal, and Hydrologic Dimensions of Potential Interstate Water Markets." American Journal of Agricultural Economics. 67(5), 1226-1230.
- International Joint Commission (IJC), 1985. Great Lakes Diversions and Consumptive Uses, A Report to the Governments of the United States and Canada under the 1977 Reference. Washington D.C., Jan.
- Massey, Dean T., 1985. "Great Lakes Water Diversion: Legal Issues." A paper presented to the Water Resources Planning and Management Div. Conference, Buffalo NY. June 10-12.
- Maxwell, Judith and John J. Waelti, 1978. "Policies and Procedures Used for Granting Irrigation Permits in Selected Upper Midwestern States" University of Minnesota Staff Paper 78-12. Department of Agricultural and Applied Economics, August.
- Michigan Lake Level Act of 1984, 1986. In Water Resources and Other Related Laws of Illinois. Illinois Department of Transportation St. Paul, Minnesota: West Publishing Co. p. 19-21.
- Mueller, Dennis C., 1981. Public Choice. Cambridge: Cambridge University Press.
- Oakerson, Ronald J., 1986. "A Model for the Analysis of Common Property Problems." in the Proceedings of the Conference on Common Property Resource Management. National Academy Press. Washington D.C., p. 13-29.
- Randall, Alan, 1987. Resource Economics (an Economic Approach to Natural Resource and Environmental Policy). New York, John Wiley and Son, Second edition, p. 182.
- Runge, Carlisle Ford, 1981. Institutions and Common Property Externalities: The Assurance Problem in Economic Development. Ph.D. Thesis The University of Wisconsin, Madison.
- Runge, Carlisle Ford, 1985. "The Innovation of Rules and the Structure of Incentives in Open Access Resources." American Journal Agricultural Economics. 67 (2), 368-372.
- Ruttan, Vernon, 1978. "Induced Institutional Change" in Induced Innovation: Technology, Institutions, and Development. eds. Hans P. Biswanger and Vernon W. Ruttan. Baltimore: Johns Hopkins University Press. p. 327-357.
- Sabatier, Paul A. and Daniel A. Mazmanian, 1981. Effective Policy Implementation. Lexington, Massachusetts: Lexington Books. p. 3-35.

Sporhase v. Nebraska, \_\_\_ U.S. \_\_\_, 102 S. Ct. 3456 (1982).

State of New York. Amended Assembly Bill No.6257, May 26, 1987.

Taff, Steven and Carlisle Ford Runge, 1986. "Supply Control, Conservation and Budget Restraint: Conflicting Instruments in the 1985 Farm Bill." University of Minnesota, Department of Agricultural and Applied Economics, Staff Paper 86-33. August.

Tarlock, Dan, 1986. "Inter and Intrastate Usage of Great Lakes Waters: A Legal Overview. Case Western Reserve Journal of International Law. 18 (1), 67-109.

Task Force on Water Diversion and Great Lakes Institutions, 1985. Final Report and Recommendations: Great Lakes Governors Task Force on Water Diversion and Great Lakes Institutions. Council of Great Lakes Governors, Madison, Wisconsin.

Tobe, Richard, 1987. Assemblymen Hoyt's Office, Albany New York. Telephone Conversation, November 9.

Utton, Albert E., 1983. "The El Paso Case: Reconciling Sporhase and Vermejo." Natural Resources Journal. (23) Jan., ix-xv.

Van Meter, D.S. and C.F. Van Horn, 1975. "The Policy Implementation Process: A Conceptual Framework." Administration and Society. 6 (4), 445-448.

Water Resources Management Committee, 1987. Managing the Waters of the Great Lakes Basin: A Report to the Governors and Premiers of the Great Lakes States and Provinces. Madison, Wisconsin, February.

