

## ABSTRACT

### GETTING OUR DUCKS IN A ROW: AN ANALYSIS OF WATERFOWL MANAGEMENT WITHIN THE ATLANTIC COAST JOINT VENTURE

By

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The purpose of this dissertation was to identify management strategies used for waterfowl management and the perceived effectiveness of these strategies at coastal sites within the Atlantic Coast Joint Venture. This was accomplished through three specific research objectives: *Objective 1*: To identify and analyze waterfowl management strategies utilized by coastal sites within the Atlantic Coast Joint Venture; *Objective 2*: To determine whether waterfowl management strategy use is consistent among coastal sites within the Atlantic Coast Joint Venture; *Objective 3*: To examine waterfowl management strategy use and value by identifying waterfowl management professionals' perception of strategy effectiveness for coastal sites within the Atlantic Coast Joint Venture.

The study sites for this dissertation included 102 coastal sites within the ACJV. The study derived 13 waterfowl management strategies from the review of administrative history, literature, and experts in the field. A rubric for site management plan analysis was developed. The data were collected from coastal ACJV sites through descriptive analysis of a sample of 43 site management plans, and a self-administered questionnaire sent to waterfowl management professionals at coastal sites within the ACJV. The results of this study indicate that wetlands on

site significantly influence the selection of less frequent waterfowl counts and weekly waterbird counts. The findings also indicate respondents' years of experience significantly decrease their perceived effectiveness of weekly waterfowl counts. From these findings five implications for waterfowl management were drawn: (1) The framework for analysis this study created is a step forward for waterfowl management evaluation at the site and regional level. (2) Waterfowl management should not be separated from wetland management; (3) More data regarding the use of the adaptive management approach for coastal sites within the ACJV and monitoring and evaluation of waterfowl at the site level is necessary; (4) Waterfowl management should include a component of Education and Outreach; and (5) There is a need for an interdisciplinary management approach to waterfowl management.



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AN ANALYSIS OF WATERFOWL MANAGEMENT WITHIN THE  
ATLANTIC COAST JOINT VENTURE

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By

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*This dissertation is dedicated to my son, Van Solon Evans.*

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## **LIST OF ABBREVIATIONS**

ACJV	Atlantic Coast Joint Venture
CCP	Comprehensive Conservation Plan
GMP	General Management Plan
IBA	Important Bird Area
MPA	Marine Protected Area
NAWMP	North American Waterfowl Management Plan
NF	National Forest
NPS	National Park Service
NWR	National Wildlife Refuge
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service

*Every March since the Pleistocene, the geese have honked unity from Currituck to Labrador,*

*Matamuskeet to Ungava, Horseshoe Lake to Hudson's Bay,*

*Avery Island to Baffin Land, Panhandle to Mackenzie, Sacramento to Yukon.*

*Aldo Leopold - A Sand County Almanac, p. 24-25.*

# CHAPTER I

## INTRODUCTION

Waterfowl are an important cultural and natural resource in North America. They have historic significance both ecologically and economically. Waterfowl are iconic to many landscapes; they have a powerful ability to link people and place. This linkage is seen throughout history in the layers of complexity inherent in the management of waterfowl, from the rich legacy of waterfowl hunting and the culture surrounding it to the long policy history accompanying waterfowl conservation.

This dissertation identifies management strategies currently used for waterfowl management and the perceived effectiveness of these management strategies at coastal sites within the Atlantic Coast Joint Venture (ACJV). Currently there is a gap in knowledge that is three-fold (1) There is no framework available for linking waterfowl management goals listed within site management plans to management strategies used on-site, (2) No resource is available that identifies waterfowl management strategies currently implemented by individual sites, within the ACJV regions, or within the Atlantic Flyway, and (3) No evaluation of waterfowl management professionals' view of waterfowl management at the site-level has been tackled in recent years.

Waterfowl management is undertaken from two perspectives: harvest regulations as well as population and habitat management. Waterfowl harvests are managed regionally through the U. S. Flyway System (Runge, Johnson, Anderson, Koneff, Reed, & Mott 2006). Flyways are “useful political units in that they group together states with common borders whose waterfowl problems are similar” (Bellrose 1976, p. 20). There are four flyways in the U.S. Flyway System; this research focuses on the Atlantic Flyway, which is presided over by a flyway council. The

mission of a flyway council is to “establish coordinated management by state and federal agencies that will ensure protection to and restoration of waterfowl and other game bird species to provide sustained annual harvests” (Atlantic Coast Joint Venture 2004, p. 2).

Waterfowl populations and habitat are managed at a continental scale through the North American Waterfowl Management Plan (NAWMP). The NAWMP is an international collaboration between Canada, the United States (US), and Mexico to return waterfowl populations to those recorded in the 1970s (Williams, Koneff, & Smith 1999). The NAWMP habitat and population goals are implemented through Joint Ventures (JVs), which align with the flyways (Runge, Johnson, Anderson, Koneff, Reed, & Mott 2006). The JV region of interest for this study is the Atlantic Coast Joint Venture (ACJV), which is presided over by management board members. The mission of the ACJV is to “provide a forum for federal, state, regional and local partners to coordinate and improve the effectiveness of bird conservation planning and implementation in the Atlantic Flyway region of the United States” (Atlantic Coast Joint Venture 2004, p. 1).

The Atlantic Flyway and the ACJV include identical administrative boundaries, and share administrative members within the flyway council and management board (Atlantic Coast Joint Venture 2004). Despite these commonalities, it is important to note distinct differences between their missions. The flyway council aims to protect waterfowl and their associated habitat to ensure sustainable harvest potential, while the ACJV seeks to foster partnerships to improve waterfowl and native bird protection efforts (Atlantic Coast Joint Venture 2004).

A large-scale conservation initiative is necessary for successful waterfowl management due to the migratory nature of the species, the vulnerable wetlands needed for species’ habitats, and the multi-jurisdictional nature of conservation lands. Waterfowl management efforts benefit

from the partnerships developed through the ACJV, as those partnerships create a geographically and administratively broad conservation network.

Further, the ACJV champions partnerships and multi-scale management in the effort to conserve waterfowl and habitat for all native birds in the Atlantic Flyway (Atlantic Coast Joint Venture 2004). By planning and implementing waterfowl management as a joint venture, “partners can direct limited resources to the highest priority actions, leverage and attract additional funding and ensure that individual actions are contributing to common goals” (Atlantic Coast Joint Venture 2004, p. 1). This dissertation identifies waterfowl management strategies used at coastal sites within the ACJV, and identifies perceived effectiveness of those management strategies. This information provides knowledge that is currently lacking in the field, establishes a base line of management practices for waterfowl management at coastal sites to be used for future comparisons and research, and can assist managers in allocating limited resources to those management strategies characterized as most effective.

## **Problem Statement**

The management of waterfowl is necessary and challenging due to the migratory nature of the species, the vulnerable wetlands needed for species habitat, and the multi-jurisdictional nature of conservation lands. Regional assessments and evaluations of waterfowl management for the ACJV do not include site-specific accomplishments. Identifying management strategies used by individual coastal sites within the ACJV sites and recognizing differences in management strategies and perceived effectiveness among individual sites will provide valuable insight to inform waterfowl management practices and policy both locally and regionally.



At present there is a gap in knowledge regarding waterfowl management within the ACJV. First, there is currently no established framework for analyzing waterfowl management strategies listed within plans or used on site, much less a means for linking waterfowl management strategies listed within the site management plans to those strategies used at the site level. Establishing this link is important since site management plans are the site-specific interpretation of regional directives. This framework would allow managers to track how regional management goals are adapted and implemented at a site level.

Second, no resource is available that identifies waterfowl management strategies currently in-use by ACJV sites or within the ACJV regions. Filling this need will inform managers how waterfowl are being managed at individual sites. Identifying waterfowl management strategies used by sites indicates where funding and staff are distributed within individual sites and among them. Further, this information will show gaps in types of management strategies utilized: whether science driven (research, monitoring, bird counts), community involvement driven (education and outreach, partnerships), or protection driven (limited access, law enforcement). It will also place those management actions of an individual site within the regional standard of practice.

Lastly, waterfowl management professionals' view of waterfowl management has not been assessed in recent years. Identifying waterfowl management professionals' attitudes toward, and perceptions of, waterfowl management is necessary since they are the folks implementing the management strategies.

## **Purpose of Study**

The purpose of this study is to identify and analyze waterfowl management strategies currently used at coastal sites in the ACJV and to examine the perceived effectiveness of these management strategies. Coastal sites are studied here as a particular class because not only are they critical elements in the Atlantic Flyway, but also they present some commonality of ecological conditions, which theoretically would lead to some commonality in management strategies. To date no framework of analysis is used to connect individual sites to national or regional waterfowl management plans. It is important to identify if there is continuity of waterfowl management throughout the ACJV and the Atlantic Flyway, and to understand how waterfowl are being managed at the site-level. This study compares different sites against each other to determine if there is uniformity of waterfowl management strategies utilized within the ACJV. This information will fill a gap in knowledge of waterfowl management continuity through regional and site scales. This study creates a framework for analysis of individual site management plans within the ACJV, with respect to waterfowl management strategies and actions.

## **RESEARCH OBJECTIVES**

### **Objective 1:**

Identify and analyze waterfowl management strategies utilized by coastal sites within the Atlantic Coast Joint Venture.

In order to achieve this objective, a rubric for site management plan analysis first had to be developed. Then, a descriptive analysis of individual site management plans is completed. The management plan analysis identifies waterfowl management strategies cited within coastal

ACJV site management plans, and discusses trends in strategy use by management agency, ACJV region, and conservation area size. This phase of research is a discourse on the state of waterfowl management and the state of practice. This objective is addressed through broad scale methods of compiling and reviewing waterfowl policy, general waterfowl management literature, and specific site conservation management plans into a single discourse.

**Objective 2:**

Determine whether waterfowl management strategy use is consistent among coastal sites within the Atlantic Coast Joint Venture.

In order to achieve this objective, a questionnaire had to be developed and distributed to waterfowl management professionals to identify waterfowl management strategies currently used at coastal ACJV sites. The ACJV is the implementing arm of the NAWMP. As such, the ACJV Membership Board is a combination of federal, state, local, and non-profit management agencies. While this administrative structure allows for theoretical continuity of management within the ACJV regions, a pit-fall could be differences in waterfowl management strategy use by management agency. This phase of research is based on hypothesis testing using primary survey data.

*Hypothesis 1:* Waterfowl management strategies will vary due to individual site management agency.

**Objective 3:**

Examine waterfowl management strategy use and value by identifying waterfowl management professionals' perception of strategy effectiveness for coastal sites within the Atlantic Coast Joint Venture.

The questionnaire developed for this study contains questions addressing influences on waterfowl management strategy selection, waterfowl management values, and perceived effectiveness of management strategies. Strategy selection is an example of how regional management goals are stepped-down to the site level. Yet, site-specific waterfowl management strategy selection can have wider ranging influences than top-down directives. Influences on strategy selection, such as wetlands on site, hunting on site, and visitor use, can indicate additional natural resource management priorities at individual sites, and identify where waterfowl management overlaps with these natural resources priorities at the site level (i.e. wetlands, habitat management, and invasive species management).

Waterfowl management professionals' perception of waterfowl management at their sites provides a glimpse of the state of management at coastal sites within the ACJV. Moreover, perceptions of waterfowl management reflect the attitudes and environmental values of those in decision-making positions. These attitudes and values influence behavior and choices regarding how waterfowl are managed. Determining the perceived effectiveness of waterfowl management strategies provides the human dimension component as to why certain strategies are chosen over others. This phase of research uses primary survey data to describe perceived effectiveness of different management strategies and test hypotheses regarding consistency of these perceptions.

*Hypothesis 2: Waterfowl management strategy selection among coastal Atlantic Coast*

Joint Venture sites, is influenced by:

H2a: Site managers' professional background

H2b: Visitor use at site

H2c: Hunting on site

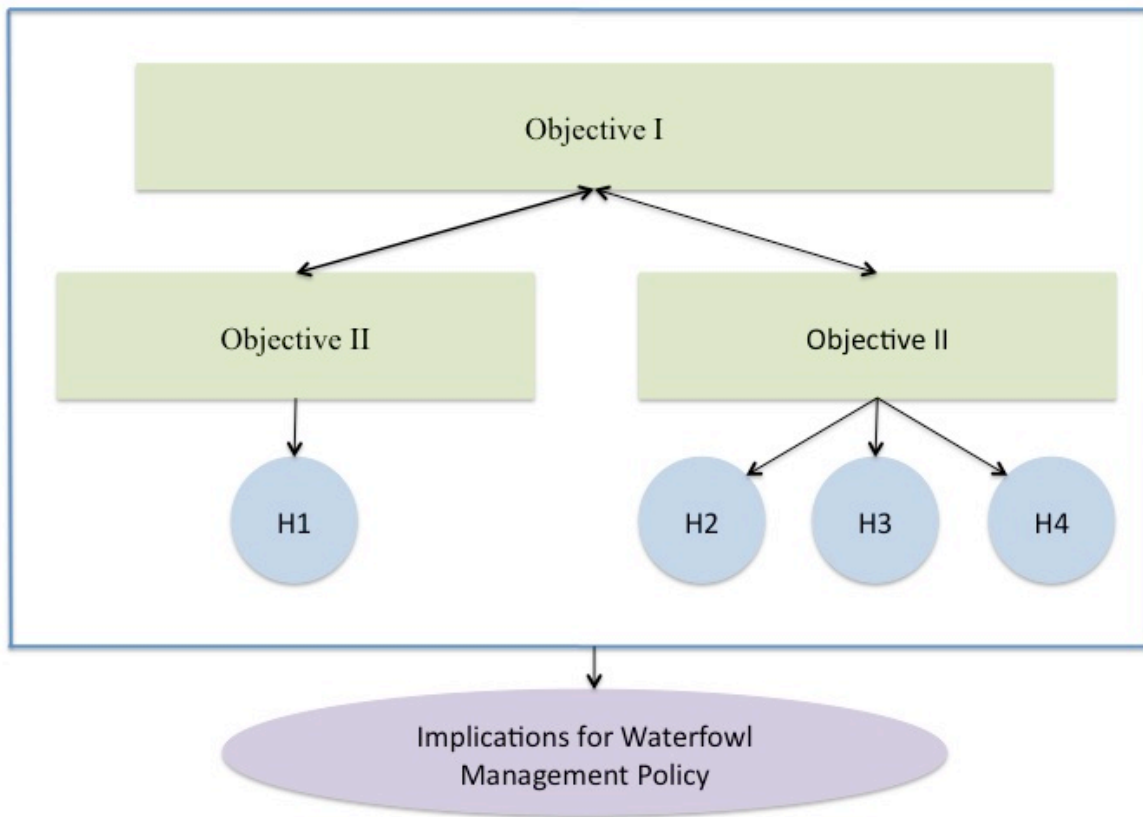
H2d: Type of site management plan

H2e: Wetlands on site

*Hypothesis 3: The perceived effectiveness of waterfowl management strategies depends on the respondents' professional background.*

*Hypothesis 4: The perceived effectiveness of waterfowl management strategies depends on the respondents' years of experience in the field.*

Figure 1: Flow Chart For Research Organization



This Figure displays the relationship between research objectives and hypotheses, and how those relationships work to inform implications for waterfowl management policy.

### STRUCTURE OF SUBSEQUENT CHAPTERS

This research study is composed of six subsequent chapters. Chapter Two further articulates the gaps in knowledge and practice and then addresses the first research objective. It begins the discourse on the current state of waterfowl management through a review of discriminating conservation policy, a dialogue of the historical narrative of waterfowl administrative authorities, and an examination of pertinent literature. Chapter Two is referred to later for the development of the site management plans' rubric, the extraction of waterfowl

management strategies to be used for best management practices, and supports the need for this study.

Chapter Three outlines the methodologies for this research in detail. This research utilizes both qualitative and quantitative methods for the site management analysis and survey analysis respectively.

Chapter Four further addresses the first objective by identifying waterfowl management strategies listed in site management plans for coastal sites within the ACJV. Chapter Four describes strategy use by ACJV region and identifies trends in waterfowl management strategy use in coastal environments.

Chapter Five addresses the second and third objectives through an analysis of survey data. It contains a discussion of descriptive statistics regarding survey respondents' socio-demographics and individual site characteristics, as well as hypothesis testing for each of the four study hypotheses.

Finally, Chapter Six discusses each of the three research objectives by tying these objectives to the previously listed gaps in knowledge. The sixth chapter discusses management implications in addition to future research implications.

## DEFINITIONS

**Atlantic Coast Joint Venture (ACJV):** “A partnership focused on the conservation of habitat for native birds in the Atlantic Flyway of the United States from Maine south to Puerto Rico” (Atlantic Coast Joint Venture 2009a, para 1).

**Coastal Atlantic Coast Joint Venture (ACJV) Sites:** ACJV sites falling within the wetlands habitat area of the ACJV habitat area map and/or coinciding with Marine Protected Area designation.

**Joint Venture (JV):** “A self-directed partnership of agencies, organizations, corporations, tribes, or individuals that has formally accepted the responsibility of implementing national or international bird conservation plans within a specific geographic area or for a specific taxonomic group, and has received general acceptance in the bird conservation community for such responsibility” (Atlantic Coast Joint Venture. 2006, para 1).

**Management Strategy:** “A specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives” (Alligator River CCP, p. 104).

**Marine Protected Area (MPA):** “Any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein” (National Marine Protected Areas Center 2008, p. 4).

**North American Waterfowl Management Plan (NAWMP):** Legislation established in 1986 by the United States and Canada (later Mexico) to reestablish waterfowl population levels of the 1970s using habitat conservation (Williams, Koneff, & Smith 1999).

**Waterfowl:** “The 37 species of the family Anatidae – ducks, geese, and swans – that regularly occur in both the United States and Canada” (North American Waterfowl Management Plan, p. 2).

**Waterfowl Management Professional:** Individuals currently managing waterfowl on a seasonal, temporary, part-time, or full-time basis.



## CHAPTER II

### LINKING WATERFOWL MANAGEMENT WITH POLICY

#### **A Brief Introduction To Waterfowl**

This section is a brief introduction to waterfowl, their classification and critical habitat. To understand the complex history of waterfowl management, the foundational information of what waterfowl are and how they relate to their environment needs to be discussed.

#### *Waterfowl Classification & Particulars*

Waterfowl are defined as “the 37 species of the family Anatidae – ducks, geese, and swans – that regularly occur in both the United States and Canada” (North American Waterfowl Management Plan 1986, p. 2). Baldassarre and Bolen (1994) stated that the family Anatidae “contains the ducks, geese, and swans, which collectively are referred to as ‘waterfowl’ in the United States and Canada, but are usually called ‘wildfowl’ in Europe” (p. 51). Similarly, Bellrose (1976) stated that waterfowl, “consisting of the swans, geese, and ducks, belong to one family, the Anatidae” (p. 30).

Waterfowl are subdivided into three subfamilies, Dendrocygninae (Whistling ducks), Anserinae (swans, and geese), and Anatinae (other ducks) (The American Ornithologists’ Union 2013). The major foraging guilds within waterfowl are whistling ducks, swans, and geese; dabbling ducks; and diving ducks. All whistling ducks belong to the genus *Dendrocygna* and the tribe Dendrocygini. Two species are found in the United States, the fulvous whistling duck and the black-bellied whistling duck. All swans belong to the genus *Cygnus*, as well as true geese. In North America, four species of swan are found, whistling, trumpeter, mute, and whooper swans.

Geese are divided into three genera, *Anser*, *Chen*, and *Branta*, with these species of geese found in North America: White-fronted, Tule, Lesser snow, Greater snow, Ross', Emperor, Canada, and Barnacle goose (although the barnacle goose is extremely rare), as well as, the Atlantic and Black brant (Bellrose 1976).

The subfamily Anatinae consists of dabbling ducks and diving ducks (The American Ornithologists' Union. 2013). Dabbling ducks belong to the tribe Anatini, with only one genus, *Anas*, found in North America (Bellrose 1976). Dabbling ducks in North America include European wigeon, American wigeon, gadwall, American green-winged teal, Mallard, Mexican duck, Florida duck, Mottled duck, Black duck, pintail, Blue-winged teal, Cinnamon teal, and Northern shoveler. Wood ducks are generally grouped with dabblers despite being perching ducks and belonging to the tribe Carinini.

Diving ducks consist of three tribes and 12 genera worldwide (Bellrose 196). In North America, Bay ducks make up the tribe Aythyini and the genus *Aythya*. Examples of these ducks include canvasback, redhead, Ring-necked duck, Tufted duck, Greater scaup, and Lesser scaup. Sea ducks make up the tribe Mergini. This tribe is divided into seven genera. The genera *Somateria* and *Polysticta* contain eiders. Eiders within the genus *Somateria* are the Common eider, King eider, and Spectacled eider. Eiders within the genus *Polysticta* include Steller's eider. The genus *Histrionicus* contains Harlequin ducks. The genus *Clangula* contains Oldsquaw. The genus *Melanitta* contains the Black scoter, Surf scoter, and White-winged scoter. The genus *Bucephala* contains Bufflehead, Barrow's goldeneye, and Common goldeneye. The genus *Mergus* contains Mergansers (Hooded, Red-breasted, and Common merganser). Finally, the tribe Oxyurini contains the genus *Oxyura*. Ducks in this genus are the Masked duck and the Ruddy duck (Bellrose 1976). See Figure 2 for a family tree of waterfowl in North America.

Figure 2: Family Tree of North American Waterfowl

Family Anatidae	Subfamily Dendrocygnae	Genus Dendrocygna	Whistling-Ducks
	Subfamily Anserinae	Genus Anser Genus Chen Genus Branta	Geese & Brant
		Genus Cygnus	Swans
	Subfamily Anatinae	Genus Aix	Wood Duck
		Genus Anas	Dabbling Ducks
		Genus Aythya	Bay Ducks
		Genus Polysticta Genus Somateria	Eiders
		Genus Histrionicus	Harlequin Duck
		Genus Melanitta	Scoters
		Genus Clanguia	Long-tailed Duck
		Genus Bucephala	Bufflehead & Goldeneye
		Genus Lophodytes	Hooded Merganser
		Genus Mergus	Common & Red-breasted Merganser
		Genus Nomonyx	Masked Duck
Genus Oxyura	Ruddy Duck		

Source: Adapted from The American Ornithologists' Union 2013.

### ***Migratory Waterfowl***

Migratory waterfowl “undertake some of the longest and most spectacular migrations of any wildlife” (Davidson & Stroud 1996, p. 41). Waterfowl migrate at altitudes between slightly above sea level and 20,000 feet; and usually, the “longer the migratory flight, the higher the altitude” (Bellrose 1976, p. 40). Generally, waterfowl fly continuously, only stopping when forced by exhaustion or poor weather conditions; thus, “there is every reason to believe that certain elements of the population in several species make nonstop flights of a minimum of 2,000 miles and possibly as much as 3,000 miles (Bellrose 1976, p. 39).

Migration is usually initiated by lack of food, lack of space, changes in the length of day, and harsh environments, with large segments of migration being determined by chiefly by food supplies (Bellrose 1976). It is important to note that waterfowl food sources and habitats are changing, thus causing waterfowl migration patterns to change. To this end, during the twentieth century, the majority of waterfowl management areas and land acquisition for refuges in the U.S., focused on waterfowl migration and wintering needs (Erwin 2002).

### *Waterfowl Habitat & Potential Threats*

Due to the migratory nature of waterfowl, they depend on networks of habitat, from local to continental scales. To this end, coastal habitats are of vital importance to waterfowl (Davidson & Stroud, 1996). Waterfowl use various habitats for breeding, wintering, and migration; and “wetlands form the primary natural habitat for waterfowl, but unlike most other landforms, the variety of wetlands is immense” (Baldassarre & Bolen 1994, p. 443). The U.S. Fish and Wildlife Service categorize wetlands into systems, subsystems, and classes. The wetland systems include marine, estuarine, riverine, lacustrine, and palustrine (Baldassarre & Bolen 1994).

The U.S. Fish and Wildlife recognizes 21 waterfowl habitat areas in North America, including:

- (1) Prairie Potholes and Parkland
- (2) Central Valley of California
- (3) Yukon-Kuskokwim Delta
- (4) Middle-Upper Atlantic Coast
- (5) Lower Mississippi Delta
- (6) Izembek Lagoon
- (7) Upper Mississippi River and Northern Lakes
- (8) Northern Great Plains
- (9) Yukon Flats
- (10) The Great Basin
- (11) Teshelpuk Lake

- (12) Middle-Upper Pacific Coast
- (13) Klamath Basin
- (14) Upper Alaska Peninsula
- (15) Copper River Delta
- (16) West-Central Gulf Coast
- (17) Upper Cook Inlet
- (18) San Francisco Bay
- (19) Northeastern United States-Southeastern Canada
- (20) The Sandhills and Rainwater Basin
- (21) The Playa (Baldassarre & Bolen 1994, p. 378).

The conservation of migratory waterfowl is difficult due to vast loss of wetland habitat over the last century and the dependence on managed conservation lands for wintering habitat and migration today (Stralberg, et al. 2011). Historically, threats to waterfowl included “habitat loss from agriculture and logging, overharvest, recurring drought on the breeding grounds, and public apathy” (U.S. Fish & Wildlife Service 2004, p. 1). Habitat loss and degradation are major threats to waterfowl and are seen by scholars as the primary reason for decline in waterfowl populations in the 20<sup>th</sup> century (Stralberg, et al. 2011; Melinchuk 1995; & Baldassarre & Bolen 1994; Bellrose 1976).

Roughly 53% of the lower 48 states original wetlands were lost between the 1780s and 1980s, a 200 year span (United States Geological Survey 2013), while “the remaining wetlands continue to be lost or steadily degraded under the attack of acid rain, exotic plants, impaired hydrology, chemical contamination, sedimentation, and other forms of pollution” (Baldassarre & Bolen 1994, p. 444). Moreover, “conversion and loss of coastal, riverine, and palustrine wetlands to agriculture, urban, and industrial developments have had significant impacts on waterbirds” (Tori, McLeod, McKnight, Moorman, & Reid 2002, p. 115). Currently, agricultural

lands are seen as priority management area for linking conservation lands and providing a network of habitat for waterfowl migration (Stralberg, et. al. 2011).

### **Administrative History of Waterfowl Management**

Waterfowl are managed on many scales and by numerous organizations and agencies. The multi-jurisdictional management framework reflects the inherent complexity of managing migratory species and their habitat at large scales. The administrative history of waterfowl management is an important element of waterfowl management in the Atlantic Coast Joint Venture (ACJV), as waterfowl are dependent on the coastal habitats therein. This section identifies and discusses federal and international policies effecting North American waterfowl conservation and management, and current administrative authorities for waterfowl management at regional and continental scales.

### *Policies Effecting Waterfowl Conservation & Management*

Waterfowl are viewed as both a cultural and natural resource. As such, multiple layers of management and conservation are needed at varying scales to provide holistic management, including harvest regulations, population goals, and habitat conservation. To this end, policy is utilized. The idea that government should play an active role in natural resource and environmental management stems from the “premise that government can effectively execute broad resource management doctrines to balance long-term societal interests and ecosystem integrity. No other social institution has the potential mandate and structure to do so” (Ascher 2001, p. 743). National policies “commonly bear direct or indirect influences on the welfare of wildlife populations” (Baldassarre & Bolen 1994, p. 536).

The history of policy effecting waterfowl management and conservation began in 1900 with the Game and Wild Birds Prevention and Disposition Act, ending market waterfowl hunting. The policy timeline ends in 1994 with the North American Waterfowl Management Plan; a continental management plan for waterfowl populations and habitat between North American, Canada, and Mexico. Table 1 shows a timeline of policies effecting waterfowl conservation and management.

Table 1: Timeline & Purpose of Waterfowl Conservation Polices

<b>Date</b>	<b>Policy</b>	<b>Responsible Party</b>	<b>Purpose</b>
1900	Lacey Act (Game and Wild Birds Preservation and Disposition Act of 1900)	Congressman John F. Lacey	To end waterfowl market hunting
1913	Migratory Bird Law (Weeks-McLean Law)	Congressman John W. Weeks & Senator George P. McLean	To create consistent waterfowl hunting regulations under the federal government
1916	Migratory Bird Treaty	Senator George P. McLean & President Woodrow Wilson	International treaty between the U.S. & Canada
1918	Migratory Bird Treaty Act	Provision 8 of the 1916 Treaty	To protect migratory birds with penalties
1929	Migratory Bird Conservation Act		To protect migratory bird habitat
1934	Migratory Bird Hunting Stamp Act (Duck Stamp)	Senator Frederic Walcott, Congressman Richard Kleberg, & J. N. Darling	To create funds for migratory bird & habitat conservation (the Migratory Bird Conservation Fund)
1937	Federal Aid in Wildlife Restoration Act (P-R)	Senator Key Pittman & Congressman A. Willis Robertson	To establish funding for state management programs
1956	Agriculture Act (Soil Bank)		To enter into 5-10 year agreement with farmers to let certain land rest from

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1961	Wetlands Loan Act	Congressman John D. Dingell	continued production To provide funds for the USFWS to purchase critical wetland habitat
1965	Food & Agriculture Act		To establish the cropland adjustment program (CAP)
1966	Endangered Species Legislation		To protect species threatened with extinction
1969	National Environmental Policy Act (NEPA)		Created Environmental Impact Statements
1971	Ramsar Convention	23 Nations	Trust agreement for wetlands of importance
1972	Federal Water Pollution Control Act		To protect waterways
1973	Endangered Species Act	Supplemental legislation for endangered species	
1977	Clean Water Act	Replacement for the 1972 Act	To protect navigable waterways
1985	Food Security Act		Created Conservation Reserve Program (CRP)
1986	North American Waterfowl Management Plan (NAWMP)	United States & Canada	To protect wetlands and waterfowl
1989	North American Wetlands Conservation Act	Part of the NAWMP	To provide matching funds for state and private wetland protected sites
1990	Food, Agriculture, Conservation, & Trade Act (Farm Bill)		To provide incentives for farmers to restore wetlands on their property
1994	NAWMP	U.S., Canada, Mexico	To protect wetlands and waterfowl

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Source: Adapted from Baldassarre & Bolen 1994

*Lacey Act-1900*



The Game and Wild Birds Preservation and Disposition Act was passed on May 25, 1900 in an effort to “prohibit game taken illegally in one state to be shipped across state boundaries contrary to the laws of the state where taken” (U.S. Fish & Wildlife Service 2002, para 4). The act was brought to congress by Congressman John F. Lacey, and was thus coined the Lacey Act (Baldassarre & Bolen 1994). The Lacey Act was the “initial response by the federal government to the commercial abuse of wildlife...” (Baldassarre & Bolen 1994, p. 520). This act also allows “the federal government to help states, tribes, and countries around the world safeguard their wildlife resources” (Fisher & Cleva 2000, para 17).

The original act of 1900 listed three primary mandates:

- Required wildlife to be clearly marked when shipped in interstate commerce
- Banned the importation of mongooses, fruit bats, English sparrows, starlings and other species that could harm U.S. crop production and horticulture
- Authorized the federal government to take measures needed to preserve and restore game bird populations (Fisher & Cleva 2000, para 20-22).

The act was then amended in 1935, to “prohibit interstate commerce in wildlife captured or killed in violation of any federal or foreign law” (Fisher & Cleva 2000, para 23); in 1945 to “add language to the Act banning the importation of wildlife under ‘inhumane or unhealthful’ conditions” Fisher & Cleva 2000, para 24); in 1981 to make the act more effective (Fisher & Cleva 2000). The 1981 amendment:

- Expanded the definition of wildlife and extended protection to rare plant species
- Incorporated protections for fish, which had been addressed previously under a separate federal law (the Black Bass Act of 1926)
- Added American Indian tribal laws and federal treaties to the list of underlying laws upheld
- Increased maximum civil penalties

- Added a felony punishment scheme for violations involving domestic or international wildlife trafficking (Fisher & Cleva 2000, para 26-29).

### ***Weeks-McLean Law-1913***

The Lacey Act was flawed and difficult to enforce, thus the need for the Migratory Bird Law (U.S. Fish & Wildlife Service 2002). Numerous laws addressing wildlife protection, specifically waterfowl and game birds, were introduced to congress between the years of 1900 and 1913, but none were enacted. The Migratory Bird Law was introduced by Congressman John W. Weeks and Senator George P. McLean from whom the law received its popular title the Weeks-McLean Law (Baldassarre & Bolen 1994).

The Weeks-McLean Law was passed on March 4, 1913, and attempted to end commercial market hunting and the shipment of migratory birds between states (U.S. Fish & Wildlife Service 2002). The Law stated:

All wild geese, wild swans, brant, wild ducks, snipe, plover, woodcock, rail, wild pigeons, and all other migratory game and insectivorous birds which in their northern and southern migrations pass through or do not remain permanently the entire year within the borders of any State or Territory, shall hereafter be deemed to be within the custody and protection of the Government of the United States, and shall not be destroyed or taken contrary to regulations hereinafter provided therefore (U.S. Fish & Wildlife Service 2002, para 6).

The Weeks-McLean Law essentially “closed the seasons for nearly all migratory species of nongame birds and ended spring waterfowl hunting once and for all” (Baldassarre & Bolen 1994, p. 521). The Weeks-McLean Law also allowed the Secretary of Agriculture to “set legal hunting seasons for migratory birds, overriding the former jurisdiction of state authority in such matters” (Baldassarre & Bolen 1994, p. 521). Because the law gave authority, which was

previously the states', to the federal government the topic of migratory bird management became highly controversial.

### ***Migratory Bird Treaty-1916***

The Weeks-McLean Law, through constitutional controversy, opened the political door to migratory game treaties and the Migratory Bird Treaty of 1916. The Migratory Bird Treaty was signed by the United States and Great Britain, acting on behalf of Canada, in 1916 (Baldassarre & Bolen 1994). This treaty “adopted a uniform system of protection for certain species of birds which migrate between the United States and Canada, in order to assure the preservation of species either harmless or beneficial to man” (U.S. Fish & Wildlife Service 1992, para 21). The treaty also set guidelines for closed seasons for migratory birds. The Migratory Bird Treaty “prohibits hunting insectivorous birds, but allows killing of birds under permit when injurious to agriculture” (U.S. Fish & Wildlife Service 1992, para 21). More specifically, the treaty provided nine provisions:

- (1) A definition of migratory birds, including those classified as (1) waterfowl, (2) insectivorous, and (3) nongame.
- (2) A closed season each year between 10 March and 1 September with hunting seasons no longer than 3.5 months in length at other times of the year. Insectivorous birds were protected throughout the year as were nongame birds, although certain exceptions were permitted for specific areas and for certain species of waterfowl and nongame birds required as subsistence food and clothing by Indians and Eskimos. Among waterfowl, scoters (*Melanitta spp.*) were designated specifically as subsistence food for Indians.
- (3) Initiation of a 10-year closed season for swans and a variety of other migratory birds, including Whooping Cranes (*Grus americana*). Woodcock (*Philohela minor*) and some other abundant species of shorebirds were excepted from this moratorium.
- (4) Initiation of a 5-year closed season for Wood Ducks and eiders (*Polysticta* and *Somateria*).
- (5) Protection of nests and eggs of migratory birds.

- (6) Prohibition from shipping or export of migratory birds or their eggs from any state or province during the closed season. Shipments of these items at other times must be marked appropriately.
- (7) Authorization of a permit system for killing migratory birds seriously damaging private property.
- (8) Agreement between each nation to seek separate enactment of legislation ensuring the execution of the convention and this Treaty.
- (9) Establishment of a means for ratification of the convention and this Treaty, including its enforcement for 15 years and thereafter on a yearly basis unless either nation provided notice 12 months in advance of its intention to terminate the agreement” (Baldassarre & Bolen 1994, p. 522).

### ***Migratory Bird Treaty Act-1918***

The Migratory Bird Treaty Act of 1918 stated “all migratory birds and their parts (including eggs, nests, and feathers) were fully protected” (U.S. Fish & Wildlife Service 2002, para9). This act was the implementing legislation for the U.S. to meet provision number eight within the Migratory Bird Treaty of 1916 (U.S. Fish & Wildlife Service 1992). Duck species listed in this treaty include: brant, bufflehead, canvasback, Black duck, eider (Common, King, Spectacled, Steller’s), gadwall, Common goldeneye, mallard, merganser (Common, Hooded, Red-breasted), pintail (Northern, White-checked), redhead, scaup (Greater, Lesser), scoter (Black, Surf, White-winged), Northern shoveler, teal (Blue-winged, Green-winged, Cinnamon, Falcated), and wigeon (American, Eurasian) (U.S. Fish & Wildlife Service 2002).

Regulations established by the Migratory Bird Treaty Act include:

- (1) Open seasons for migratory game birds
- (2) The means by which migratory birds may be hunted legally
- (3) Rules for possession and shipment of migratory birds legally secured
- (4) Bag limits
- (5) Rules for the propagation of migratory birds and for their sale
- (6) Prohibition of sale of migratory birds except waterfowl propagation under permit
- (7) Special permits for collecting migratory birds for purposes of scientific study or other needs (Baldassarre & Bolen 1994, p. 523-524).

The Migratory Bird Treaty Act upholds the United States' commitment to several other international migratory bird conventions “with Canada, Japan, Mexico, and Russia, for the protection of shared migratory bird resources” (U.S. Fish & Wildlife Service 2002, para 10). The international conventions associated with migratory birds are the Migratory Bird and Game Mammal Treaty with Mexico, the Migratory Bird Treaty with Japan, the Migratory Bird Treaty with Canada, and the Migratory Bird Treaty with the Soviet Union (U.S. Fish & Wildlife Service 2002).

#### ***Migratory Bird Conservation Act-1929***

While previous legislation and treaties were successful in protecting waterfowl, additional measures were needed to protect waterfowl habitat in order to meet long-term conservation goals (Baldassarre & Bolen 1994). The Migratory Bird Conservation Act was established on February 18, 1929, and established a Migratory Bird Conservation Commission “to approve areas recommended by the Secretary of the Interior for acquisition with Migratory Bird Conservation Funds” (Migratory Bird Conservation Act 1929, para 1). The Migratory Bird Conservation Act “provides for cooperation with States in enforcement. It established procedures for acquisition by purchase, rental or gift of areas approved by the Commission for migratory birds” (Migratory Bird Conservation Act 1929, para 2).

#### ***Migratory Bird Hunting Stamp Act (Duck Stamp)-1934***

The Migratory Bird Hunting Stamp Act was introduced by Senator Frederic Walcott of Connecticut and Congressman Richard Kleberg of Texas becoming law in March 1934

(Baldassarre & Bolen 1994). The political cartoonist J.N. Darling “Ding” created the first Duck Stamp in 1934 and created \$635,000 in revenue (Baldassarre & Bolen 1994, p. 527). The Duck Stamp was,

A crucial step as Congress had not always appropriated the money committed earlier by the Migratory Bird Conservation Act. Now, however, revenues from duck hunters and others who bought the stamps provided an independent source of funds dedicated to a single mission: the Migratory Bird Conservation Fund was the formal name given to these revenues (Baldassarre & Bolen 1994, p. 527).

Due to the established Fund, numerous waterfowl habitat protection programs resulted.

Currently, there is an annual contest for artist to create the next year’s Duck Stamp; prior to 1949, the U.S. Fish and Wildlife commissioned the stamp design each year (Baldassarre & Bolen 1994).

### ***Federal Aid in Wildlife Restoration Act (P-R)-1937***

The Federal Aid in Wildlife Restoration Act was established in September 1937 and is referred to as the ‘Pittman-Robertson Act’ (P-R); it has been through several amendments with the primary purpose to provide federal aid to states for wildlife management and restoration (Federal Aid in Wildlife Restoration Act. 1937). Many versions of a wildlife conservation bill were sponsored before P-R, but they were never enacted (Baldassarre & Bolen 1994). Senator Key Pittman of Nevada and Congressman A. Willis Robertson of Virginia sponsored the Federal Aid in Wildlife Restoration Act and gave it its nickname, P-R (Baldassarre & Bolen 1994).

P-R established “a far-reaching means of funding management programs at the state level” (Baldassarre & Bolen 1994, p. 528). Prior to P-R, states managed and planned for wildlife conservation through annual appropriation and legislation processes. This meant that wildlife conservation funds and programs changed annually and had little security. P-R, however, “levied

a 10% federal excise tax on most types of arms and ammunition (the tax later was increased to 11% and expanded to include sales of handguns in 1971 and archery equipment in 1975)” (Baldassarre & Bolen 1994, p. 528). The P-R funds are allocated to states based on state size and number of registered hunters. In addition, states must match federal funds, at a ratio of 1-3, to qualify for P-R fund consideration (Baldassarre & Bolen 1994). Due to the enactment of P-R, state wildlife conservation has steady funding and numerous programs have been established. Moreover, P-R has “distributed \$2.6 billion dollars from 1937 to 1993; \$190 million dollars were collected in 1993” (Baldassarre & Bolen 1994, p. 529).

#### ***Agriculture Act (Soil Bank)-1956***

The Agriculture Act, or Soil Bank, was a prominent agricultural policy with wildlife, particularly waterfowl, implications (Baldassarre & Bolen 1994). The Soil Bank entered farmers into “5 or 10 year agreements with the government that retired land from continued crop production” (Baldassarre & Bolen 1994, p. 536). The Soil Bank also required that the retired cropland be maintained with sufficient plant cover (Baldassarre & Bolen 1994).

#### ***Waterfowl Depredations Prevention Act-1956***

The Waterfowl Depredations Prevention Act was established in July of 1956 and authorized the “Secretary of the Interior to use surplus grain owned by Commodity Credit Corporation in feeding waterfowl to prevent crop damage” (Waterfowl Depredations Prevention Act 1956, para 1). The Secretary of the Interior examines crop damage reports and determines when grain can be used to lure waterfowl away from crops to prevent further damage. During this process, waterfowl are not to be lured over land where they would be exposed to shooting

(Waterfowl Depredations Prevention Act 1956). Grain used for this purpose “may be made available to Federal, State, or local governments or private organizations or individuals”

(Waterfowl Depredations Prevention Act 1956, para 2).

### ***Wetlands Loan Act-1961***

With wetland habitat decreasing at dangerous rates, the Duck Stamp was an attempt to create funds for waterfowl habitat conservation. The Duck Stamp was creating conservations funds, but these funds alone were not enough to combat the severe loss of habitat (Baldassarre & Bolen 1994). In 1961, Congressman John D. Dingell of Michigan proposed the Wetlands Loan Act (Baldassarre & Bolen 1994). Through the Wetlands Loan Act:

A 7-year loan of \$105 million was granted to the U.S. Fish and Wildlife Service for an accelerated acquisition of crucial wetlands. These funds were merged with duck stamp receipts in the Migratory Bird Conservation Fund. Future revenues from the sales of duck stamps were pledged for repayment of the loan (Baldassarre & Bolen 1994, p. 534).

The loan was then increased to \$200 million and extended to 1983; ultimately, “all but about \$2.5 million was appropriated, and most importantly, the loan was forgiven in its entirety, thereby making repayment unnecessary from the future sales of duck stamps” (Baldassarre & Bolen 1994, p. 534).

### ***Food and Agriculture Act-1965***

The Food and Agriculture Act of 1965 created the Cropland Adjustment Program (CAP) (Baldassarre & Bolen 1994). Under CAP, nearly 16 million hectares of land were taken out of crop production and planted with grasses for wildlife habitat. The “dense cover suitable as nesting habitat for many species of ducks thus replaced crops on an area equivalent to all of Ohio



and half of Pennsylvania” (Baldassarre & Bolen 1994, p. 537); with the Prairie Pothole region of the U.S. benefiting most heavily from this transformation of cropland to waterfowl habitat.

### ***National Environmental Policy Act (NEPA)-1969***

The National Environmental Policy Act (NEPA) was established in 1969 and ended the process of development without thought of environmental consequences (Baldassarre & Bolen 1994). This was accomplished through the creation of Environmental Impact Statements (EIS). Title I of NEPA “requires that all Federal agencies prepare detailed environmental impact statements for every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment” (National Environmental Policy Act 1969, para 2). The EIS became the center of NEPA’s “powerful mandate for maintaining safe, healthful, productive, and aesthetically and culturally pleasing surroundings” (Baldassarre & Bolen 1994, p. 539). Waterfowl and wetland habitat play an important role in implementing this mandate.

NEPA requires the Federal government to “employ interdisciplinary approach in related decision-making and develop means to ensure that un-quantified environmental values are given appropriate consideration, along with economic and technical considerations” (National Environmental Policy Act 1969, para 3). Specifically, Title II of NEPA requires “annual reports on environmental quality from the President to the Congress, and established a Council on Environmental Quality in the Executive Office of the President with specific duties and functions” (National Environmental Policy Act 1969, para 4).

### ***Ramsar Convention-1971***

The Convention on Wetland of International Importance, Especially as Waterfowl Habitat (Ramsar Convention) was held in Ramsar, Iran in 1971 (Baldassarre & Bolen 1994). The mission of upholds, “the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world” (The Ramsar Convention on Wetlands 1971, para 3). Delegates from 23 countries agreed to the Ramsar Convention (Baldassarre & Bolen 1994).

The Ramsar Convention considered waterfowl as “birds ecologically dependent on wetlands, and thus other orders of water birds as well as Anseriformes are included” (Baldassarre & Bolen 1994, p. 556). The Convention also includes many types of wetlands, such as “lakes and rivers, swamps and marshes, wet grasslands and peatlands, oases, estuaries, deltas and tidal flats, near-shore marine areas, mangroves and coral reefs, and human-made sites such as fish ponds, rice paddies, reservoirs, and salt pans” (The Ramsar Convention on Wetlands 1971, para 4). Centered on the wise use concept, The Convention strives for “the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the contest of sustainable development” (The Ramsar Convention on Wetlands 1971, para 5).

Moreover, members and contractors are committed to three principles of The Convention:

- To designate suitable wetlands for the List of Wetlands of International Importance (Ramsar List) and ensure their effective management;
- To work towards the wise use of all their wetlands through national land-use planning, appropriate policies and legislation, management actions and public education;
- To cooperate internationally concerning transboundary wetlands, shared wetland systems, shared species, and development projects that may affect wetlands (The Ramsar Convention on Wetlands 1971, para 6).

### ***Federal Water Pollution Control Act-1948***

The Federal Water Pollution Control Act was established in 1948 and

authorized the Surgeon General of the Public Health Service, in cooperation with other Federal, state and local entities, to prepare comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries and improving the sanitary condition of surface and underground waters (Federal Water Pollution Control Act 1948, para 3).

The Federal Water Pollution Control Act was amended widely, with the major amendments occurring in the years 1961, 1966, 1970, 1972, 1977, and 1987. The 1977 amendments created the Clean Water Act (Federal Water Pollution Control Act 1948).

The Clean Water Act included the following provisions:

- Development of “Best Management Practices” Program as part of the state area wide planning program;
- Authority for the Fish and Wildlife Service to provide technical assistance to states in developing “best management practices” as part of its water pollution control programs;
- Authorization of \$6 million for the Secretary of Interior to complete the National Wetlands Inventory by December 31, 1981;
- Exemption of various activities from the dredge and fill prohibition including normal farming, silviculture, and ranching activities;
- Procedures for State assumption of the regulatory program, including a requirement that the Director of the Fish and Wildlife Service be involved in an advisory role regarding transfer of the program to the State; and
- Requirement for development of agreements to minimize duplication and delays in permit issuance (Federal Water Pollution Control Act 1948, para 22).

The most important component of the Clean Water Act, in regards to wetlands, is Section 404, which “requires that the U.S. Army Corps of Engineers issue permits for any discharge of dredged and fill materials into the waters of the United States that alters and modifies the course, condition, and capacity of those waters” (Baldassarre & Bolen 1994, p. 540).

The 1987 amendment established the Water Quality Act and included the following provisions:

- Authority to continue the Chesapeake Bay Program and to establish a Chesapeake Bay Program Office. The original authorization for this program, the Chesapeake Bay Research Coordination Act of 1980, expired on September 30m 1984;
- Establishment of a Great Lakes National Program Office within EPA and a Great Lakes Research Office within NOAA. Related Federal agencies, including the Fish and Wildlife Service, are required to submit annual reports to EPA regarding agency activities affecting compliance with the 1978 Great Lakes Water Quality Agreement;
- Requirement that EPA, in conjunction with the Fish and Wildlife Service and NOAA, conduct research, as part of the Great Lakes Program, on the harmful effects of pollutants on the general health and welfare. Such research should emphasize the effect bioaccumulation of these pollutants in aquatic species has upon reducing the value of aquatic commercial and sport fisheries;
- Requirement that states develop strategies for toxics cleanup in waters where the application of “Best Available Technology” (BAT) discharge standards is not sufficient to meet State water quality standards and support public health;
- Increase in the penalties for violations of Section 404 permits;
- Provisions that additional State reporting requirements on water quality of lakes including methods to mitigate the harmful effects of high acidity. Authorization for EPA to undertake a water quality demonstration program for lakes with an authorization of \$15 million to States, with funds to be distributed based on relative acidity problems;
- Establishments of \$400 million program for States to develop and implement, on a watershed basis, nonpoint source management and control programs with EPA responsibility for grant administration, program approval, and periodic program evaluation;
- Authorization for a State/Federal cooperative program to nominate estuaries of national significance and to develop and implement management plans to restore and maintain the biological and chemical integrity of estuarine waters. Authorization to NOAA to conduct water quality research and trends assessment in estuaries of national significance;
- Requirements that EPA study and monitor the water quality effects attributable to the impoundment of water by dams (Federal Water Pollution Control Act 1948, para 24).

### ***Endangered Species Act-1973***

Legislation expressing concern for threatened species was enacted in 1966 (Baldassarre & Bolen 1994). Later, “supplemental legislation followed, included the Endangered Species Act

of 1973 and later amendments, further defining the national commitment to the preservation and management of threatened and endangered biota” (Baldassarre & Bolen 1994, p. 543). The primary concern with the 1966 legislation, and consequently, the primary focus of the 1973, was the additional protection of subspecies and subpopulations of species (Baldassarre & Bolen 1994).

The 1973 Act:

Implemented the Convention on International Trade in Endangered Species of Wild Fauna and Flora (T.I.A.S. 8249), signed by the United States on March 3, 1973, and the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere (50 Stat. 1354), signed by the United States on October 12, 1940 (Endangered Species Act 1973, para 2).

The Act in turn provided protection and conservation of ecosystems needed for threatened and endangered species to thrive (Endangered Species Act 1973). The 1973 Act:

- Authorizes the determination and listing of species as endangered and threatened;
- Prohibits unauthorized taking, possession, sale, and transport of endangered species;
- Provides authority to acquire land for the conservation of listed species, using land and water conservation funds;
- Authorizes the assessment of civil and criminal penalties for violating the Act or regulations; and
- Authorizes the payment of rewards to anyone furnishing information leading to arrest and conviction for any violation of the Act or any regulation issued thereunder (Endangered Species Act 1973, para 4-9).

Finally, Section 7 of the Act “requires Federal agencies to insure that any action authorized, funded or carried out by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat” (Endangered Species Act 1973, para 10).

### ***Food Security Act-1985***

The Food Security Act was enacted in 1985 and deals with crop surplus and soil erosion (Baldassarre & Bolen 1994). Due to the Act, “the Conservation Reserve Program (CRP), the farmers voluntarily remove highly erodible land from further crop production for 10 years in return for annual payments, as determined by a bid system, from the U.S. Department of Agriculture” (Baldassarre & Bolen 1994, p. 537). Waterfowl benefit from the Food Security Act because the idle land must be seeded with adequate plant cover, which in turn, provides waterfowl habitat (Baldassarre & Bolen 1994).

The Food Security Act is also known as the Swampbuster and “prohibits farmers from receiving the benefits of federal subsidies such as price supports, low-interest loans, and crop insurance if they drain wetlands” (Emergency Wetlands Resources Act 1986, p. 538). This action “simultaneously curtails both bringing additional land into crop production and draining valuable wetland habitat” (Emergency Wetlands Resources Act 1986, p. 538).

### ***North American Waterfowl Management Plan (NAWMP)-1986***

The North American Waterfowl Management Plan (NAWMP) is discussed in great detail later in this chapter. See section titled: Current Management Authorities, subtitle: North American Waterfowl Management Plan.

### ***Emergency Wetlands Resources Act-1986***

The Emergency Wetlands Resources Act was established in November 1986 and “authorized the purchase of wetlands from Land and Water Conservation Fund monies, removing a prior prohibition on such acquisitions” (Emergency Wetlands Resources Act 1986,

para 1). The Act also created the National Wetlands Priority Conservation Plan, which, “required the States to include wetlands in their Comprehensive Outdoor Recreation Plans, and transferred to the Migratory Bird Conservation Fund amounts equal to the import duties on arms and ammunition” (Emergency Wetlands Resources Act 1986, para 1). The Act also included the:

Establishment of entrance fees at National Wildlife Refuges, with fee receipts to be allocated 70 percent into the Migratory Bird Conservation Fund and 30 percent for operations and maintenance at the refuges; and increase in the price of duck stamps from \$7.50 to \$15.00, to be phased in through 1991; and the establishment of the bayou Sauvage National Wildlife Refuge in Louisiana (Emergency Wetlands Resources Act 1986, para 3).

As such, the Act created revenue for waterfowl conservation and created new conservation habitat.

#### ***North American Wetlands Conservation Act-1989***

The North American Wetlands Conservation Act (NAWCA) was established in 1989 and is a primary funding instrument for the North American Waterfowl Management Plan (Williams, Koneff, & Smith 1999). The NAWCA also provides funding and administrative services for the Tripartite Agreement for wetlands between Canada, the U.S., and Mexico (The NAWCA encourages wide-range partnerships for waterfowl conservation) (Williams, Koneff, & Smith 1999). Roughly \$250 million dollars have been accredited to the NAWCA.

The NAWCA supplies “federal funds as matching monies for state and private agencies proposing sites for wetland protection” (Baldassarre & Bolen 1994, p. 535-536). The Act also:

Converts the P-R account into a trust fund, with the interest available without appropriation through the year 2006 to carry out the programs authorized by the Act, along with the authorization for annual appropriation of \$15 million plus an amount equal to the fines and forfeitures collected under the Migratory Bird Treaty Act (North American Wetlands Conservation Act 1989, para 2).

The NAWCA funds are divided between the U.S., Canada, and Mexico and are approved by the Migratory Bird Conservation Commission (North American Wetlands Conservation Act 1989).

The NAWCA states “at least 50 percent and no more than 70 percent of the funds received are to go to Canada and Mexico each year” (North American Wetlands Conservation Act 1989, para 3).

Moreover, the NAWCA created the North American Wetlands Conservation Council to:

Recommend projects to be funded under the Act to the Migratory Bird Conservation Commission. The Council is to be composed of the Director of the Service, the Secretary of the National Fish and Wildlife Foundation, a State fish and game agency director from each Flyway, and three representatives of different non-profit organizations participating in projects under the Plan or the Act. The Chairman of the Council and one other member serve *ex officio* on the Commission for consideration of the Council’s recommendations (North American Wetlands Conservation Act 1989, para 4).

This Act was giant step forward for waterfowl conservation and management and continued the large-scale management approach.

### ***Food, Agriculture, Conservation, and Trade Act (Farm Bill)-1990***

The Food, Agriculture, Conservation & Trade Act of 1990 (the Farm Bill), is the Wetlands Reserve Program (WRP) which “offers farmers payments for restoring and preserving wetlands on their property” (Baldassarre & Bolen 1994, p. 538). The WRP is a voluntary program and provides “cost-sharing payments for wetland restoration, but the easements for preserving wetlands are for longer periods (i.e., more than the 10 years specified in the CAP agreements)” (Baldassarre & Bolen 1994, p. 538). Acceptable uses of wetlands under the WRP can include “hunting, fishing, haying, or grazing; plans are prepared jointly by the landowner with the Soil Conservation Service and the U.S. Fish and Wildlife Service” (Baldassarre & Bolen 1994, p. 538).



### *Current Waterfowl Management Authorities*

Waterfowl are managed at various scales by numerous authorities. Currently, waterfowl management is approached from two sides, waterfowl population and habitat conservation, and harvest regulation. The North American Waterfowl Management Plan (NAWMP) is responsible for waterfowl population and habitat conservation, while the Atlantic Flyway oversees harvest regulations. These management authorities are a conglomerate of federal, state, local, and non-profit representatives focused on regional and continental waterfowl needs. Identifying the administrative structure and management framework of these primary waterfowl authorities provides a chain of command for issues related to waterfowl populations, habitat, and harvests, as well as, accountability for the efficacy of waterfowl management.

### ***North American Waterfowl Management Plan***

The North American Waterfowl Management Plan (NAWMP) was established in 1986, and signed by both the U.S. Secretary of the Interior and the Canadian Minister of the Environment (Williams, Koneff, & Smith. 1999). The central goal of the NAWMP was to reestablish waterfowl population levels of the 1970s using habitat conservation (Williams, Koneff, & Smith 1999). The population objectives of the 1970s “were chosen presumably because they reflected a period in which waterfowl managers generally were satisfied with hunting opportunities” (Runge, Johnson, Anderson, Koneff, Reed, & Mott 2006, p. 1234).

The NAWMP focuses on “landscape-level changes that provide multiple benefits for soil, water and wildlife conservation” (Melinchuk 1995, p. 211). The NAWMP was stimulated by declining waterfowl populations, long-term drought in the Great Plains, and habitat loss and degradation due to agriculture in North America (Williams, Koneff, & Smith 1999). In 1994, the

NAWMP was expanded to include Mexico, which made the Plan “truly continental in scope” (Williams, Koneff, & Smith 1999, p. 418).

The NAWMP is “concerned with conserving habitat for waterfowl over a decades-long timeframe, whereas federal harvest management processes set waterfowl hunting regulations on an annual basis” (Runge, Johnson, Anderson, Koneff, Reed, & Mott 2006, p. 1231). The habitat management goals of the NAWMP are implemented through regional joint ventures; however, the “original Plan also included regulatory prescriptions for harvest of Mallards (*Anas platyrhynchos*), Northern Pintails (*A. acuta*), and American Black Ducks (*A. rubripes*)” (Runge, Johnson, Anderson, Koneff, Reed, & Mott 2006, p. 1231). Harvest regulation provisions were removed from the NAWMP in the 1994 update.

Eight principles guide the NAWMP and are constant throughout plan revisions (North American Waterfowl Management Plan 2004). These principles include:

1. Waterfowl are among North America’s most highly valued natural resources
2. Waterfowl populations should be sustained at objective levels across their natural ranges to provide both ecological and socioeconomic benefits
3. Protection of North American waterfowl populations and their habitats requires long-term planning and close cooperation and coordination of management activities in Canada, the United States, Mexico and other countries important to North American waterfowl
4. Resident and endemic species are important components of each nation’s waterfowl heritage and deserve significant attention and resources from within the jurisdictions where they occur
5. Managed harvests of the renewable waterfowl resource are desirable and consistent with its conservation
6. Habitat joint ventures, which are partnerships among private organizations, individuals, and government agencies, are the primary vehicles for accomplishing Plan objectives. Species joint ventures further scientific understanding that is necessary to effectively manage specific waterfowl species
7. Long-term protection, restoration, and management of waterfowl habitats requires that Plan partners collaborate with other conservation and community efforts in the development of conservation, economic, and

social policies and programs that sustain the ecological health of landscapes

8. Plan implementation is founded on sound science and guided by biologically based planning, both of which are, in turn, refined with increased knowledge gained through evaluation and research (North American Waterfowl Management Plan 2004, p. 2).

These foundational principles reflect an environmental ethic and value of waterfowl and their habitat. In addition to guiding principles, the original NAWMP stated that goals within the plan should be able to maintain waterfowl populations and their habitats at levels perceived by waterfowl enthusiasts and conservations as acceptable. To this end, the NAWMP listed five goals specifically for ducks, which were to:

1. Maintain the current diversity of duck species throughout North America and, by the year 2000, achieve a breeding population level of 62 million during years with average environmental conditions. This would provide a fall flight of over 100 million birds during average years.
2. Reach or exceed the Table 2 goals [1970 population stats] for breeding populations of the 10 most common species of ducks in the surveyed area. More specific recommendations are listed below for mallards, pintails and black ducks.
3. By year 2000, achieve and maintain in the surveyed area a breeding population index level of 8.7 million mallards during years of average environmental conditions. Average distribution of breeding mallards in the surveyed area would be 75 percent Canada and 25 percent United States.
4. By the year 2000, achieve and maintain in the surveyed area a breeding population index level of 6.3 million pintails during years of average environmental conditions. Average distribution of breeding pintails in the surveyed areas would be 65 percent Canada and 35 percent United States.
5. The goal for black ducks is to attain, by the year 2000, a wintering population index of 385,000 birds in the Atlantic and Mississippi Flyways (North American Waterfowl Management Plan 1986, p. 6).

Meeting these goals for duck populations would allow approximately 20 million ducks to be harvested annually in Canada and the United States (North American Waterfowl Management Plan 1986). A key factor in waterfowl management and meeting management goals listed in the NAWMP was to “accommodate the diverse public interests in waterfowl and to assure that all

citizens can benefit from abundant waterfowl populations” (North American Waterfowl Management Plan 1986, p. 6). Harvest goals for waterfowl are currently at levels identified in objectives from the original NAWMP of 1986 (North American Waterfowl Management Plan Revisions Draft 2012).

Population goals set for geese were also based on 1970s population statistics, and were close to being met when the plan was established, with the exception of the Cackling, Dusky and Aleutian Canada goose populations and the Pacific White Front and Brant populations, which were declining (North American Waterfowl Management Plan 1986). Similarly, population goals for swans were based on the 1970s population statistics, with the Trumpeter Swan being “an international priority” and needing more specific population goals and management plans (North American Waterfowl Management Plan 1986, p. 9). The NAWMP has been successful in meeting waterfowl population goals for some species (gadwall, Green-winged teal, Blue-winged teal, Cinnamon teal, Northern shoveler, and redhead); there are no current population trends for mallard and canvasback, while Northern pintail, American wigeon, Lesser scaup, and Greater scaup show population declines (North American Waterfowl Management Plan Revisions Draft 2012).

The original NAWMP set habitat goals as well. The habitat goals were designed to be accomplished over a 15-year period and focused on the following objectives:

1. To restore mallard and pintail breeding habitat in the midcontinent region to 1970-1979 levels by protecting and improving 3.6 million additional acres in Canada and about 1.1 million additional acres in the United States for duck production. These estimates are based on a ratio of three acres of upland nesting cover per acre of water.
2. To protect 686,000 additional acres of mallard and pintail migration and wintering habitat in the lower Mississippi River-Gulf Coast region and increase the carrying capacity for wintering birds on land and waters already acquired for waterfowl.

3. To improve the quality of publicly managed habitat and protect and restore 80,000 additional acres of wintering habitat for pintails and other waterfowl in the Central Valley of California.
4. To protect 60,000 additional acres of breeding and migration habitat in the Great Lakes – St. Lawrence lowlands for black ducks and other waterfowl in Canada and 10,000 additional acres in the United States.
5. To protect and enhance migration and wintering habitat for black ducks by:
  - a. protecting 50,000 additional acres of migration and wintering habitat on the east coast of the United States;
  - b. protecting 10,000 additional acres on the east coast of Canada;
  - c. improving habitat quality of other areas in the region; and
  - d. affecting a 25 percent increase in carrying capacity on 382,500 acres of land managed for waterfowl use by wildlife agencies in eastern United States.
6. To maintain the habitat value of designated areas of international significance to waterfowl listed in Figure 2.
7. To maintain waterfowl habitats of acceptable quality and minimize exposure to contaminants (North American Waterfowl Management Plan 1986, p. 13).

Overall, the 1986 NAWMP stressed that “maintenance and, where possible, enhancement of habitat are the most important factors in enabling waterfowl populations to grow to the levels called for in the goals” (North American Waterfowl Management Plan 1986, p. 14). Moreover, the 1986 NAWMP stated four approaches to plan implementation:

1. National Waterfowl Management Plans outline recommendations for accomplishing broad objectives within each nation including both international and domestic planning priorities. With respect to achieving the North American goals, these recommendations should establish how the operational program should be conducted between the federal government, states, and flyway councils in the United States, and provinces, territories and federal government in Canada.
2. United States state and flyway action plans and Canadian provincial and territorial action plans translate national planning priorities into operational programs within the respective jurisdictions and should be the principal vehicles for practical implementation of general strategies. These plans require specific details for implementing activities within management units, and should be designed according to local considerations but coordinated nationally.
3. Joint venture projects should be implemented through facilitating agreements negotiated and agreed to by all those wishing to participate. A

joint action group should be established for each joint venture. The planning, ongoing management funding, implementation method and evaluation of joint ventures should be set out as a proposal which would detail the contributions of private organizations, individuals, states, provinces, territories and official proposed budgets of the two governments. Each project should be forwarded to the North American Waterfowl Management Plan Committee for its review and recommendation

4. The proposed initial implementing actions are as follows:
  - a. The North American Waterfowl Management Plan Committee would be established during June 1986.
  - b. The Plan Committee would review the recommendations for proposed joint ventures and recommend participants for each joint venture action group at the first meeting during July 1986.
  - c. Joint venture action groups may be established by July 1986.
  - d. The Plan Committee would review joint venture progress reports during November 1986.
  - e. The Plan Committee would review the list of actions proposed to carry out the Plan by March 1987 (North American Waterfowl Management Plan 1986, p. 17).

This established the framework for the Joint Ventures, which are the backbone of habitat protection within the NAWMP. Since the original NAWMP of 1986, over four billion dollars have been used Plan partners to restore and protect 15.7 million acres of wetland habitat (North American Waterfowl Management Plan Revisions Draft 2012).

From 1986 to 1999, there was an increase in the majority of waterfowl populations, and many species' levels were at or near the levels identified in the NAWMP (Williams, Koneff, & Smith 1999). These increases are credited to, "abundant precipitation on the breeding grounds, widespread changes in agricultural practices and policies, restrictions on the sport harvest of waterfowl, and habitat conservation by public and private partners" (Williams, Koneff, & Smith 1999, p. 417). Furthermore, waterfowl managers "need to clarify whether Plan [NAWMP] objectives represent the optimal level for maximizing harvest yield, a habitat carrying capacity, or something else" (Runge, Johnson, Anderson, Koneff, Reed, & Mott 2006, p. 1235). Options

for balancing the needs of habitat and harvest management include interpreting NAWMP species objectives as:

1. The desired carrying capacity, that is, the equilibrium population size in the absence of harvest
2. One-half the desired carrying capacity, that is, the equilibrium population size under a harvest strategy that seeks to maximize harvest
3. Some specific point between 0.5 and 1.0 times the carrying capacity, or
4. The equilibrium population size under whatever harvest strategy is operating at the time (Runge, Johnson, Anderson, Koneff, Reed, & Mott 2006, p. 1236).

The NAWMP is fully embraced by Ducks Unlimited as the standard for waterfowl management (Melinchuk 1995). The population goals set forth in the NAWMP were established to provide for most aspects of waterfowl conservation and management, including hunting opportunities and ecological and aesthetic purposes (Williams & Johnson 1995).

#### *Atlantic Coast Joint Venture (ACJV)*

Joint Ventures (JVs) are the implementing arm of the NAWMP; JVs organize and implement local and regional conservation goals (Erwin 2002). JVs are focused in waterfowl rich areas, such as the “Lower Mississippi Valley, the Prairie Pothole regions of the U.S. and Canada, and the Central Valley of California” (Erwin 2002, p. 6). There are 22 habitat JVs in North America (See Figure 3) (Integrated Bird Conservation in the United States 2010).

In addition to JVs, NAWMP requires an oversight committee, which is composed of 18 representatives from the three countries, Canada, U.S., and Mexico (Williams, Koneff, & Smith 1999). The committee is responsible for “coordinating efforts among joint ventures, approving structural changes in the joint ventures, and periodically recommending changes in the [NAWMP] Plan itself” (Williams, Koneff, & Smith 1999, p. 418).

Figure 3: North American Bird Habitat Joint Ventures

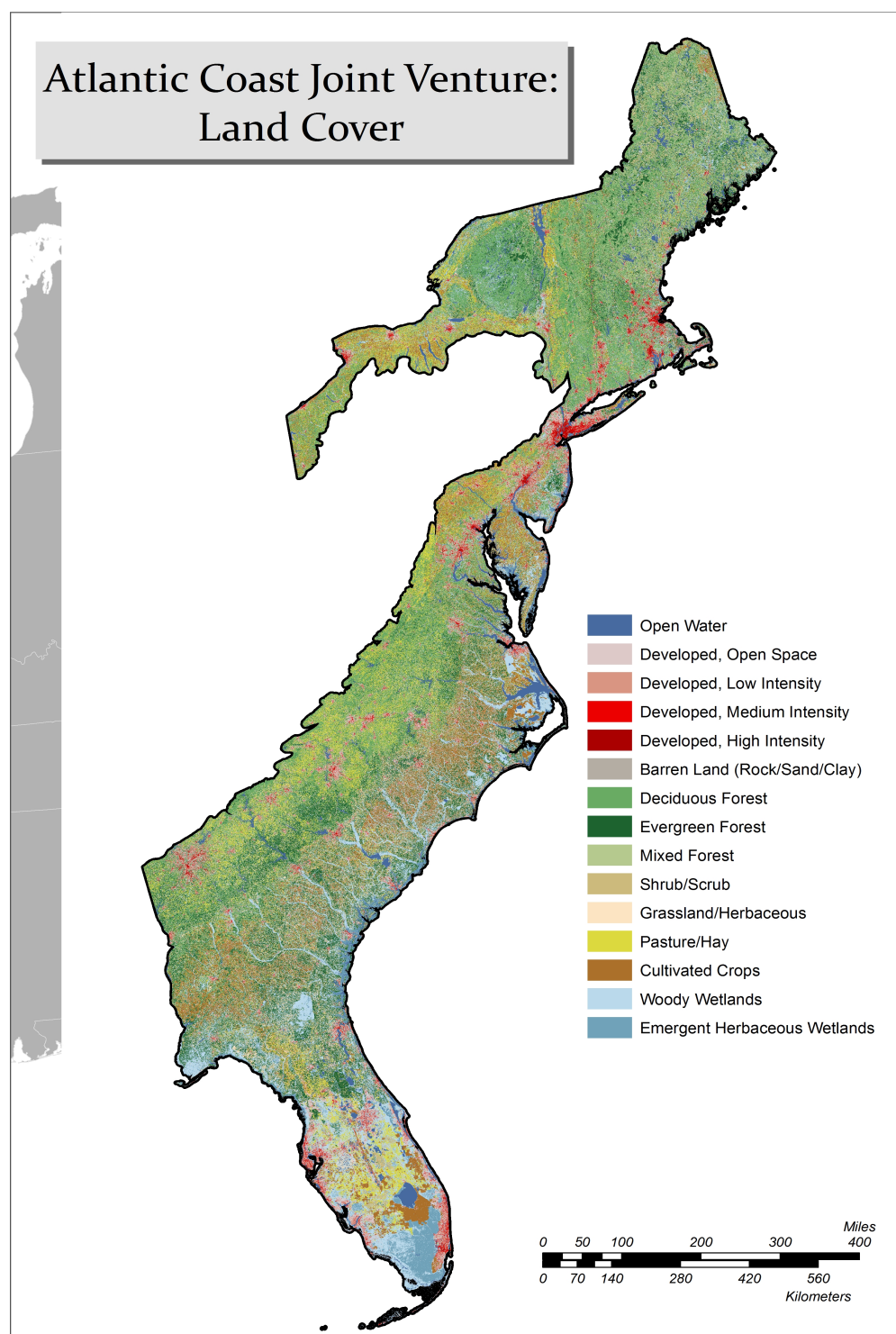


Source: Adapted from the North American Bird Conservation Initiative (Integrated Bird Conservation in the United States 2010). This map provides a geospatial layout of the 22 NAWMP Habitat Joint Ventures.



This dissertation focused on the Atlantic Coast Joint Venture (ACJV). The ACJV is “a partnership of federal, regional, and state agencies and organizations focused on the conservation of habitat for native birds in the Atlantic Flyway of the United States from Maine south to Puerto Rico” (Atlantic Coast Joint Venture 2004, p. i). The ACJV includes 283 million acres of total area, which represents 12% of the United States’ entire land area (Atlantic Coast Joint Venture 2009a). The ACJV has approximately 105 million people residing in its boundaries, with 19 distinct types of habitat, which can be seen in Figure 4 (Atlantic Coast Joint Venture 2009a).

Figure 4. Land Cover Types Within the ACJV



Source: Adapted from the Atlantic Coast Joint Venture (Atlantic Coast Joint Venture 2009a). Map displays the 19 distinct habitat types found within the Atlantic Coast Joint Venture boundaries.

The mission of the ACJV is:

To provide a forum for federal, state, regional and local partners to coordinate and improve the effectiveness of bird conservation planning and implementation in the Atlantic Flyway region of the United States (Atlantic Coast Joint Venture 2009a, para 4).

To meet this mission, an ACJV Strategic Plan was developed (Atlantic Coast Joint Venture 2004). The Strategic Plan for the ACJV includes objectives, strategies, and measures of achievement, which are, grouped into three categories Biological Foundations, Conservation Coordination and Delivery, and Communication and Outreach (Atlantic Coast Joint Venture 2004).

*Atlantic coast joint venture structure.* A component of the ACJV Strategic Plan is partnerships. The JV partners “work together to achieve common goals for bird conservation in the Atlantic Flyway” (Atlantic Coast Joint Venture 2009c, para 1). Partnerships exist at many levels, with a primary partnership being the Management Board partners (Atlantic Coast Joint Venture 2009c). The Management Board Partners for the ACJV include:

- Connecticut Department of Natural Resources
- Delaware Division of Fish and Wildlife
- Florida Fish and Wildlife Conservation Commission
- Georgia Department of Natural Resources
- Maine Department of Inland Fisheries and Wildlife
- Maryland Department of Natural Resources
- Massachusetts Division of Fisheries and Wildlife
- New Hampshire Fish and Game Department
- New Jersey Division of Fish and Wildlife
- New York Department of Environmental Conservation
- North Carolina Wildlife Resources Commission
- Pennsylvania Game Commission
- Puerto Rico Department of Natural and Environmental Resources
- Rhode Island Division of Fish and Wildlife
- South Carolina Department of Natural Resources
- Vermont Fish and Wildlife Department
- Virginia Department of Game and Inland Fisheries
- Ducks Unlimited, Inc.

- The Nature Conservancy
- The National Fish and Wildlife Foundation
- U.S. Fish and Wildlife Service
- U.S. Fish and Wildlife Service, Region 4
- U.S. Fish and Wildlife Service, Region 5
- National Park Service
- Wildlife Management Institute
- U.S.D.A. Forest Service
- U.S.G.S. Patuxent Wildlife Research Center (Atlantic Coast Joint Venture. 2009c, para 3).

The ACJV administrative structure is composed of multiple committees. The ACJV Management Board is at the head of this structure, followed by the Integrated Bird Conservation Committee (IBCC) Steering Committee (Atlantic Coast Joint Venture 2004). Next there are two Technical Committees, the ACJV Game Bird Technical Committee (includes the Waterfowl Technical Committee), and the ACJV Nongame Bird Technical Committee (Atlantic Coast Joint Venture 2009d). These committees are assisted by separate standing and ad-hoc subcommittees and by joint standing and ad-hoc subcommittees (Atlantic Coast Joint Venture 2009d).

The Management Board is composed of representatives of each Management Board Partner (listed above). The purpose of the ACJV Management Board is to “provide overall leadership, guidance, resources and support to the joint venture partnership for the planning and delivery of bird habitat conservation in the joint venture area” (Atlantic Coast Joint Venture 2009d, para 2).

The ACJV Game Bird Technical Committee members represent ACJV partner agencies and organizations, which are selected by their particular management board members, as well as, representatives from additional migratory game organizations within the ACJV (Atlantic Coast Joint Venture 2009d). The purpose of the ACJV Game Bird Technical Committee is to “provide input, guidance and assistance on waterfowl and other game bird conservation in the joint

venture based on the best available information to the management board and staff” (Atlantic Coast Joint Venture 2009d, para 4). The Game Bird Technical Committee is responsible for the “technical aspects of the planning and delivery of the North American Waterfowl Management Plan and other game bird plans in the joint venture area” (Atlantic Coast Joint Venture 2009d, para 4). Additionally, the committee organizes activities between the ACJV Nongame Bird Technical Committee, the Black Duck Joint Venture Technical Committee, and the Atlantic Flyway Migratory Game Bird Technical Section (Atlantic Coast Joint Venture 2009d).

The ACJV Nongame Bird Technical Committee members also represent ACJV partner agencies and organizations, which are selected by their particular management board members, as well as, other representatives of continental, national and regional bird conservation initiatives relative to the ACJV (Atlantic Coast Joint Venture 2009d). The Nongame Bird Technical Committee works in coordination with other initiatives, such as, Partners in Flight, U.S. Shorebird Conservation Plan, and Waterbird Conservation for the Americas (Atlantic Coast Joint Venture 2009d).

The purpose of the committee is to:

Provide guidance on integrating biological planning, conservation design, conservation delivery and evaluation among the major nongame bird conservation initiatives operating within the joint venture area and to compile and provide priority actions for consideration by the ACJV member agencies and organizations (Atlantic Coast Joint Venture 2009d, para 5).

The committee also organizes activities with the ACJV Game Bird Technical Committee and the Atlantic Flyway Migratory Nongame Bird Technical Section (Atlantic Coast Joint Venture 2009d).

The Waterfowl Technical Committee (WTC) seeks to “provide input and guidance to the management board and staff on waterfowl conservation in the joint venture based on the best

information available” (Atlantic Coast Joint Venture 2009d, para 6). The WTC is responsible for “translating the objectives of the NAWMP to the ACJV area and implementing projects to achieve those objectives” (Atlantic Coast Joint Venture 2009d, para 6).

The ACJV staff is employed by the U.S. Fish and Wildlife Service (Atlantic Coast Joint Venture 2009d). Positions within the ACJV include an ACJV Coordinator, an Assistant Joint Venture and/or BCR Coordinators, an ACJV Science Coordinator, and ACJV GIS Analyst, and an ACJV Communications/Outreach Coordinator (Atlantic Coast Joint Venture 2009d).

Additional committees within the ACJV structure include Bird Conservation Regions (BRCs) Steering Committees, State Working Groups, and Focus Area Working Groups (Atlantic Coast Joint Venture 2009d). For each BRC within the ACJV area, the ACJV is or will be “leading, supporting or facilitating integrated bird conservation planning” (Atlantic Coast Joint Venture 2009d, para 7). Figure 4 illustrates the BRCs within the ACJV area.

The state working groups occur in some states within the ACJV when state partners form a group to address specific bird conservation initiatives within that state (Atlantic Coast Joint Venture 2009d). Focus Area Working Groups occur in specific regions or high interest areas within the ACJV, examples include the “Great Bay Resource Protection Partnership in New Hampshire, South Carolina Coastal Task Forces, St. Lawrence Valley Working Group in New York, Delaware Bay Partnership (New Jersey, Pennsylvania and Delaware), and Chesapeake Bay Waterfowl Working Group (Maryland, Delaware, Virginia and West Virginia)” (Atlantic Coast Joint Venture 2009d, para9).

*Atlantic coast joint venture conservation plans and initiatives.* A primary conservation plan under the ACJV is the Waterfowl Implementation Plan. The NAWMP was updated in 2004

and the ACJV Waterfowl Implementation Plan was also updated (North American Waterfowl Management Plan 2005). The updated Waterfowl Implementation Plan addressed the:

Expanded geographic area and mission of the joint venture as well as the updates to the NAWMP. It steps down continental and regional waterfowl population and habitat goals from the NAWMP 2004 Update to the ACJV area, presents habitat conservation goals and population indices for the ACJV consistent with this update, provides current status assessments for waterfowl and their habitats in the joint venture, and updates focus area narratives and maps for each state (North American Waterfowl Management Plan 2005, p. 1).

The ACJV Waterfowl Implementation Plan also identified 149 waterfowl conservation focus areas within the ACJV, and stated that “ACJV partners need to conserve, through protection, restoration or enhancement, more than 638,000 ha (>1,577,000 acres) of wetlands and associated uplands over the next five to ten years to meet our commitment to waterfowl populations under the NAWMP” (North American Waterfowl Management Plan 2005, p. 1).

In addition to the Waterfowl Implementation Plan, the ACJV is responsible for the South Atlantic Migratory Bird Initiative (SAMBI) (Atlantic Coast Joint Venture 2010). SAMBI seeks to deliver a “habitat conservation strategy for the conservation of ‘all birds across all habitats’, consistent with and complimentary to international, national, regional, and local migratory bird planning efforts” (Atlantic Coast Joint Venture 2010, para 15). SAMBI is based in biological processes and encourages strong partnerships at all levels of management, including “federal, state, non-governmental organizations, and private landowners” (Atlantic Coast Joint Venture 2010, para 15). The conservation plan for SAMBI was completed in July 2005 (Atlantic Coast Joint Venture 2010).

***Atlantic coast joint venture accomplishments.*** The ACJV has been making significant conservation strides since 1988. The ACJV tracks its accomplishments through monitoring and

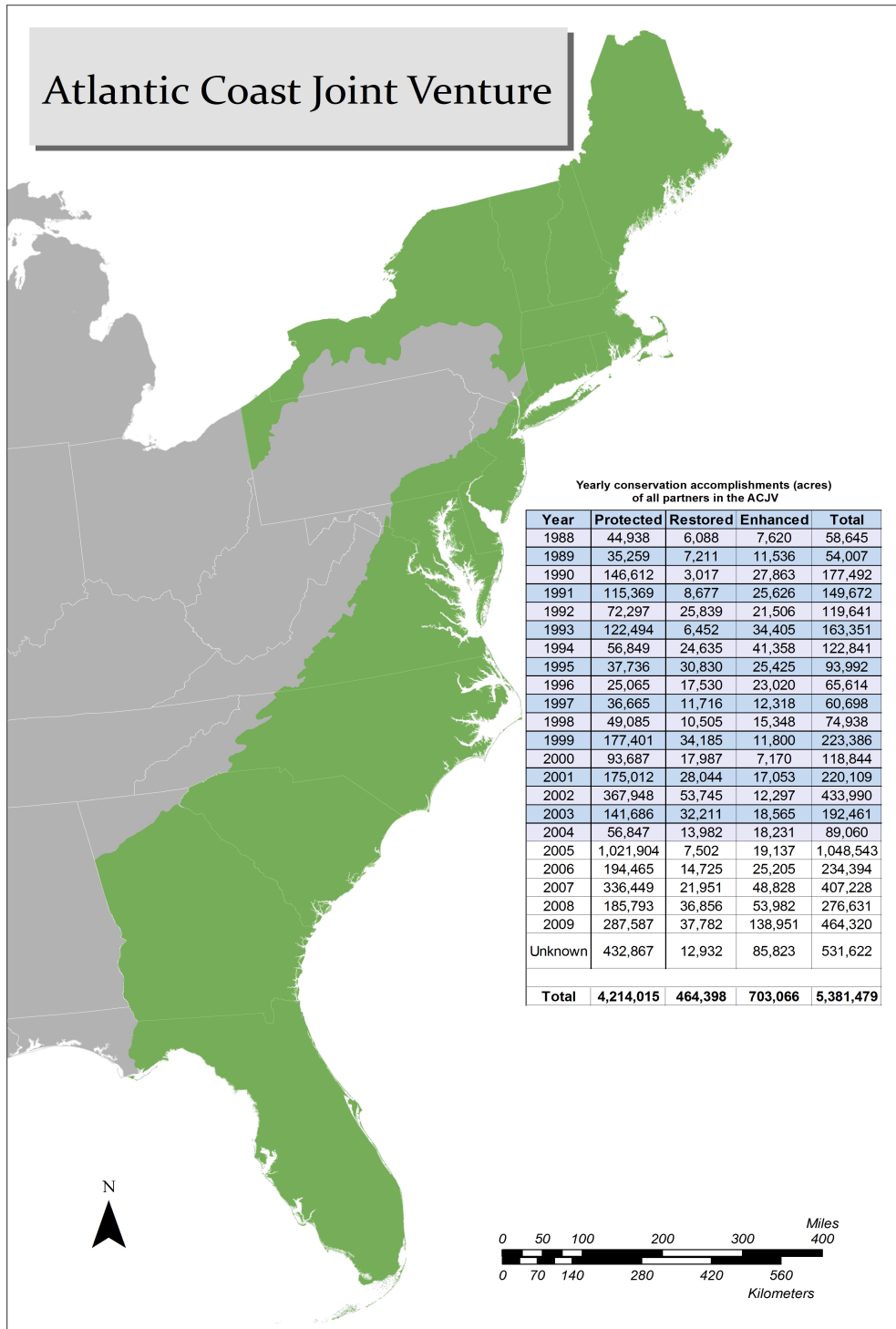
recording acres of habitat protected, restored, and enhanced (Atlantic Coast Joint Venture 2009b). ACJV accomplishments are achieved through funding sources and partnerships, including:

North American Wetland Conservation Act grants, National Coastal Wetland Conservation Act grants, National Wildlife Refuge acquisitions, National Forest habitat conservation, Partners for Fish and Wildlife habitat restoration, Ducks Unlimited habitat conservation, The Nature Conservancy habitat conservation, State Fish and Wildlife agency projects, and Atlantic Coast Joint Venture funded projects (Atlantic Coast Joint Venture 2009b, para 1).

Accomplishments are listed in Figure 5 below and are representative of total acres throughout the entire ACJV area (Atlantic Coast Joint Venture 2009b).



Figure 5. ACJV Yearly Conservation Accomplishments



Source: Adapted from the Atlantic Coast Joint Venture (Atlantic Coast Joint Venture 2009b). This map identifies the yearly conservation accomplishments from 1988-2009 for protected, restored, and enhanced land by all ACJV partners. It also identifies the ACJV boundary.

The least productive year for habitat conservation in total acres was 1989, with 54,007 total acres, while the most productive year was 2005, with 1,048,543 acres (Atlantic Coast Joint Venture 2009b). Between the years of 1988 and 2008, more habitat was protected, 3,926,428 total acres, than was restored or enhanced (Atlantic Coast Joint Venture 2009b). The total amount of habitat either protected, restored, and enhanced since 1988 is 4,917,159 acres (Atlantic Coast Joint Venture 2009b).

ACJV habitat conservation accomplishments by state are similar to overall accomplishments, in that, more acres of habitat were protected by states, than restored or enhanced. Maine conserved the most habitat with 1,249,087 total acres (Atlantic Coast Joint Venture 2009b). South Carolina was second in total habitat conservation, followed by North Carolina, with 617,670 acres and 604,845 acres respectively (Atlantic Coast Joint Venture 2009b). Rhode Island produced the least habitat conservation in the continental U.S. with 23,050 total acres (Atlantic Coast Joint Venture 2009b). However, this is not unexpected due to Rhode Island's small total size. Massachusetts was close behind Rhode Island with 25,142 total acres of habitat conservation (Atlantic Coast Joint Venture 2009b).

### **Atlantic Flyway**

Most of the bird species in North America migrate, but “because waterfowl are more visible than other species in migration, they epitomize this phenomenon to most people” (Bellrose 1976, p. 39). One means of organizing the migratory movements of waterfowl for the purpose of management are flyways. Flyways were created in an effort to understand waterfowl migration and distribution, and aid in waterfowl conservation through harvest regulations (Bellrose 1976).

A flyway is “a useful geographic term that conveniently designates four regions of the United States...The flyways are useful political units in that they group together states with common borders whose waterfowl problems are similar” (Bellrose 1976, p. 20). It is important to note that individual waterfowl also tend to use one flyway instead of flying over the entire continent.

There are four flyways associated with waterfowl, Pacific, Central, Mississippi, and Atlantic. This study focused on the Atlantic Flyway. The Atlantic Flyway extends from Canada down to the U.S. Virgin Islands, crossing 17 states, 6 provinces, and 2 territories (U. S. Fish & Wildlife Service n.d.). Each flyway also has a flyway council that aids in the waterfowl hunting management in North America (U. S. Fish & Wildlife Service n.d.). The flyway councils were established in 1951 by the International Association of Game, Fish, and Conservation Commissioners and meet yearly in winter, spring, and early August to discuss harvest regulations (Atlantic Flyway 2010; & Bellrose 1976). The flyway councils were responsible for establishing annual hunting seasons during the years 1960 and 1970 (Bellrose 1976).

The Atlantic Flyway Council contains “representatives (usually administrators) from all the agencies that have management responsibility for migratory bird resources in the Flyway” (U. S. Fish & Wildlife Service n.d., para 2.). The role of the Atlantic Flyway Council is to determine “actions required for sound migratory game bird management and make recommendations to the U.S. Fish and Wildlife Service” (U. S. Fish & Wildlife Service n.d., para 3). The flyway council is responsible for the harvest management of the 41 native species of waterfowl occurring in the Atlantic Flyway (North American Waterfowl Management Plan 2005). Harvest management is important to waterfowl conservation as key component of the three-prong approach, population, habitat, and harvest management.

## **Waterfowl Management Theories & Approaches**

As with most modern professions founded in nature, waterfowl management has evolved and adapted over the years based on innovative scientific research, the human values and attitudes placed on the environment and its parts, and improved understanding of effective planning techniques. This section identifies and discusses founding philosophies of natural resource and wildlife management, changing views of the environment and how humans relate to nature, differing natural resource management approaches, and strategies for the management of waterfowl.

### *Natural Resource Management Theory & World Views*

Many theories and philosophies provide insight into natural resource management. Two such theories are environmental epochs and command and control theory. Environmental epochs are a means to understand the evolution of the way in which the United States (U.S.) deals with environmental issues. The first epoch was considered the command and control epoch, in that the focus was on correcting environmental problems quickly (Mazmanian & Kraft 1999). During the first epoch, there was concern for protection of natural resources and biodiversity (Mazmanian & Kraft 1999). The second epoch was somewhat of a downgrade from the first. The focus of the second epoch shifted toward social and economic growth, and moved away from environmental issues (Mazmanian & Kraft 1999). Incentives, for compliance with environmental policies, were a new approach to environmental protection during the second epoch. The third epoch dealt with the concept of sustainable development and sustainable communities. A similarity between all three environmental epochs is that as the human population increases, natural resources decrease

(Holling & Meffe 1996). According to Mazmanian and Kraft (1999), the global community is currently living within the third epoch.

A second theory of natural resource management is the command and control theory (Holling & Meffe 1996). Mazmanian and Kraft (1999) limited the command and control theory to the first environmental epoch, however, Holling and Meffe (1996) view this theory as one that is currently applied to natural resources. Command and control is a problem solving approach in which “a problem is perceived and a solution for its control is developed and implemented” (Holling & Meffe 1996, p. 329).

Command and control seeks to solve problems through:

Control of the processes that lead to the problem (e.g., good hygiene to prevent disease, or laws that direct human behavior) or through amelioration of the problem after it occurs (e.g., pharmaceuticals to kill disease organisms, or prisons or other punishment of lawbreakers) (Holling & Meffe 1996, p. 329).

Generally, command and control is used in natural resource management to remove extremes and create a steady state (Holling & Meffe 1996).

Natural resource management has a history of trying to control nature for the purpose of resource extraction, resource threat reduction, and producing short-term outcomes for human benefit (Hollings & Meffe 1996). This control over natural systems causes a “pathology of natural resource management”, which is defined as the point “when the range of natural variation in a system is reduced, the system loses resilience” (Holling & Meffe 1996, p. 330). Resilience is a measure of an ecosystem’s ability to resist disturbance and ability to recover from disturbance and resume equilibrium of the system (Holling & Meffe 1996).

The theory of command and control, and the concept of the pathology of natural resource management lead to the “Golden Rule” of natural resource management: “Natural resource

management should strive to retain critical types and ranges of natural variation in ecosystems” (Holling & Meffe 1996, p. 334). Essentially, natural resource management should aid existing natural processes and variabilities instead of trying to control or manipulate them (Holling & Meffe 1996).

### *Wildlife Management Theory*

Historically, there are three philosophical views of the origins of wildlife management. The first philosophy was based on “the biblical passage that man was given dominion over the earth (Genesis 1:26)” and Protagoras’ teaching which holds that our “primary allegiance is owed to society” (Conover & Conover 2001, p. 675). Meaning, man is supreme and should use natural resources to his benefit and gain. This philosophy held true through colonization of the new world and the Industrial Revolution (Conover & Conover 2001).

The second philosophy argues, “our primary allegiance is owed to the resource” (Conover & Conover 2001, p. 675). This philosophy held that natural resources (plants, animals, landscapes) had intrinsic value and should be preserved. This shift in resource ideology began after the Industrial Revolution, with writers such as Thoreau and Emerson in the U.S., and stemmed from the antebellum period (Conover & Conover 2001). The concept of managing for ‘the resource’ is equated with this second philosophy, but society has not fully adopted this philosophy, placing higher value on human needs than those of nature (Conover & Conover 2001).

These two philosophies are at fundamental odds. A normalizing philosophy between these extremes states “each generation has a fiduciary obligation to future generations and that wildlife management should be based on fulfilling our fiduciary responsibilities” (Conover &

Conover 2001, p. 677). Centered on ethical responsibilities, this view argues that humans should protect and preserve natural resources from degradation, but the focus of protection and preservation should be future generations (Conover & Conover 2001). For natural resource managers, this means managing the resource in a way that it is passed “along in an undiminished capacity, so that future generations cannot say of them [present generation] that the natural world was allowed to deteriorate during their watch” (Conover & Conover 2001, p. 678).

As wildlife management theories developed, the concept became defined as “the guidance of decision-making processes and implementation of practices to purposefully influence interactions among and between people, wildlife, and habitats to achieve impacts valued by stakeholders” (Riley, et al 2002, p. 586). Biology and expert authority framed wildlife management in the twentieth century. Biology was thought to be the single most important component of wildlife management, while expert authorities were thought to be wildlife biologists (Riley, et al 2002). This school of thought did not hold, and a shift toward integrated wildlife management began.

Integration in wildlife management focused on merging the “biological and human dimensions in practice and engaging stakeholders in decision-making processes” (Riley, et al 2002, p. 586). Integration in wildlife and wetlands management began with Aldo Leopold (Erwin 2002). Aldo Leopold boldly stated, “the individual is a member of a community of interdependent parts” (Leopold 1949, p. 239). Though we may not understand the intricacies of our connection with nature, that lack of understanding does not remove the connection or the consequences of ignorant choices. Integrated waterbird management includes waterfowl habitat, among other elements, in its management strategy (Erwin 2002). Five key factors associated

with integrated waterbird management are “taxonomic, spatial, temporal, population-habitat, and multiple-use management objectives” (Erwin 2002, p. 5).

To date, four key factors are associated with the success of wildlife management, incorporation of larger stakeholder groups, events and interactions, scale of management efforts, and biodiversity. Adams, Leifester, and Herron (1997) reaffirmed prior research stating the profession of wildlife management needs to expand politically and financially to incorporate a larger stakeholder group, in addition to hunters. Events and interactions are key factors of wildlife management, which can include, “wildlife interactions with other wildlife, wildlife interactions with the environment, interactions between wildlife and people, interactions between people and wildlife habitat, and interactions among people that result from wildlife” (Riley, et al 2002, p. 587). A serious issue when addressing impacts of events and interactions is scale. Spatial, temporal, operational, and relative scales are all needed to address wildlife management impacts, however, operational and relative scales are not regularly considered in management decisions (Riley, et al 2002).

Maintaining biodiversity is key for wildlife managers and has been cause for concern among “wildlife managers, land use planners and conservation biologists dealing with the realities of lost habitats, vanishing wildlife and plant species and dysfunctional ecosystems” (Rodiek & DelGiudice 1994, p. 1). Rodiek and DelGiudice (1994) stated that “the process of continuing human evolution upon the landscape has created a series of threats to the integrity and renewability of the environment” (p. 1); and that as such, the “biological diversity-landscape sustainability crisis is really an extension of this growing problem” (p. 1). Moreover, the authors affirm that biological diversity and landscape sustainability are concepts that demonstrate problems associated with coupled human and natural systems, which are then driven by politics



and culture. To this end, wildlife management is most successful at a large scale (temporal, spatial, and social) (Erwin 2002). Equally important is cohesive landscape or regional scale management of waterfowl, without losing sight of individuals (Kaminski 2002).

### *Waterfowl Management Approaches*

Waterfowl management is a long-standing example of the collaboration between wildlife research and resource management (Williams 1997). As such, waterfowl are seen as “both a heritage from the past and a legacy for the future” (Baldassarre & Bolen 1994, p. 13). Waterfowl management includes consumptive and non-consumptive management goals. Waterfowl are viewed as a valuable resource by both birders (non-consumptive) and hunters (consumptive) alike (Adams, Leifester, & Herron 1997). This is a function of waterfowls’ ability to link humans to the landscape. Both birders and waterfowl hunters reported closeness to nature as an important reason for participation in their activity (Adams, Leifester, & Herron 1997). A shift in non-consumptive wildlife interests was observed in the 1970s and 1980s due to the increasing numbers of endangered species (Erwin 2002). Also during this time an increasing demand for wetland protection lead to efforts to create “wetland inventories by the Waterfowl Research Bureau (now known as Wetlands International)” (Erwin 2002, p. 6).

Moreover, waterfowl management is composed of two opposing and related prongs, in that, waterfowl management is most effective at the regional scale, and manageability of waterfowl is more difficult as spatial scale increases (Erwin 2002). The study of waterfowl management and ecology has contributed to the advancement in applied science, including:

Adaptive resource management; continental-scale ecosystem conservation (e.g., North American Waterfowl Management Plan, North American Bird Conservation Initiative); species, community, and systems ecology; economics; ethology; evolution and systematic; human dimensions; mathematics; modeling;

nutritional and physiological ecology; population monitoring and genetics; and statistics (Kaminski 2002, p. 621).

The management of waterfowl can be subdivided into a number of management approaches, and can be undertaken at many scales. The current management strategy is adaptive management, though, ecosystem management is being applied more and more. Conservation land can be either waterfowl sources, providing for recruitment, or sinks, areas of higher mortality, based on natural variability (Erwin 2002). Thus, determining management approaches are crucial to waterfowl management success.

Multi-use lands are common in the field of natural resource management as limited conservation areas are required to be managed for human needs and resources. Lands with various management regimes can be viewed on a gradient; as agricultural and commercial land use increase, waterfowl manageability decreases (Erwin 2002). Ascher (2001) stated “complexity and organizational interests also frequently give rise to patterns of perverse learning that reinforce rather than rectify the problems of natural resource management” (p. 743).

### ***Ecosystem Management***

An ecosystem is “composed of the complex interactions and relationships between all of its biological and physical properties. It is never static, and living organisms in the system have evolved to deal with cyclical changes, catastrophic events and other stresses” (Gaydos, Gilardi, & Davis 2003, p. 2). Ecosystem management is becoming a governing paradigm for the management of many public lands (Endter-Wada, Blahna, Krannich, & Brunson 1998). Ecosystem management is defined as “focusing on ecological systems that may cross administrative and political boundaries, incorporating a “systems” perspective sensitive to issues

of scale, and managing for ecological integrity” (Endter-Wada, Blahna, Krannich, & Brunson 1998, p. 891).

Ecosystem management also “approaches the complexity of systems and the need to view it holistically by making jurisdictions correspond to ecosystem boundaries, increasing the levels of coordination, and combining multiple information sources from across the ecosystem” (Ascher 2001, p. 743). This management approach is a truly holistic view of waterfowl management and the only management approach that accounts for human involvement, specifically policy and administrative wills. Conversely, since waterfowl management is already extremely complex due to the numerous authorities and policies involved, ecosystem management could make coordination of these various aspects more complex (Ascher 2001).

### ***Landscape Management***

It has been noted over the past decade that the “probability of maintaining viable wildlife populations often depends on management at several spatial scales” (Erwin 2002, p. 7). Further, multiple-species conservation “requires that habitat-based conservation programs be applied at the landscape scale” (Tori, McLeod, McKnight, Moorman, & Reid 2002, p. 118). Ducks Unlimited began a landscape approach to habitat conservation for waterfowl (Melinchuk 1995). The landscape approach ensures the “[accommodation of] the life-cycle of North America’s migratory birds” (Melinchuk 1995, p. 211). The most successful example of a landscape-level habitat conservation program is the Conservation Reserve Program, which Ducks Unlimited supports (Melinchuk 1995).

### *Adaptive Management*

Adaptive management strives to be flexible and adapt management strategies as needed to meet management goals (Ascher 2001). The primary components of adaptive management include “monitoring, feedback, capacity to learn from past mistakes, and incentives to experiment with new adaptations” (Ascher 2001, p. 744). Williams and Johnson (1995) stated, “through adaptive management, we can actively pursue the information needed to more effectively manage waterfowl populations” (p. 430). Adaptive management can be passive or active. Passive-adaptive management addresses the influence of management impacts in the future, but does little to address the reduction of uncertainty of waterfowl management in the future (Williams 1997). Active-adaptive management “seeks to reduce uncertainty by generating information through management itself” (Williams 1997, p. 717). A benefit to active-adaptive management approach is that it can be undertaken systematically.

Adaptive management is also applied to waterfowl harvests. The United States Fish and Wildlife Service (USFWS) has used adaptive harvest management, specifically for Mallard harvest, since 1995 (Nichols, Runge, Johnson, & Williams 2007). Adaptive harvest management aims to identify best possible harvest management strategies, as well as to improve understanding of waterfowl biology and population dynamics (Williams, Johnson, & Wilkins 1996). There are five components to adaptive harvest management, which include:

- (1) Potential options for regulating waterfowl harvests
- (2) Alternative biological mechanisms by which to represent population dynamics
- (3) Measures of model uncertainty by which to track the relative ability of each model to characterize population dynamics
- (4) A monitoring program by which to assess population status, recognize biological mechanisms, and reduce uncertainties in the management of harvest
- (5) An objective function, by which to compare and evaluate different regulatory policies” (Williams, Johnson, & Wilkins 1996, p.224).

As with all forms of natural resource management, adaptive harvest management has a level of uncertainty. Factors that contribute to the uncertainty of waterfowl harvest regulation are the number of regulations, changes to regulations based on population statistics, and a decline of waterfowl scientists (Williams, Johnson, & Wilkins 1996). Overall, adaptive management is proving to be quite effective at reducing these uncertainties to produce more effective natural resource management (Williams 2011).

### *Waterfowl Management Strategies*

Waterfowl conservation “embraces four distinct entities: habitat preservation and enhancement, the establishment of waterfowl regulations that permit the highest kill commensurate with the capability of the species to replace these losses, the control of disease, and propagation” (Bellrose 1976, p. 43). Waterfowl management approaches are a way to view waterfowl management as a whole, and as a collection of parts. Waterfowl management strategies are how a management approach is implemented. A management strategy is defined as “a specific action, tool, or technique or combination of actions, tools, and techniques used to meet unit objectives” (Alligator River CCP, p. 104). Conservation sites and waterfowl management professionals use various management strategies. No definitive list of best practices, or best management strategies is available. The NAWMP is the current standard in waterfowl management for population and habitat conservation. The Flyway system is the current standard for harvest regulations. After careful review of these administrative documents, and numerous site management plans, monitoring and evaluation, education, and harvest regulations were consistently listed as effective waterfowl management strategies.

### ***Monitoring & Evaluations***

Monitoring is the backbone of resource management at all scales. Williams (1997) stated, “it is clear that management in the absence of monitoring can be potentially damaging to a population; conversely, monitoring in absence of management is potentially irrelevant to decision-makers” (p. 716). Further, Williams and Johnson (1995) discussed the monitoring component of waterfowl management as:

Informed decision-making requires large-scale monitoring programs that deliver information about population status and trends, harvest levels, and other important biological attributes. This information is crucial to ascertain effects of harvest regulation and to establish a coherent framework for setting harvest regulations (p. 431).

It can also be said that monitoring should not be equated with conservation or management, but rather should be seen vital components of each (Nichols, Runge, Johnson, & Williams 2007).

The right hand of monitoring is evaluation. Colt (1994) stated, “a comprehensive evaluation seeks to identify the actual causal relationships, or links, between management goals, actions (outputs), and outcomes” (p. 87). More specifically, “comprehensive evaluation seeks to verify the actual outcomes of particular management actions and to generate insight into how particular management reforms will enhance the attainment of management goals” (Colt 1994, p. 87).

### ***Education***

Another integral aspect of waterfowl management, and all natural resource management, is education. Erwin (2002) stated, “under all circumstances, however, additional public education is needed to demonstrate the ecological and aesthetic roles of waterbirds in their wetland environments” (p. 10). Sites that facilitate environmental education and community outreach

increase awareness of important conservation issues at their site, and also foster community partnerships with non-profit organizations and schools. These partnerships lead to funding, research opportunities, community stewardship, and a strong volunteer base.

### ***Harvest Regulations & Waterfowl Surveys***

The goal of waterfowl harvest regulations is to “provide an opportunity to harvest waterfowl by establishing hunting seasons that are compatible with the long-term sustainability of waterfowl populations” (Runge, Johnson, Anderson, Koneff, Reed, & Mott 2006, p. 1232). The establishment of duck-hunting regulations in the United States and Canada was fostered from the Migratory Bird Treaty Act of 1918 (Runge, Johnson, Anderson, Koneff, Reed, & Mott 2006).

Some harvest strategies incorporate the North American Waterfowl Management Plan (NAWMP) populations goals (waterfowl populations of the 1970s), but few link habitat management and harvest management (Runge, Johnson, Anderson, Koneff, Reed, & Mott 2006). Harvest strategies that incorporate NAWMP goals include, “Adaptive Harvest Management (AHM) of Mallards in the United States, the Prairie Mallard Harvest Strategy in Canada, the Atlantic Brant Management Plan, and the Pacific Flyway Management Plan for the Cackling Canada Goose” Runge, Johnson, Anderson, Koneff, Reed, & Mott 2006, p. 1232).

Moreover, Baldassarre and Bolen (1994) stated, “unremitting exploitation of wildlife – with little thought of conservation – clearly prevailed until the dawn of the 20<sup>th</sup> century” (p. 520). Bellrose (1976) stated, “the purpose of [hunting] regulations is to control the harvest, generally by changing season times and lengths, bag limits, and methods of hunting” (p.59). Not surprisingly, waterfowl hunters were the first to recognize the need to conserve, not only

waterfowl, but their habitat as well. Hunters played a primary role in securing both state and federal waterfowl conservation policies (Bellrose 1976).

Waterfowl surveys in North America have been undertaken for more than 50 years under the North American Waterfowl Population Program (U.S. Fish & Wildlife Service 2004). This survey is performed in the U.S. and Canada, and is cited as “the most extensive, comprehensive, long-term annual wildlife survey effort anywhere” (U.S. Fish & Wildlife Service 2004, p. 1). Essentially the waterfowl survey is implemented by a once per year flight over waterfowl breeding grounds, to count waterfowl and record quality and quantity of habitat (U.S. Fish & Wildlife Service 2004).

Geographically, the survey extends from the “Canadian Maritimes west to the Pacific, and from the mid-U.S. north to the Arctic Ocean” (U.S. Fish & Wildlife Service 2004, p. 1). Additional surveys aid in waterfowl management, and include the “mid-winter surveys extending into Mexico, special surveys for certain species and populations, satellite imagery, hunter participation and harvest surveys, and banding programs” (U.S. Fish & Wildlife Service 2004, p. 1). The Office of Migratory Bird Management of the U.S. Fish and Wildlife Service gather and analyze waterfowl survey and banding information (U.S. Fish & Wildlife Service 2012).

### **Values, Ethics, and Attitudes Toward Natural Resources & Waterfowl**

Humans place value on nature. Economic value is fairly straightforward in identifying and measuring, but nonuse value is more difficult to examine. However, it holds great value in the management of natural resources, specifically waterfowl (Kotchen & Reiling 1999). Value can be defined as the worth of an item, or the importance placed on an item. Nature, or the environment, generally speaking, is valued intrinsically, for its own sake, independent of human



assessment; and/or valued based on humans' assessment of worth (Dietz, Fitzgerald, & Shwom 2005). Nature can also be valued through moral principles, suggesting "standards about how we should value various states of the world and actions of ourselves and others" (Dietz, Fitzgerald, & Shwom 2005, p. 340). This interpretation of value, links values to social groups and specifically to behavior and actions (Dietz, Fitzgerald, & Shwom 2005). Values are related to ethics in that "values influence how people make decisions" (Dietz, Fitzgerald, & Shwom 2005, p. 340). The problem of environmental ethics concerns "whether the environment and other species have intrinsic value or instead are of value only because they are means to human ends, referred to as instrumental value" (Dietz, Fitzgerald, & Shwom 2005, p. 341). The fundamental question here is: Should the environment (systems, species, and ecosystems) be valued, even if they hold no importance to humans?

Nature is "life-affirming and life-enhancing" (Cafaro & Sandler 2005, p. 3). Our society's infrastructure is founded on natural resources, and every part of the environment is necessary to sustain humans, whether directly or indirectly. As Aldo Leopold so boldly stated, "the individual is a member of a community of interdependent parts" (Leopold 1949, p. 239). Though we may not understand the intricacies of our connection with nature, that lack of understanding does not remove the connection or the consequences of ignorant choices.

The differences lay in attitude and belief toward the environment. Attitudes are "positive or negative evaluates of something quite specific" (Dietz, Fitzgerald, & Shwom 2005, p 346). Essentially, We might value wilderness, and we might oppose a proposal for oil development in a wildlife refuge. The former is more general and would be considered a value; the latter is more specific and considered an attitude (Dietz, Fitzgerald, & Shwom 2005, p. 346).

Beliefs are “understandings about the state of the world; they are facts as an individual perceives them” (Dietz, Fitzgerald, & Shwom 2005, p. 346). Thus, at the very least humans should value the environment and all its parts and processes, while the debate of how to best use and conserve natural resources occurs when attitudes and beliefs differ.

Cafaro and Sandler (2005) define environmental ethics as “the attempt to understand the human relationship with the environment (including natural ecosystems, agricultural ecosystems, urban ecosystems, and the individuals that populate and constitute those systems) and determine the norms that should govern our interactions with it” (Cafaro & Sandler 2005, p. 1). These norms are both actions and character (Cafaro & Sandler 2005). Aldo Leopold defines ethic in ecological and philosophical terms (Leopold 1949). Ecologically, ethic is “a limitation on freedom of action in the struggle for existence” (Leopold 1949, p. 238). Philosophically, ethic is “a differentiation of social from anti-social conduct” (Leopold 1949, p. 238). Leopold (1949) asserts that man applies ethics to numerous aspects of daily life, but not to nature, the land. From this observation, Leopold created the concept of a land-ethic. The purpose of the land-ethic is to affirm man’s need to recognize the intrinsic value of natural resources as well as, the instrumental value. Leopold (1949) stated, a land-ethic “of course cannot prevent the alteration, management, and use of these ‘resources’, but it does affirm their right to continued existence, and, at least in spots, their continued existence in a natural state” (p. 240).

The concepts of environmental value, ethic, and virtue are related, and mutually inclusive. Value determines the worth we place on the environment and all its parts. Ethic determines our actions, right and wrong, toward the environment. And virtue is the set of character traits possessed by an individual, or group that describe their relationship with, and guide their interaction with, the environment. These concepts reinforce each other. For instance,

we can value waterfowl for their beauty, their great feat of migration, and the recreational hunting and food they provide. Our ethic for waterfowl would be one of conservation and responsible management and hunting. Thus, our virtues would consist of moderation, tolerance, justice, compassion, love, integrity, respect, restraint, and service, to name a few. These three concepts, value, ethic, and virtue, help to explain and to define one another; and these concepts are correlated, where if one changes the other two do as well. Therefore, all three must be addressed when discussing the relationship between humans and nature.

### *Environmental Virtue Ethic*

Environmental virtues are “the proper dispositions or character traits for human beings to have regarding their interactions and relationships with the environment” (Cafaro & Sandler 2005, p. 3). A complete environmental ethic will include both a description of correct interactions with the environment and a description of virtues regarding the environment (Cafaro & Sandler 2005). In short, both an ethical code of conduct and a list of character traits are needed to complete an environmental ethic. To this end, environmental virtue ethics was created. Virtue ethics is “a normative ethical theory which takes as its orienting question: What kind of person should I be?” (Knights 2009, p. 1).

Officially, environmental virtue ethics (EVE) began in 1983 when Thomas Hill, Jr. suggested:

That rather than trying to prove nature’s intrinsic value or justify nonhuman rights, we might develop environmental ethics by asking, in the face of environmentally destructive behavior: what kind of person would do that? And: what kinds of persons will we become if we do likewise? (Cafaro 2010, p. 3).

The important distinction between environmental ethics and environmental virtue ethics is this question posed by Thomas Hill, Jr., the question of: what kind of person would do that? This

question is the virtue statement, demanding the definition of character traits for certain environmental actions.

Unofficially, EVE could have been developed much earlier and by a few different men, namely, Henry Thoreau in 1853, Aristotle in Fourth century BC, or Tao Te Ching a century earlier (Cafaro 2010). Aristotle contributed Virtue Theory to EVE, which states human rationality “distinguishes our essential nature from the nature of other animals, and our rationality can determine the appropriate goals for human lives when it is understood that humans can only flourish within a *polis* or community” (Holly 2006, p. 391). Virtue ethics are defined as “a type of moral theory in which virtue, as opposed to consequences, rights, deontological duties, values, is central” (Swanton 2010, p. 145).

The concepts of values, ethics, and virtues must be included in discussions of the human relationship with nature. The human relationship with nature is important because it is certain (Cafaro & Sandler 2005). Plainly stated:

One simply cannot opt out of a relationship with the natural world. On some accounts this is because humans are themselves a part of nature. On others it is because we must breathe, eat, drink, and decompose, each of which involves an exchange with the natural world. But whereas a relationship with nature is given, the nature of that relationship is not (Cafaro & Sandler 2005, p. 1).

Moreover, EVE has contributed greatly to environmental philosophy:

- By deploying a multifaceted set of virtue and vice concepts, it provides a rich, nuanced descriptive and normative language for our relationships and interactions with the natural environment;
- By explicating the connection between human flourishing and nature, it complements duty-based and fear-based justifications for environmentally progressive behavior and policies;
- By providing an ecologically informed account of human flourishing that is attentive to the full range of environmental values, it offers an alternative to consumption-oriented conceptions of human flourishing;
- By articulating a positive, aspirational vision in which humans and nature flourish together, it provides an alternative conception of the human-

- nature relationship to those in which people are either villains and despoilers, or self-denying ascetics;
- By specifying the kind of character conducive to environmental appreciation and personal restraint, it contributes to sketching the parameters of a genuinely sustainable society: one which doesn't careen from one environmental problem to the next, seeking techno-fixes, but instead might really solve them;
  - By focusing attention on the character states necessary for accomplishing lasting environmental improvement, it raises the salience of moral development and education to environmental ethics (Cafaro 2010, p. 4).

### *Environmental Virtue Ethic & Waterfowl Management*

Although written about Aldo Leopold's land-ethic, this statement summarizes the importance and purpose of environmental virtue ethics: "it reflects a conviction of individual responsibility for the health of the land" (The Aldo Leopold Foundation 2007, p. 2). The implications of EVE and waterfowl management are far reaching. The implications fall into three main categories: policy, conservation and management, and fostering virtue.

First, there are political implications of EVE on waterfowl management. EVE is a framework through which to view environmental concerns and problems. As of now, the physical infrastructure of our society is based on natural resources. Equally important, the governing infrastructure of our society creates value statements through policy. Values are a means to measure humans' relationships to environmentally consequential behaviors; "it is also possible to interpret the goals of national policies and international treaties and agreements as statements of values" (Dietz, Fitzgerald, & Shwom 2005, p. 336). This begs the question: Do our value statements in environmental policies related to waterfowl accurately reflect our relationship with the environment and waterfowl? And: Is this the relationship we want with the environment and waterfowl?

To attempt to answer these questions, the most influential policy for waterfowl must be discussed, the North American Waterfowl Management Plan of 1986. This plan listed eight principles, which are still upheld today:

1. Waterfowl are among North America's most highly valued natural resources
2. Waterfowl populations should be sustained at objective levels across their natural ranges to provide both ecological and socioeconomic benefits
3. Protection of North American waterfowl populations and their habitats requires long-term planning and close cooperation and coordination of management activities in Canada, the United States, Mexico and other countries important to North American waterfowl
4. Resident and endemic species are important components of each nation's waterfowl heritage and deserve significant attention and resources from within the jurisdictions where they occur
5. Managed harvests of the renewable waterfowl resource are desirable and consistent with its conservation
6. Habitat joint ventures, which are partnerships among private organizations, individuals, and government agencies, are the primary vehicles for accomplishing Plan objectives. Species joint ventures further scientific understanding that is necessary to effectively manage specific waterfowl species
7. Long-term protection, restoration, and management of waterfowl habitats require that Plan partners collaborate with other conservation and community efforts in the development of conservation, economic, and social policies and programs that sustain the ecological health of landscapes
8. Plan implementation is founded on sound science and guided by biologically based planning, both of which are, in turn, refined with increased knowledge gained through evaluation and research (North American Waterfowl Management Plan 2004, p. 2).

These principles clearly state the value of waterfowl, both intrinsic and instrumental, and list broad conservation goals including, habitat, long-term protection, and waterfowl's connection to ecosystems. These principles illustrate the value of waterfowl as part of a larger environmental community, and stress the need for partnerships in waterfowl management and conservation efforts. The requirement of partnerships reiterates the need for connections to be addressed in policy. Waterfowl connect landscapes, ecological processes, administrative bodies, and

individuals. Currently, no single waterfowl conservation or management policy accurately reflects the intricate connections of waterfowl to humans and the environment.

No virtues are directly attached to these statements of value within the North American Waterfowl Management Plan. The scientific understanding of ecological systems alone will not provide all our environmental and waterfowl conservation policy solutions (Dutcher, Finley, Luloff, & Johnson 2007). Our choices are driven by value, and I would argue, virtue (Dutcher, Finley, Luloff, & Johnson 2007). In order to deter environmentally consequential behavior, we must understand the value and character traits driving the choice. Instead “we legislate regarding behavior, not character; policy concerns actions, not attitudes; and the courts apply the standards accordingly” (Cafaro & Sandler 2005, p. 2).

EVE attempts to define the nature of our relationship with the environment and all its parts through virtue. When the answer to the question ‘What kind of person would do that?’ is answered, the nature of our relationship with the environment will become clearer. Then, we, as individuals and a society, can move forward to describe the type of person who would not participate in environmentally destructive behaviors. Building environmental virtue is a bottom up endeavor. Virtue cannot be enforced in the form of top-down government regulation society is used to, however, coupled with environmental ethic, virtue can guide our interactions with the environment and hold us accountable for our individual and collective actions, on a personal level.

Including statements of virtue within waterfowl conservation and management policies would more clearly reflect our relationship with the environment and our values. As it stands, the principles for the North American Waterfowl Management Plan are an accurate statement of our values regarding waterfowl conservation and management, but the addition of virtue would

address the character of those who participate and advocate waterfowl conservation and management. In regards to the relationship we should have with waterfowl and the environment, society has made vast improvements in the last few decades, through habitat conservation, habitat restoration, hunting regulations, and conservation polices. While virtues are not yet addressed in waterfowl management and conservation, there is potential.

Second, EVE has implications for waterfowl conservation and management strategies. Generally, scientists attribute three values to nature, aesthetic, economical, and ethical (Van Houtan 2006). Scientists usually keep to economic or scientific theories and avoid ethical theories. However, as wildlife management theories developed, it became defined as “the guidance of decision-making processes and implementation of practices to purposefully influence interactions among and between people, wildlife, and habitats to achieve impacts valued by stakeholders” (Riley, et al 2002, p. 586). To this end, it would benefit waterfowl management and conservation to adopt the EVE model since wildlife management includes stakeholder values.

Furthermore, waterfowl management and conservation are interdisciplinary fields, consisting of multiple agencies at all government levels, as well as, multidisciplinary managers. Addressing waterfowl conservation and management through the EVE model would not only provide a value statement for waterfowl and a code of ethical conduct, but the EVE model would also provide a statement of virtue. This statement would describe appropriate behavior for waterfowl management professionals, regardless of educational background. Again, virtues begin with the individual. The addition of virtue in waterfowl conservation and management strategies would build conservation from the grass-roots (individual) up.



Moreover, conservation theories and practices assume a right and wrong outcome (Van Houtan 2006). The acts of “protecting species, designing nature preserves, restoring degraded ecosystems, promoting sustainable use – these are thought of as ‘good’ undertakings” (Van Houtan 2006, p. 1368). Currently, statements of value and ethic are created on the premise that conservation is the right action to take. To this end, EVE provides reinforcement to waterfowl conservation efforts by affirming waterfowl conservation as ‘right’. Moreover, as Leopold stated, “it is, by common consent, a good thing for people to get back to nature” (Leopold 1949, p. 280). Virtue makes better people; people who “possess and exercise the virtues enjoy, all other things being equal, greater well-being than those who do not” (Knights 2009, p. 7).

Instilling environmental virtues will aid in waterfowl conservation efforts, while simultaneously creating ‘better’ conservationists. EVE enhances existing conservation and management efforts by the addition of virtue. By stating desirable characteristics for waterfowl conservation and management, managers and stakeholders could potentially become better people (people with a deeper connection to nature and a foundation of virtues, based on environmental advocacy, that carry over into all aspects of life). Connections to each other are also cultivated through environmental virtue. In essence, nature is “a wellspring of creativity – vital to our work and to our play – where we can forge healthier and more fulfilling lives through resonant connects with the land and with each other” (The Aldo Leopold Foundation 2007, p. 3).

Finally, EVE can provide the framework for field-based environmental education and the structure for empirical research regarding waterfowl conservation and management (Knights 2009). Field-based environmental education fosters environmental virtues, including: “proper humility, wonder, care, compassion, aesthetic sensibility, respect, attentiveness, appreciation,

and ecological sensitivity” (Knights 2009, p. 5). Interaction with waterfowl through management and/or conservation can foster environmental virtues in individuals.

The implications of EVE on waterfowl management include policies, management and conservation, and fostering virtue. EVE enhances our current model of conservation (ecological management, adaptive management) by providing guidelines for personal and group character traits. EVE goes beyond value statements and codes of ethics to include the kind of people who conserve the environment, or the kind of people who destroy it. EVE also defines conservation on an individual level, giving each individual equal fault or credit for environmental choices. We now have a model of conservation that addresses virtue; the need is in a means of enforcement. While adding virtue to waterfowl management policies and conservation initiatives is reasonable, enforcing character traits is not.

The addition of virtue in waterfowl conservation policy could create virtue in those involved in the process of conservation. Fulfilling our “moral and pragmatic obligations to other people and the land community, for our time and future generations, is about changing who we are and how we lead our lives” (The Aldo Leopold Foundation 2007, p. 4). Ultimately, waterfowl conservation is a process, not an end.

Understanding EVE, as it relates to waterfowl management, is important when identifying and discussing waterfowl management professionals’ perception of the state of practice. EVE can be used as another layer of standards for the conservation of waterfowl. A standard of practice based on environmental virtues and ethics, in addition to the preexisting standards within the NAWMP and the Atlantic Flyway. This addition to standard of practice would only boost conservation efforts a fundamental way, linking individuals with the

environment they are conserving. EVE can also help predict behavior and environmental choices on an individual scale.

## CHAPTER III

### METHODOLOGY

#### **Study Sites**

The setting for this study includes coastal ACJV sites. The ACJV is “a partnership focused on the conservation of habitat for native birds in the Atlantic Flyway of the United States from Maine south to Puerto Rico” (Atlantic Coast Joint Venture 2009a, para 1). The ACJV includes “a total area of 283 million acres (442,000 square miles) representing 12% of the total area of the United States” (Atlantic Coast Joint Venture 2009a, para 2). The ACJV has approximately 105 million people residing in its area (Atlantic Coast Joint Venture 2009a). There are 19 types of habitat within the entire ACJV.

The ACJV’s original focus was primarily

“on coastal wintering and migration habitat for the American black duck, a high priority species under NAWMP. With the addition of southern and inland areas, the focus broadened to include habitats for all priority waterfowl species in the Atlantic Flyway” (Atlantic Coast Joint Venture 2004, p. 2).

The Marine Protected Area National System (MPA) was utilized in order to determine which coastal ACJV sites to focus on. The MPA National System served to filter sites and habitat types, to include coastal ACJV sites with high potential for wetlands. Wetlands were specifically filtered for because the management of individual wetland sites impacts the number of waterfowl identified during counts. There are a total of 80 MPA sites within the ACJV. However, 6 of these MPA sites are managed for submerged cultural resources, and will not be included in this study. This leaves a total of 74 MPA sites included in this study. Using the habitat map of the ACJV to identify coastal areas with high potential for wetlands, additional United States Fish and Wildlife Service, National Park Service, and United States Forest Service

sites were included in this study. There are a total of 102 sites identified for this study. These sites are listed below in alphabetical order (see Table 2) and mapped in Figure 7.

Table 2: Coastal ACJV Sites

<b>Site</b>	<b>State</b>	<b>Agency</b>
Acadia National Park	ME	NPS
ACE Basin NWR	SC	USFWS
Alligator River NWR	NC	USFWS
Amagansett NWR	NY	USFWS
Archie Carr NWR	FL	USFWS
Aroostook NWR	ME	USFWS
Arthur R. Marshall-Loxahatchee NWR	FL	USFWS
Assateague Island National Seashore	MD/ VA	NPS
Back Bay NWR	VA	USFWS
Bethel Beach Natural Area Preserve	VA	VA Department of Conservation & Recreation
Biscayne National Park	FL	NPS
Blackbeard Island NWR	GA	USFWS
Blackwater NWR	MD	USFWS
Block Island NWR	RI	USFWS
Bombay Hook NWR	DE	USFWS
Cape Cod National Seashore	MA	NPS
Cape Hatteras National Seashore	NC	NPS
Cape Lookout National Seashore	NC	NPS
Cape May NWR	DE	USFWS
Cape Romain NWR	SC	USFWS
Cedar Island NWR	NC	USFWS
Chincoteague NWR	MD/ VA	USFWS
Conscience Point NWR	NY	USFWS
Croatan National Forest	NC	USFS
Crocodile Lake NWR	FL	USFWS
Cross Island NWR	ME	USFWS
Crystal River NWR	FL	USFWS
Cumberland Island National Seashore	GA	NPS
Currituck NWR	NC	USFWS
Dameron Marsh Natural Area Preserve	VA	VA Department of Conservation & Recreation
Eastern Neck NWR	MD	USFWS
Eastern Shore of Virginia NWR	VA	USFWS
Edward B. Forsythe NWR	NJ	USFWS
Elizabeth A. Morton NWR	NY	USFWS

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Everglades National Park	FL	NPS
False Cape State Park	VA	VA Department of Conservation & Recreation
Featherstone NWR	VA	USFW
Fire Island National Seashore	NY	NPS
Fisherman Island NWR	VA	USFWS
Francis Marion National Forest	SC	USFS
Gateway National Recreation Area	NJ/NY	NPS
Great Bay NWR	NH	USFWS
Great Dismal Swamp NWR	VA	USFWS
Guana Tolomato Matanzas National Estuarine Research Reserve	FL	FL Department of Environmental Protection
Harris Neck NWR	GA	USFWS
Hobe Sound NWR	FL	USFWS
Hughlett Point Natural Area Preserve	VA	VA Department of Conservation & Recreation
James River RNW	VA	USFWS
Jacques Cousteau National Estuarine Research Reserve	NJ	Rutgers University, Institute of Marine & Coastal Sciences
John H. Chafee NWR	RI	USFWS
Kiptopeke State Park	VA	VA Department of Conservation & Recreation
Lake Woodruff NWR	FL	USFWS
Mackay Island NWR	NC	USFWS
	/VA	
Martin NWR	VA/M	USFWS
	D	
Massasoit NWR	MA	USFWS
Mashpee NWR	MA	USFWS
Mason Neck NWR	VA	USFWS
Mattamuskeet NWR	NC	USFWS
Merritt Island NWR	FL	USFWS
Monomoy NWR	MA	USFWS
Moosehorn NWR	ME	USFWS
Nansemond NWR	VA	USFWS
National Key Deer Refuge	FL	USFWS
Nantucket NWR	MA	USFWS
Ninigret NWR	RI	USFWS
Norman Land Island NWR	MA	USFWS
Ocala National Forest	FL	USFS
Occoquan Bay NWR	VA	USFWS
Okefenokee NWR	GA	USFWS
Oyster Bay NWR	NY	USFWS
Parker River NWR	MA	USFWS
Pea Island NWR	NC	USFWS

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Pelican Island NWR	FL	USFWS
Petit Manan NWR	ME	USFWS
Pinckney Island NWR	SC	USFWS
Plum Tree Island NWR	VA	USFWS
Pocosin Lakes NWR	NC	USFWS
Pond Island NWR	ME	USFWS
Presquile NWR	VA	USFWS
Prime Hook NWR	DE	USFWS
Rachel Carson NWR	ME	USFWS
Rappahannock NWR	VA	USFWS
Rookery Bay National Estuarine Research Reserve	FL	FL Department of Environmental Protection
Sachuest Point NWR	RI	USFWS
Savage Neck Dunes Natural Area Preserve	VA	VA Department of Conservation & Recreation
Savannah NWR	GA	USFWS
Seal Island NWR	ME	USFWS
Seatuck NWR	NY	USFWS
Stewart B. McKinney NWR	CN	USFWS
Supawna Meadows NWR	NJ	USFWS
Swanquarter NWR	NC	USFWS
Target Rock NWR	NY	USFWS
Thatcher Island NWR	MA	USFWS
Timucuan Ecological & Historic National Preserve	FL	NPS
Trustom Pond NWR	RI	USFWS
Tybee NWR	SC	USFWS
Waccamaw NWR	SC	USFWS
Wallops Island NWR	VA	USFWS
Wassaw NWR	GA	USFWS
Waquit Bay National Estuarine Research Reserve	MA	MA Department of Conservation & Recreation
Wertheim NWR	NY	USFWS
Wolf Island NWR	GA	USFWS

Source: Adapted from the National Marine Protected Areas Center (2009) and the Atlantic Coast Joint Venture (2990a), This table identifies MPA sites within the ACJV boundaries and additional conservation areas located within the two types of wetland habitat along the coastal boarder of the ACJV.

## **Research Design**

The research design for this study is a non-experimental and descriptive design. This research design was adapted from Silver's (2009) dissertation research design. Silver (2009) investigated management strategies for submerged shipwrecks in National Marine Sanctuaries. This study will use a one-time data collection process, group comparisons, and inferential statistics in order to accurately answer the research objectives.

## **Sample**

Data were collected from coastal ACJV sites through descriptive analysis of a sample of site management plans and a self-administered questionnaire sent to a sample of waterfowl management professionals at coastal ACJV sites. Survey participants were selected based on their occupational title and relationship to waterfowl management.

## **Data Collection – Site Management Plans**

A rubric was developed to analyze site management plans. The rubric identified ten site attributes: site name, size of site in hectares, primary management agency, ACJV region, origin of management plan, date of management plan, separate waterfowl management plan, longitude and latitude, waterfowl management strategies, and management actions to implement strategies. Thirteen waterfowl management strategies were derived from an extensive review of the administrative history of waterfowl, literature, site management plans, and an expert panel of waterfowl management professionals. Each management plan was analyzed for its inclusion of these 13 management strategies. Forty-three sites were chosen based on waterfowl prevalence at the site (the rubric was completed for a sample of the 43 coastal ACJV site management plans).



After each site's rubric was completed, a descriptive analysis of each management plan was conducted. Descriptive comparisons between management plans were also performed.

### **Data Collection - Questionnaire**

The instrument used in data collection was a self-administered questionnaire. Totalling 5-6 pages, the questionnaire had two main sections and could be completed in less than fifteen minutes.

The first section addressed socio-demographic characteristics of survey participants. The second section addressed waterfowl management strategies implemented at the site and perceived effectiveness of those management strategies. A 5-point Likert scale was used for survey questions. The Likert Technique is a means of measuring value statements and attitudes (Likert 1932). A portion of the survey questions asked participants to identify their agreement or disagreement with value statement by selecting: "strongly agree," "agree," "neither," "disagree," and "strongly disagree." The remaining questions measured perceived effectiveness by asking participants rank statements on a scale of 1 through 5, 1 being "not important/effective" and 5 being "very important/effective". The questionnaire included an open-ended question for participants to write additional comments.

The questionnaire was tested for clarity and appropriateness of questions and structure. Prior to distribution, the questionnaire was given to waterfowl management professionals of the John Heinz National Wildlife Refuge in Philadelphia, Pennsylvania. The waterfowl management professionals at this site served as an expert panel for critiquing the questionnaire. This site was chosen for an expert panel based on the site's location within the Atlantic Coast Joint Venture, the site's coastal nature as a tidal marshland, and the site's participation in the management of

waterfowl. John Heinz National Wildlife Refuge is not part of the Marine Protected Area (MPA) system, nor is the refuge well within the coastal wetland habitat illustrated in the ACJV habitat map, and therefore is not included in this study's results.

The questionnaire was distributed to participants via email through Qualtrics. The Dillman method of survey research was used (Dillman, Tortora, & Bowker 1999; & Dillman 2007). A contact email, including a brief introduction from the researcher and project overview, was sent to participants. This email ensured the information obtained through the survey was for research purposes only and was kept confidential. The initial contact email provided a link to the electronic survey. There were two phases of follow up. An email reminding participants to complete and return the survey was sent eight days after initial mailing. A second round of questionnaires was sent to non-respondents eighteen days after the initial mailing.

## **Data Analysis**

### *Site Management Plans*

The descriptive analysis of site management plans generated nominal and interval data. The variables for this portion of data analysis were site characteristics. Site characteristics included region, agency, and size. Region is defined as the North, Mid-Atlantic, and South Regions of the ACJV. Agency is defined as the primary management agency of the site, such as United States Fish and Wildlife Service, National Park Service, or State agency. Size is defined as the site's geographic size in hectares. These characteristics were used in descriptive data analysis. All plans were analyzed for their inclusion of 13 waterfowl management strategies.

Those strategies are:

1. Education and Outreach
2. Enforcement
3. Habitat Management (vegetation cover, food source)
4. Hunting
5. Impoundment Management
6. Invasive Species Management
7. Less Frequent Waterbird Count
8. Limited Access
9. Mid-winter Waterfowl Count
10. Monitoring (nest boxes, banding, wing counts)
11. Partnerships
12. Research
13. Weekly Waterbird Count

### *Questionnaire*

The questionnaire generated nominal and interval data. The variables for this study were divided into the categories: respondents' background, management strategies, strategy selection influences, and strategy effectiveness.

#### ***Respondents' Background***

The first part of the questionnaire was used to create a profile of respondents. The profile included socio-demographic information, such as: age, sex, education, number of years in the field of waterfowl management, agency of employment, and current job title.

#### ***Management Strategies***

The same 13 management strategies derived for the site management plan analysis rubric were used in the questionnaire, with the exception of Invasive Species Management. This strategy was not used in the questionnaire due to expert panel suggestion that waterfowl management professionals would view Invasive Species Management as a separate strategy

rather than a strategy used for the management of waterfowl. The strategies included in the questionnaire are:

1. Education and Outreach
2. Enforcement
3. Habitat Management (vegetation cover, food source)
4. Hunting
5. Impoundment Management
6. Less-Frequent Waterfowl Count
7. Limited Access
8. Mid-winter waterfowl count
9. Monitoring (nest boxes, banding, wing counts)
10. Partnerships
11. Research
12. Weekly waterbird count

Respondents were asked to identify which strategies were not used at their site.

### ***Strategy Selection Influences***

Respondents were asked to rank a set of criteria according to their influence on waterfowl management strategy selection at the respondents' sites. The criteria were ranked on a scale from 0 to 4 (0 being not influential, 4 being very influential). The criteria ranked were:

1. Location of the site (remoteness, climate)
2. Type of management plan (CCP, Habitat Management Plan)
3. Visitor use (hiking, fishing, boating)
4. Hunting on site
5. Wetlands on site
6. Managers' professional background
7. Managers' years of experience

### ***Strategy Effectiveness***

Respondents were asked to rank perceived effectiveness of the 12 waterfowl management strategies. These management strategies were derived from the North American Waterfowl Management Plan (NAWMP) 2004, the Atlantic Coast Joint Venture (ACJV)

Strategic Plan 2004, two coastal ACJV site plans used for ‘test plans’, and professionals in the field of waterfowl management at John Heinz National Wildlife Refuge in Philadelphia, Pennsylvania. Effectiveness was ranked on a scale from 0 to 4 (0 being not effective, 4 being very effective). The 12 strategies used were:

1. Education and Outreach
2. Enforcement
3. Habitat Management (vegetation cover, food source)
4. Hunting
5. Impoundment Management
6. Less-Frequent Waterfowl Count
7. Limited Access
8. Mid-winter waterfowl count
9. Monitoring (nest boxes, banding, wing counts)
10. Partnerships
11. Research
12. Weekly waterbird count

### **Hypothesis Testing**

Hypothesis testing was undertaken in two stages. First, Hypothesis 1 in Objective I was tested using Chi Square. This hypothesis examined the relationship between management strategies used and site characteristics.

Second, the hypotheses in Objective II were tested. Hypothesis 2 was analyzed using a Chi Square and series T-test to determine differences between influences on waterfowl management strategy selection. A T-test was used to test Hypothesis III, which examined the relationship between perceived effectiveness of waterfowl management strategies and respondents’ professional background. Pearson’s Correlation was used to test Hypothesis IV, which examined the relationship between perceived effectiveness of waterfowl management strategies and respondents’ years of experience in the field.

## CHAPTER IV

### DESCRIPTIVE ANALYSIS OF SITE MANAGEMENT PLANS

The purpose of this chapter is to describe site management plans within the ACJV based on inclusion of waterfowl management strategies, to identify waterfowl management strategy use among coastal sites within the ACJV. A sample of 43 management plans were chosen from the 102 coastal ACJV sites identified for this study, based on the site being part of a larger complex (one management plan for multiple sites), and probability of waterfowl wintering, nesting, and/or migrating at the site. Due to the United States Fish and Wildlife Service (USFWS) grouping of sites into management complexes, the number of physical sites was greater than the number of management plans. Thirteen waterfowl management strategies were derived from regional waterfowl management plans, extensive review of literature and administrative waterfowl management history, a review of site plans outside of the geographic boundaries of this study (non-coastal sites within the AJV), and discussion with an expert panel of waterfowl management professionals. Moreover, a rubric for site management plan analysis was developed and used for analysis.

The analysis of management plans included 43 plans from the three regions of the Atlantic Coast Joint Venture (ACJV) distributed across 14 states. A rubric for each management plan was recorded during the time frame of June 2011 to March 2012. The rubric included site characteristics such as, name of primary site(s) managed (note was made of additional sites managed, such as a complex, or master plan for several parks), location of primary site(s), size (hectares) of primary site(s); primary agency responsible for plan, type of plan, phase of plan, date plan went into effect, and waterfowl management strategies cited. The profiles for each plan

can be seen in Appendix C. The profiles were described and discussed by region, with step down descriptions by agency and state.

It is important to note that only management strategies directly related to waterfowl management were included in this qualitative analysis. Therefore, the management plans described may have included all management strategies listed, but did not specifically state those management strategies that were used for the management of waterfowl. If a management strategy was heavily used within the management plan, but did not refer to its use for waterfowl, then, for the purpose of this study, that strategy was not included in the profile for that management plan. Also, only management plans considered in active status were included.

Management plan consistency was found within management agencies. That is, the USFWS uses a Comprehensive Conservation Plan (CCP) universally for the management plans for National Wildlife Refuges (NWR); the National Park Service (NPS) uses a General Management Plan (GMP) universally for the management plans for National Parks, and the United States Forest Service (USFS) uses Land and Resource Management Plans universally for the management plans for National Forests.

## **Region**

As previously stated in Chapter Two, the ACJV is divided into three distinct regions: North, Mid-Atlantic, and South. This section addresses management plan characteristics by region. The states and agencies associated with the management plans are discussed, in detail, for each region.

The 43 plans listed management strategies for a combined 1,767,495.24 hectares of coastal ACJV conservation area. The smallest area managed was located in the North Region at

Block Island NWR totaling 41.60 hectares. This is not surprising based on the size of the state (Rhode Island) in which Block Island is located. The largest area managed was located in the South Region at Everglades National Park totaling 566,775.60 hectares. The mean size of coastal conservation land managed was 41,811.08 hectares. It also noted if a step-down plan specifically for the management of waterfowl was used at each site. None of the 43 plans reported having, using, or being in the process of preparing a waterfowl management plan.

### *North Region*

This study included six states from the North Region of the ACJV. Those states, from northernmost to southernmost along the Atlantic Coast, were Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, and New York. From those six states, 12 management plans were analyzed to understand how waterfowl management was expressed in site level management plans. The 12 management plans represented 43 physical sites.

The total managed area represented by the 12 plans was 71,182.37 hectares (see Table 7). Of this total area, the state of Maine contained the largest amount of managed area at 29,660.57 hectares; and the state of Rhode Island contained the smallest amount of managed area at 41.60 hectares. The remaining managed area included: New York totaling 20,984.20 hectares, Massachusetts totaling 20,172.30 hectares, New Hampshire totaling 1,886.60 hectares, and Connecticut totaling 323.70 hectares.

It is important to note that Parker River NWR and Great Bay NWR share one CCP and are located in Massachusetts and New Hampshire, respectively. Therefore the area accounted for from this CCP was only added once in the total managed area for the North Region. For the purpose of this study, the area accounted for from the Parker River NWR and Great Bay NWR



CCP was counted once for each state where appropriate. Additionally, the GMP for Gateway National Recreation Area overlaps the North and Mid-Atlantic Region because it resides in both the state of New York and the state of New Jersey. Due to this regional overlap, the GMP was only counted in the North Region. The North Region claimed this GMP since two of the three physical sites this management plan represents are located in the state of New York.

The two primary management agencies within the North Region were USFWS and NPS. The NPS accounted for a larger portion of managed area than the USFWS, totaling 50,366.44 hectares. This is most likely due to National Parks being larger, on average, than National Wildlife Refuges. The state of New York contained the most NPS managed area totaling 18,353.80 hectares. The state of Maine contained the most USFWS managed area totaling 15,294.23 hectares. A breakdown of total area per agency is detailed in Table 3.

Table 3: North Region Area Totals

<b>States</b>	<b>Total Managed Area (ha)</b>	<b>Total USFWS Area (ha)</b>	<b>Total NPS Area (ha)</b>	<b>Other Total Area (ha)</b>
Maine	29,660.57	15,294.23	14,366.34	0
Massachusetts	20,172.30	1,886.60	17,646.30	639.40
New Hampshire	*	*	0	0
Rhode Island	41.60	41.60	0	0
Connecticut	323.70	323.70	0	0
New York	20,984.20	2,630.40	18,353.80	0
<b>Total</b>	<b>71,182.37</b>	<b>20,176.53</b>	<b>50,366.44</b>	<b>639.40</b>

\*Totals for New Hampshire are reflected in totals for Massachusetts due to the shared CCP for Parker River NWR & Great Bay NW

As previously stated, a management plan for coastal conservation land can be the governing document for several physical sites in multiple locations. This is true for quite a few of the USFWS CCPs for this study. Thus, 12 management plans were analyzed in the North Region,

and these 12 plans accounted for 43 physical sites. Of those 12 plans, six were considered Active Status. Seven of the plans were CCPs from USFWS sites, four were GMPs from NPS sites, and one was considered other (a management plan implemented by National Oceanic and Atmospheric Administration (NOAA) for Waquoit Bay National Estuarine Research Reserve (WBNERR). The seven CCPs accounted for 37 individual USFWS sites, while the four GMPs accounted of five NPS sites. A breakdown of physical site counts and management agency by state can be seen below in Table 4.

Table 4: North Region Physical Sites & Management Agency

<b>States</b>	<b>Total Physical Sites</b>	<b>Total Number of Plans</b>	<b>Active Plans</b>	<b>USFWS CCP</b>	<b>Physical USFWS Sites</b>	<b>NPS GMP</b>	<b>Physical NPS Sites</b>	<b>Other Plans</b>
Maine	18	4	4	3	17	1	1	0
Massachusetts	3	3	2	1	1	1	1	1
New Hampshire	1	*	0	*	1	0	0	0
Rhode Island	1	1	1	1	1	0	0	0
Connecticut	10	1	0	1	10	0	0	0
New York	10	3	1	1	7	2	3	0
<b>Total</b>	<b>43</b>	<b>12</b>	<b>8</b>	<b>7</b>	<b>37</b>	<b>4</b>	<b>5</b>	<b>1</b>

\* Totals for New Hampshire are reflected in totals for Massachusetts due to the shared CCP for Parker River NWR & Great Bay NWR

#### *States in the North Region*

Findings from the 12 management plans were discussed by state. Individual management plan findings for the North Region can be seen in Appendix C. Each plan was scrutinized for waterfowl management strategy use. Thirteen management strategies were used for analysis.

### *State of Maine*

Four management plans were analyzed from the state of Maine. Of those plans, three were CCPs from USFWS sites. These three sites were Moosehorn NWR, Maine Coastal Islands NWR, and Rachel Carson NWR. The fourth management plan was a GMP from a NPS site. The NPS site is Acadia National Park.

The GMP from Acadia National Park served the largest area at 14,366.34 hectares. The CCP from Rachel Carson NWR served the smallest area at 2,142.00 hectares. The total area accounted for from the four management plans was 29,660.57 hectares. All four management plans from the state of Maine were considered Active status. The USFWS CCPs had fairly recent effective dates. The CCPs from Moosehorn NWR and Rachel Carson NWR were dated 2007. The CCP from Maine Coastal Islands NWR was dated 2005. The GMP from Acadia National Park had an older effective date of 1992.

In regard to waterfowl management strategies, all four management plans from the state of Maine acknowledged monitoring was used as a management strategy for waterfowl. Conversely, none of the management plans from the state of Maine listed invasive species management or weekly waterbird counts as waterfowl management strategies. The GMP from Acadia National Park listed two of the 13 management strategies, limited access and monitoring, as in use for waterfowl management. The CCP for Rachel Carson NWR listed six of the 13 waterfowl management strategies, these being: education and outreach, habitat management, waterfowl hunting, monitoring, partnerships, and research. The CCP for Moosehorn NWR listed seven of the 13 management strategies used for waterfowl management, which were: education and outreach, habitat management, waterfowl hunting, impoundment management, less frequent waterfowl count, monitoring, and partnerships. The CCP for Maine Coastal Islands NWR listed

eight of the 13 management strategies used for waterfowl management, which were: education and outreach, law enforcement, habitat management, waterfowl hunting, impoundment management, limited access, mid-winter waterfowl count, monitoring, and research. Waterfowl management cited in Maine management plans can be seen in Table 5. Management strategies used by sites are represented in tables by (X) and strategies not used are represented by (-).

Table 5: Waterfowl Management Strategies Used in Maine Management Plans

<b>Management Strategy</b>	<b>Acadia National Park</b>	<b>Moosehorn NWR</b>	<b>Maine Coastal Islands NWR</b>	<b>Rachel Carson NWR</b>
Education & Outreach	-	X	X	X
Law Enforcement	-	-	X	-
Habitat Management	-	X	X	X
Waterfowl Hunting	-	X	X	X
Impoundment Management	-	X	X	-
Invasive Species Management*	-	-	-	-
Less Frequent Waterfowl Count	-	X	-	-
Limited Access	X	-	X	-
Mid-Winter Waterfowl Count	-	-	X	-
Monitoring **	X	X	X	X
Partnerships	-	X	-	X
Research	-	-	X	X
Weekly Waterbird Count*	-	-	-	-

\*Denotes unused management strategies, \*\* Denotes a management strategy used in all plans, X denotes strategies used, - denotes strategies not used

### *State of Massachusetts*

Three management plans were analyzed from the state of Massachusetts. One CCP for the USFWS site Parker River NWR; this CCP is used for the management of a NWR complex including Great Bay NWR in New Hampshire. One GMP for the NPS site Cape Cod National Seashore, and one Management Plan for the National Oceanic and Atmospheric Administration

(NOAA) site Waquoit Bay National Estuarine Research Reserve (WBNERR) were selected. The GMP of the NPS site was accountable for the largest area at 17,646.30 hectares. The Management Plan for the NOAA site was responsible for the smallest area at 639.40 hectares. The total area accounted for from the three management plans was 20,172.30 hectares.

Two plans were considered Active Status, The GMP for the Cape Cod National Seashore, dated 1998, and the Management Plan for the Waquoit Bay National Estuarine Research Reserve, dated 2006 through 2011. The CCP for the Parker River/Great Bay NWR was in the Preplanning Status. Management strategies used purposely for waterfowl were severely limited in the state of Massachusetts. The only management strategy used was education and outreach from the GMP of Cape Cod National Seashore. This was due in part to the Preplanning Status of the CCP for Parker River/Great Bay NWR. Since the CCP is in the Preplanning Phase, no management strategies could be gleaned. While the management plan for WBNERR included many of the management strategies in question, the plan did not directly link the use of these strategies with the management of waterfowl (See Table 6).

Table 6: Management Strategies Used in Massachusetts Management Plans

<b>Management Strategy</b>	<b>Cape Cod National Seashore</b>	<b>WBNERR</b>
Education & Outreach	X	-
Law Enforcement*	-	-
Habitat Management*	-	-
Waterfowl Hunting*	-	-
Impoundment Management*	-	-
Invasive Species Management*	-	-
Less Frequent Waterfowl Count*	-	-
Limited Access*	-	-
Mid-Winter Waterfowl Count*	-	-
Monitoring *	-	-
Partnerships*	-	-
Research*	-	-
Weekly Waterbird Count*	-	-

\* Denotes unused management strategies, X denotes strategies used, - denotes strategies not used

### ***State of New Hampshire***

One management plan was chosen from the state of New Hampshire. This plan was a CCP for the USFWS site of Great Bay NWR, which is part of the Parker River NWR Complex in Massachusetts. The total managed area from this plan is 1,886.60 hectares. Again, this CCP is in the Preplanning Phase, meaning no management strategies could be analyzed.

### ***State of Rhode Island***

One management plan was analyzed from the state of Rhode Island. The plan was the CCP for the USFWS site of Block Island NWR. The total managed area for this plan was 41.60 hectares. This CCP was Active and dated 2002. The management strategies listed specifically for the management of waterfowl within this CCP were law enforcement, habitat management, and partnerships (See Table 7).

Table 7: Management Strategies Used in Rhode Island Management Plans

<b>Management Strategy</b>	<b>Block Island NWR</b>
Education & Outreach*	-
Law Enforcement	X
Habitat Management	X
Waterfowl Hunting*	-
Impoundment Management*	-
Invasive Species Management*	-
Less Frequent Waterfowl Count*	-
Limited Access*	-
Mid-Winter Waterfowl Count*	-
Monitoring *	-
Partnerships	X
Research*	-
Weekly Waterbird Count*	-

\* Denotes unused management strategies, X denotes strategies used, - denotes strategies not used

### ***State of Connecticut***

One management plan was chosen from the state of Connecticut; the CCP of the USFWS site of Stewart B. McKinney NWR. This managed area totaled 323.70 hectares. This CCP was in the Scoping Stage. As such, there were no current management strategies to analyze.

### ***State of New York***

Three management plans were analyzed from the state of New York. These plans included one CCP from the USFWS site of Long Island Complex NWR, one GMP from the NPS site of Fire Island National Seashore, and one GMP from the NPS site of Gateway National Recreation Area. The GMP for Gateway National Recreation Area listed the largest managed area totaling 10,521.80 hectares (not surprising since it includes land in New Jersey also). The GMP for Gateway National Recreation Area was only included for the state of New York due to New York containing two of the three physical sites for the recreation area. The GMP for Fire

Island National Seashore listed the smallest site totaling 7,832 hectares. The total area accounted for from the state of New York was 20,984.20 hectares. The CCP for the USFWS Long Island Complex NWR was Active and dated 2006. The GMP for the NPS Fire Island National Seashore was in the Develop Planning Alternatives Stage, while the GMP for the NPS Gateway National Recreation Area was in the Planning Stage.

Since two of the three management plans from the state of New York were under development, only one plan could be analyzed for management strategies geared toward waterfowl. The CCP for the Long Island Complex NWR listed eight management strategies used distinctively for the management of waterfowl (See Table 8). These strategies were education and outreach, law enforcement, habitat management, waterfowl hunting, impoundment management, less frequent waterfowl counts, monitoring, and partnerships.

Table 8: Management Strategies Used in New York Management Plans

<b>Management Strategy</b>	<b>Long Island Complex NWR</b>
Education & Outreach	X
Law Enforcement	X
Habitat Management	X
Waterfowl Hunting	X
Impoundment Management	X
Invasive Species Management*	-
Less Frequent Waterfowl Count	X
Limited Access*	-
Mid-Winter Waterfowl Count*	-
Monitoring	X
Partnerships	X
Research*	-
Weekly Waterbird Count*	-

\* Denotes unused management strategies, X denotes strategies used, - denotes strategies not used



### *Mid-Atlantic Region*

This study included four states from the Mid-Atlantic Region of the ACJV. Those states, from northernmost to southernmost along the Atlantic Coast, were New Jersey, Delaware, Maryland, and Virginia. From those four states, 12 management plans were selected as a sample to represent how waterfowl management is expressed in site level management plans. These 12 management plans represented 28 physical sites.

The total managed area represented by the 12 plans was 123,945 hectares. Of this total area, the state of Virginia contained the largest amount of managed area at 51,221 hectares; and the state of Delaware contained the smallest amount of managed area at 6,575 hectares. The remaining managed area was accounted for by Maryland totaling 38,782 hectares and New Jersey totaling 27,366 hectares.

The two primary management agencies within the Mid-Atlantic Region were USFWS and NPS. The USFWS accounted for a larger portion of managed area than the NPS, totaling 104,467 hectares. This is most likely due to National Wildlife Refuges greatly outnumbering National Parks in this region, despite individual USFWS sites being smaller on average than NPS sites. The state of Virginia contained the most USFWS managed area totaling 50,847 hectares. The state of Maryland contained the most NPS managed area totaling 19,424 hectares. A breakdown of total area per agency is detailed in Table 9. It is important to note that one management plan from the state of Virginia was state managed and accounted for five coastal conservation sites totaling 373 hectares.

Table 9: Mid-Atlantic Region Total Area

<b>States</b>	<b>Total Managed Area (ha)</b>	<b>Total USFWS Area (ha)</b>	<b>Total NPS Area (ha)</b>	<b>Other Total Area (ha)</b>
New Jersey	27,366.80	27,366.80	0	0
Delaware	6,575.50	6,575.50	0	0
Maryland	38,782.20	19,357.30	19,424.90	0
Virginia	51,221.01	50,847.49	0	373.52*
<b>Total</b>	<b>123,945.51</b>	<b>104,147.09</b>	<b>19,424.90</b>	<b>373.52</b>

\* Reflects the State of Virginia’s five Natural Preserves.

Twelve management plans were analyzed in the Mid-Atlantic Region, and those 12 plans accounted for 28 physical sites. Of those 12 plans, eight were considered in Active Status. Ten of the plans were CCPs from USFWS sites, one was a GMP from a NPS site, and one was considered other (a management plan implemented by Virginia’s Natural Heritage Program and Virginia Department of Conservation and Recreation (VADCR) for five Natural Area Preserves). The ten CCPs accounted for 22 individual USFWS sites, while the one GMP accounted for one NPS sites. A breakdown of physical site counts and management agency by state can be seen below in Table 10.

Table 10: Mid-Atlantic Region Physical Sites & Management Agency

<b>States</b>	<b>Total Physical Sites</b>	<b>Total Number of Plans</b>	<b>Active Plans</b>	<b>USFWS CCP</b>	<b>Physical USFWS Sites</b>	<b>NPS GMP</b>	<b>Physical NPS Sites</b>	<b>Other Plans</b>
New Jersey	4	2	2	2	4	0	0	0
Delaware	1	1	0	1	1	0	0	0
Maryland	11	3	1	2	10	1	1	0
Virginia*	12	6	5	5	7	0	0	1
<b>Total</b>	<b>28</b>	<b>12</b>	<b>8</b>	<b>10</b>	<b>22</b>	<b>1</b>	<b>1</b>	<b>1</b>

\* Virginia has five state managed sites that are not represented in Table 10.

### *States in the Mid-Atlantic Region*

Findings from the 12 management plans were separated and addressed by state. Individual management plan findings for the Mid-Atlantic Region can be seen in Appendix C. Each plan was scrutinized for use of the 13 waterfowl management strategies.

#### ***State of New Jersey***

Two management plans were selected from the state of New Jersey. These plans consisted of two CCPs from the USFWS sites Edwin B. Forsythe NWR and Cape May Complex NWR. The GMP from the NPS site Gateway National Recreation Area, which boundaries include parts of New York and New Jersey, was not included in the Mid-Atlantic Region or the state of New Jersey. To see information on this GMP see the section titled North Region. The CCP for Edwin B. Forsythe NWR described the largest management area at 22,905.20 hectares. The CCP for Cape May Complex NWR represented the smallest managed area from New Jersey at 4,461.60 hectares. The total managed area for New Jersey was 37,888.60 hectares. Both CCPs for Edwin B. Forsythe NWR and Cape May Complex NWR were Active and dated 2004.

The CCP for Edwin B. Forsythe NWR noted 10 of the 13 management strategies used specifically for the management of waterfowl (See Table 11). These strategies included education and outreach, law enforcement, habitat management, waterfowl hunting, impoundment management, invasive species management, mid-winter waterfowl county, monitoring, partnerships, and weekly waterbird counts. Cape May Complex NWR listed five of the 13 waterfowl management strategies, including, education and outreach, habitat management, waterfowl hunting, monitoring, and partnerships. Five waterfowl management strategies were used in both CCPs; those were education and outreach, habitat management, waterfowl hunting,

monitoring, and partnerships. Three waterfowl management strategies were not used in either CCP; those were less frequent waterfowl counts, limited access, and research.

Table 11: Management Strategies Used in New Jersey Management Plans

<b>Management Strategy</b>	<b>Edwin B. Forsythe NWR</b>	<b>Cape May Complex NWR</b>
Education & Outreach**	X	X
Law Enforcement	X	-
Habitat Management**	X	X
Waterfowl Hunting**	X	X
Impoundment Management	X	-
Invasive Species Management	X	-
Less Frequent Waterfowl Count*	-	-
Limited Access*	-	-
Mid-Winter Waterfowl Count	X	-
Monitoring **	X	X
Partnerships**	X	X
Research*	-	-
Weekly Waterbird Count	X	-

\*Denotes unused management strategies, \*\* Denotes management strategies used in all plans, X denotes strategies used, - denotes strategies not used

### ***State of Delaware***

One management plan was selected from the state of Delaware, the CCP for the USFWS site of Bombay Hook NWR. This CCP noted 6,575.50 hectares of managed area. The CCP for Bombay Hook NWR was in the Scoping State of plan development, which means no waterfowl management strategies could be analyzed.

### ***State of Maryland***

Three management plans were selected from the State of Maryland. Two CCPs for the USFWS sites of Chesapeake Marshland Complex NWR and Chincoteague NWR, and one GMP

for the NPS site of Assateague National Seashore. The GMP for Assateague National Seashore noted the largest management area, totaling 19,424.90 hectares; while the CCP for Chincoteague NWR listed the smallest management area totaling 5,665.60 hectares. The total management area for the state of Maryland was 38,782.20 hectares. The GMP for Assateague was in the Develop Planning Alternatives Stage of completion, and the CCP for Chincoteague NWR was in the Develop Draft Alternatives State of completion. The CCP for Chesapeake Marshland Complex NWR was Active and dated 2006.

The CCP for Chesapeake Marshland Complex NWR listed 10 of the 13 waterfowl management strategies as used for the management of waterfowl (See Table 12). These strategies were education and outreach, habitat management, waterfowl hunting, impoundment management, invasive species management, mid-winter waterfowl count, monitoring, partnerships, research, and weekly waterbird count.

Table 12: Management Strategies Used in Maryland Management Plans

<b>Management Strategy</b>	<b>Chesapeake Marshland Complex NWR</b>
Education & Outreach	X
Law Enforcement*	-
Habitat Management	X
Waterfowl Hunting	X
Impoundment Management	X
Invasive Species Management	X
Less Frequent Waterfowl Count*	-
Limited Access*	-
Mid-Winter Waterfowl Count	X
Monitoring	X
Partnerships	X
Research	X
Weekly Waterbird Count	X

\* Denotes unused management strategies, X denotes strategies used, - denotes strategies not used

### *State of Virginia*

Six management plans were chosen from the state of Virginia. Five of the plans were CCPs for the USFWS sites of Great Dismal Swamp NWR, Back Bay NWR, Eastern Shore of Virginia NWR, Mason Neck/Featherstone NWR, and Presquile NWR. One management plan for the State of Virginia contains four Natural Area Preserves within its administrative boundaries: Bethel Beach, Dameron Marsh, Hughlett Point, Savage Neck Dunes Natural Area Preserves. The CCP for the Great Dismal Swamp NWR recorded the largest management area totaling 45,002.25 hectares. The management plan for the state Natural Area Preserves contained the smallest management area totaling 373.52 hectares, despite the total area consisting of four independent sites. The total management area for the state of Virginia was 51,221.01 hectares.

All management plans for the state of Virginia were in Active Status, with the exception of the CCP for Presquile NWR, which was in the Planning Stage. The Active Plans' establishment dates are as follows: Back Bay NWR 2010; Great Dismal Swamp NWR 2006; Eastern Shore of Virginia NWR 2004; all four state managed Natural Area Preserves 2003; Mason Neck & Featherstone NWR 2011.

The CCP for Presquile NWR is in the Planning Stage, thus no waterfowl management strategies could be assessed. Two waterfowl management strategies were not mentioned in any of the five management plans, those strategies were mid-winter waterfowl count and weekly waterbird count (See Table 13). The CCP for Back Bay NWR listed all waterfowl management strategies except for mid-winter waterfowl count and weekly waterfowl count. The CCP for Great Dismal Swamp NWR listed three management strategies for waterfowl, education and outreach, habitat management, and partnerships. The CCP for the Eastern Shore of Virginia listed four waterfowl management strategies, which were education and outreach, waterfowl

hunting, less frequent waterfowl count, and partnerships. The management plan for the Natural Area Preserves listed habitat management and research as waterfowl management strategies used on site. The CCP for Mason Neck and Featherstone NWRs listed all waterfowl management strategies except waterfowl hunting, less frequent waterfowl count, mid-winter waterfowl count, research, and weekly waterbird count.

Table 13: Management Strategies Used in Virginia Management Plans

<b>Management Strategy</b>	<b>Back Bay NWR</b>	<b>Great Dismal Swamp NWR</b>	<b>Eastern Shore of Virginia NWR</b>	<b>Natural Area Preserves</b>	<b>Mason Neck &amp; Featherstone NWR</b>
Education & Outreach	X	X	X	-	X
Law Enforcement	X	-	-	-	X
Habitat Management	X	X	-	X	X
Waterfowl Hunting	X	-	X	-	-
Impoundment Management	X	-	-	-	X
Invasive Species Management	X	-	-	-	X
Less Frequent Waterfowl Count	X	-	X	-	-
Limited Access	X	-	-	-	X
Mid-Winter Waterfowl Count*	-	-	-	-	-
Monitoring	X	-	-	-	X
Partnerships	X	X	X	-	X
Research	-	-	-	X	-
Weekly Waterbird Count*	-	-	-	-	-

\* Denotes unused management strategies, X denotes strategies used, - denotes strategies not used

### *South Region*

This study included four states from the South Region of the ACJV. Those states, from northernmost to southernmost along the Atlantic Coast, are North Carolina, South Carolina, Georgia, and Florida. From those four states, 19 management plans were selected as a sample to

represent how waterfowl management was expressed in site level management plans. Those 19 management plans represented 24 physical sites.

The total managed area represented by the 19 plans was 1,572,367.36 hectares. Of this total area, the state of Florida contained the largest amount of managed area at 855,053.01 hectares; and the state of Georgia contained the smallest amount of managed area at 197,282.23 hectares. The remaining managed area was accounted for by North Carolina totaling 218,533.62 hectares and South Carolina totaling 301,498.50 hectares.

The three primary management agencies within the South Region were USFWS, NPS, and the United States Forest Service (USFS). The NPS accounted for a larger portion of managed area than the USFWS and the USFS, totaling 675,902.47 hectares. The USFS also accounted for a larger portion of managed area than the USFWS in the South Region, totaling 474,696.26 hectares of National Forest.

The state of Georgia contained the most USFWS managed area totaling 182,545.60 hectares. The state of Florida contained the most NPS managed area totaling 637,595.59 hectares. The state of South Carolina contained the most USFS managed area totaling 254,547.27 hectares. A breakdown of total area per agency is detailed in Table 14. It is important to note that ‘Other Total Area’ in Table 14 represents USFS managed area.

Table 14: South Region Total Area

<b>States</b>	<b>Total Managed Area (ha)</b>	<b>Total USFWS Area (ha)</b>	<b>Total NPS Area (ha)</b>	<b>Other Total Area (ha)</b>
North Carolina	218,533.62	129,808.98	23,570.25	65,154.39
South Carolina	301,498.50	46,951.23	0	254,547.27
Georgia	197,282.23	182,545.60*	14,736.63	0
Florida	855,053.01	62,462.82	637,595.59	154,994.60
<b>Total</b>	<b>1,572,367.36</b>	<b>421,768.63</b>	<b>675,902.47</b>	<b>474,696.26</b>

\* Area for Savannah Coastal Complex NWR are reflected in the totals for the state of Georgia



Nineteen management plans were analyzed in the South Region, and those 13 plans accounted for 24 physical sites. Of those 19 plans, 17 were considered Active Status. Ten of the plans were CCPs from USFWS sites, five were GMPs from NPS sites, and three were considered other (USFS Land and Resource Management Plans). The 10 CCPs account for 16 individual USFWS sites, while the five GMPs account for five NPS sites, and the three Land and Resource Management Plans accounted for three USFS sites. A breakdown of physical site counts and agency by state can be seen below in Table 15.

Table 15: South Region Physical Sites & Management Agency

<b>States</b>	<b>Total Physical Sites</b>	<b>Total Number of Plans</b>	<b>Active Plans</b>	<b>USFWS CCP</b>	<b>Physical USFWS Sites</b>	<b>NPS GMP</b>	<b>Physical NPS Sites</b>	<b>Other Plans</b>
North Carolina	9	7	6	4	6	2	2	1
South Carolina	4	3	2	1	3	0	0	1
Georgia	5	3*	3*	2*	4	1	1	0
Florida	6	6	6	3	3	2	2	1
<b>Total</b>	<b>24</b>	<b>19</b>	<b>17</b>	<b>10</b>	<b>16</b>	<b>5</b>	<b>5</b>	<b>3</b>

\* The CCP for the Savannah Coastal Complex NWR is reflected in the totals for Georgia

### *States in the South Region*

Findings from the 19 management plans were separated and discussed by state. Individual management plan findings for the South Region can be seen in Appendix C. Each plan was scrutinized for waterfowl management strategy use. Thirteen waterfowl management strategies were included in the descriptive analysis of site management plans.

### *State of North Carolina*

Seven management plans were gleaned from the state of North Carolina. Four of those plans were CCPs for the USFWS sites of Alligator River NWR, Mattamuskeet NWR, MacKay

Island NWR, and Pocosin Lakes NWR. Two of the plans were GMPS for the National Seashores of Cape Hatteras and Cape Lookout. One plan was a Land and Resource Management Plan for the National Forest site Croatan National Forest. The Land and Resource Management Plan for the Croatan National Forest listed the largest area totaling 65,154.39 hectares. The CCP for MacKay Island NWR listed the smallest area totaling 3,326.11 hectares. The total area managed from the seven management plans in the state of North Carolina is 218,533.62 hectares.

Six of the plans from North Carolina are Active Status, while the GMP for Cape Hatteras National Seashore is in the Planning Stage. From the six active plans, the oldest plan was the GMP from Cape Lookout National Seashore dated 1982. The other plans were dated as follows: Alligator River NWR 2008, Croatan National Forest 2002, Mattamuskeet NWR 2008, MacKay Island NWR 2008, Pocosin Lakes NWR 2007.

Weekly waterbird counts were not listed as a waterfowl management strategy in any of the six plans used for management strategies analysis (See Table 16). The GMP for Cape Lookout National Seashore did not list any management strategies used specifically for the management of waterfowl. The CCP for Alligator River NWR listed seven management strategies for the management of waterfowl, which were, law enforcement, habitat management, waterfowl hunting, less frequent waterfowl count, monitoring, partnerships, and research. The Land and Resource Management Plan for Croatan National Forest listed four habitat management, waterfowl hunting, impoundment management, and partnerships as strategies used for the management of waterfowl. The CCP for Mattamuskeet NWR listed all waterfowl management strategies with the exception of limited access and weekly waterbird counts. The CCP for MacKay Island NWR listed education and outreach, habitat management, impoundment management, less frequent waterfowl count, limited access, monitoring, partnerships, and

research as strategies for the management of waterfowl. The CCP for Pocosin Lakes NWR listed impoundment management, less frequent waterfowl count, limited access, monitoring, partnerships, and research as strategies used for waterfowl management.

Table 16: Management Strategies Used in North Carolina Management Plans

<b>Management Strategy</b>	<b>Alligator River NWR</b>	<b>Cape Lookout National Seashore</b>	<b>Croatan National Forest</b>	<b>Mattamuskeet NWR</b>	<b>MacKay Island NWR</b>	<b>Pocosin Lakes NWR</b>
Education & Outreach	-	-	-	X	X	-
Law Enforcement	X	-	-	X	-	-
Habitat Management	X	-	X	X	X	-
Waterfowl Hunting	X	-	X	X	-	-
Impoundment Management	-	-	X	X	X	X
Invasive Species Management	-	-	-	X	-	-
Less Frequent Waterfowl Count	X	-	-	X	X	X
Limited Access	-	-	-	-	X	X
Mid-Winter Waterfowl Count	-	-	-	X	-	-
Monitoring	X	-	-	X	X	X
Partnerships	X	-	X	X	X	X
Research	X	-	-	X	X	X
Weekly Waterbird Count*	-	-	-	-	-	-

\* Denotes unused management strategies, X denotes strategies used, - denotes strategies not used

### *State of South Carolina*

Four management plans were chosen from the state of South Carolina. Three of those plans were CCPs for the USFWS sites of Cape Romaine NWR, Waccamaw Complex NWR, and Savannah Coastal Complex NWR (which is within the administrative boundaries of both the state of South Carolina and the state of Georgia). One plan was a Land and Resource Management Plan for the National Forest site of Francis Marion National Forest. The management plan noting the largest managed area was the Land and Resource Management Plan for Francis Marion National Forest, totaling 254,547.27 hectares. The smallest managed area was listed in the CCP for Waccamaw Complex NWR, totaling 20,125.83 hectares. The total area managed in the four management plans equals 324,160.90 hectares.

All the management plans from South Carolina are Active Status, except for the CCP for Cape Romaine NWR, which was in the Planning Phase. The establishment dates for the active plans are as follows: Francis Marion National Forest 1996, Waccamaw Complex NWR 2008, Savannah Coastal Complex NWR 2011.

Since the CCP for Cape Romaine NWR was in the Planning Phase, no waterfowl management strategies were assessed. Law enforcement, invasive species management, research, and weekly waterbird count were strategies not mentioned for the management of waterfowl for any of the three management plans (See Table 17). The CCP for Waccamaw Complex NWR listed all other management strategies except those listed above, as strategies used for waterfowl management. The CCP for Savannah Coastal Complex NWR also did not list those strategies above, with the addition of not using limited assess as a strategy for the management of waterfowl.

Table 17: Management Strategies Used in South Carolina Management Plans

<b>Management Strategy</b>	<b>Francis Marion National Forest</b>	<b>Waccamaw Complex NWR</b>	<b>Savannah Coastal Complex NWR</b>
Education & Outreach	-	X	X
Law Enforcement*	-	-	-
Habitat Management	-	X	X
Waterfowl Hunting	-	X	X
Impoundment Management	-	X	X
Invasive Species Management*	-	-	-
Less Frequent Waterfowl Count	-	X	X
Limited Access	-	X	-
Mid-Winter Waterfowl Count	-	-	X
Monitoring	-	X	X
Partnerships	-	X	X
Research*	-	-	-
Weekly Waterbird Count*	-	-	-

\* Denotes unused management strategies, X denotes strategies used, - denotes strategies not used

### *State of Georgia*

Three management plans were selected from the state of Georgia. Two CCPs for the USFWS sites of Savannah Coastal Complex NWR and Okefenokee NWR; one GMP for the National Park Service site of Cumberland Island National Seashore. The largest managed area was Okefenokee NWR at 159,883.20 hectares; the smallest managed area was Cumberland National Seashore, at 14,736.63 hectares. The total area managed in the three management plans was 197,282.23 hectares.

Since the Savannah Coastal Complex NWR administrative boundaries encompass areas in South Carolina and Georgia, the CCP for the complex was discussed in the previous section. Both the CCP for Okefenokee NWR, dated 2006, and the GMP for Cumberland Island National

Seashore, dated 1984, are in Active Status. Several of the 13 waterfowl management strategies were not noted in either the CCP or GMP. Those strategies were education and outreach, law enforcement, habitat management, waterfowl hunting, impoundment management, invasive species management, limited access, research, and weekly waterbird count (See Table 18). Conversely, both plans stated using partnerships for the management of waterfowl. The CCP also stated using less frequent waterfowl count, mid-winter waterfowl count, and monitoring as strategies for waterfowl management. The GMP for Cumberland Island National Seashore only listed partnerships as a waterfowl management strategy.

Table 18: Management Strategies Used in Georgia Management Plans

<b>Management Strategy</b>	<b>Okefenokee NWR</b>	<b>Cumberland Island National Seashore</b>
Education & Outreach*	-	-
Law Enforcement*	-	-
Habitat Management*	-	-
Waterfowl Hunting*	-	-
Impoundment Management*	-	-
Invasive Species Management*	-	-
Less Frequent Waterfowl Count	X	-
Limited Access*	-	-
Mid-Winter Waterfowl Count	X	-
Monitoring	X	-
Partnerships**	X	X
Research*	-	-
Weekly Waterbird Count*	-	-

\*Denotes unused management strategies, \*\* Denotes management strategies used in all plans, X denotes strategies used, - denotes strategies not used

### ***State of Florida***

Six management plans were selected from the state of Florida. Three of those plans were CCPs for the USFWS sites Archie Carr NWR, Arthur R. Marshall-Loxahatchee NWR, and Crocodile Lake NWR. One plan was a Land and Resource Management Plan for the National

Forest site Ocala National Forest. Two plans were GMPs for the National Park sites Biscayne National Park and Everglades National Park. The largest managed area among the six plans was Everglades National Park totaling 566,775.60 hectares. The smallest managed area was Archie Carr NWR totaling 104.00 hectares. The six plans listed a management area totaling 855,053.01 hectares.

All the management plans from the state of Florida were in Active Status. The CCPs from the USFWS sites were dated as follows: Archie Carr NWR 2008, Arthur R. Marshall-Loxahatchee NWR 2000, and Crocodile Lake NWR 2006. The Land and Resource Management Plan for Ocala National Forest were dated 1999. The GMPs for the National Park sites were dated as follows, Biscayne National Park 1983, and Everglades National Park 1979.

Three management plans did not list any of the 13 waterfowl management strategies as being in use; those plans were the CCP from Crocodile Lake NWR and the GMPs from Biscayne National Park and Everglades National Park (See Table 19). Five management strategies were not used in any of the selected plans from Florida; those strategies were education and outreach, invasive species management, less frequent waterfowl count, research, and weekly waterbird count. The Land and Resource Management Plan from Ocala National Forest listed monitoring as a strategy for waterfowl management, while the CCP for Archie Carr NWR listed mid-winter waterfowl count and partnerships as waterfowl management strategies. The CCP for Arthur R. Marshall-Loxahatchee NWR listed the most waterfowl management strategies, which were law enforcement, habitat management, waterfowl hunting, impoundment management, limited access, monitoring, and partnerships.

Table 19: Management Strategies Used in Florida Management Plans

<b>Management Strategy</b>	<b>Archie Carr NWR</b>	<b>Arthur R. Marshall-Loxahatchee NWR</b>	<b>Crocodile Lake NWR</b>	<b>Ocala National Forest</b>	<b>Biscayne National Park</b>	<b>Everglades National Park</b>
Education & Outreach*	-	-	-	-	-	-
Law Enforcement	-	X	-	-	-	-
Habitat Management	-	X	-	-	-	-
Waterfowl Hunting	-	X	-	-	-	-
Impoundment Management	-	X	-	-	-	-
Invasive Species Management*	-	-	-	-	-	-
Less Frequent Waterfowl Count*	-	-	-	-	-	-
Limited Access	-	X	-	-	-	-
Mid-Winter Waterfowl Count	X	-	-	-	-	-
Monitoring	-	X	-	X	-	-
Partnerships	X	X	-	-	-	-
Research*	-	-	-	-	-	-
Weekly Waterbird Count*	-	-	-	-	-	-

\* Denotes unused management strategies, X denotes strategies used, - denotes strategies not used

### Region Summary

A sample of 43 management plans were analyzed from the 102 coastal ACJV sites identified for this study, based on site being part of a larger complex (one management plan for multiple sites), and probability of waterfowl wintering, nesting, and/or migrating at site. This probability was determined using the ACJV habitat map. Only sites within wetland habitat along the Atlantic Coast portion of the ACJV were selected for surveys, because this is the primary



habitat for waterfowl. Due to the USFWS grouping of sites into management complexes, the number of physical sites is greater than the number of management plans as seen in Table 20.

These management plans were then assessed by ACJV region. From this sample, the South Region contained the largest amount of managed area (1,572,367.36 hectares) with the fewest physical sites (See Table 20). The North Region contained the smallest amount of managed area (71,182.37 hectares), with the most physical sites. The South Region contains a lesser number of larger coastal conservation areas, while the North Region contains a larger number of smaller coastal conservation areas. Roughly half of the management plans sampled from the North (6) and Mid-Atlantic (8) Regions were considered Active Status. Nearly all plans sampled from the South Region (17) were considered Active Status (only two plans were non-active). This means that the North and Mid-Atlantic Regions in the process of revising a large portion of their site management plans, while the majority of the site management plans within the South Region are in Active Status, or newly revised and currently implemented.

The two primary management agencies in all three regions were the USFWS and the NPS. Over all three regions, USFWS sites dominated. More CCPs (29) were included in this sample than NPS GMPs (10) or other management plans (5). The North Region also contained one NOAA managed area, Waquoit Bay National Estuarine Research Reserve. The Mid-Atlantic Region also contained four state managed sites, Natural Area Preserves. While the South Region also contained three USFS sites, Croatan, Francis Marion, and Ocala National Forests. All three National Forests are quite large in comparison to the other coastal conservation lands in the sample. This contributes to the South Region having greater coastal conservation land compared to the other regions. A summary of regional totals can be seen in Table 20.

Table 20: Region Totals

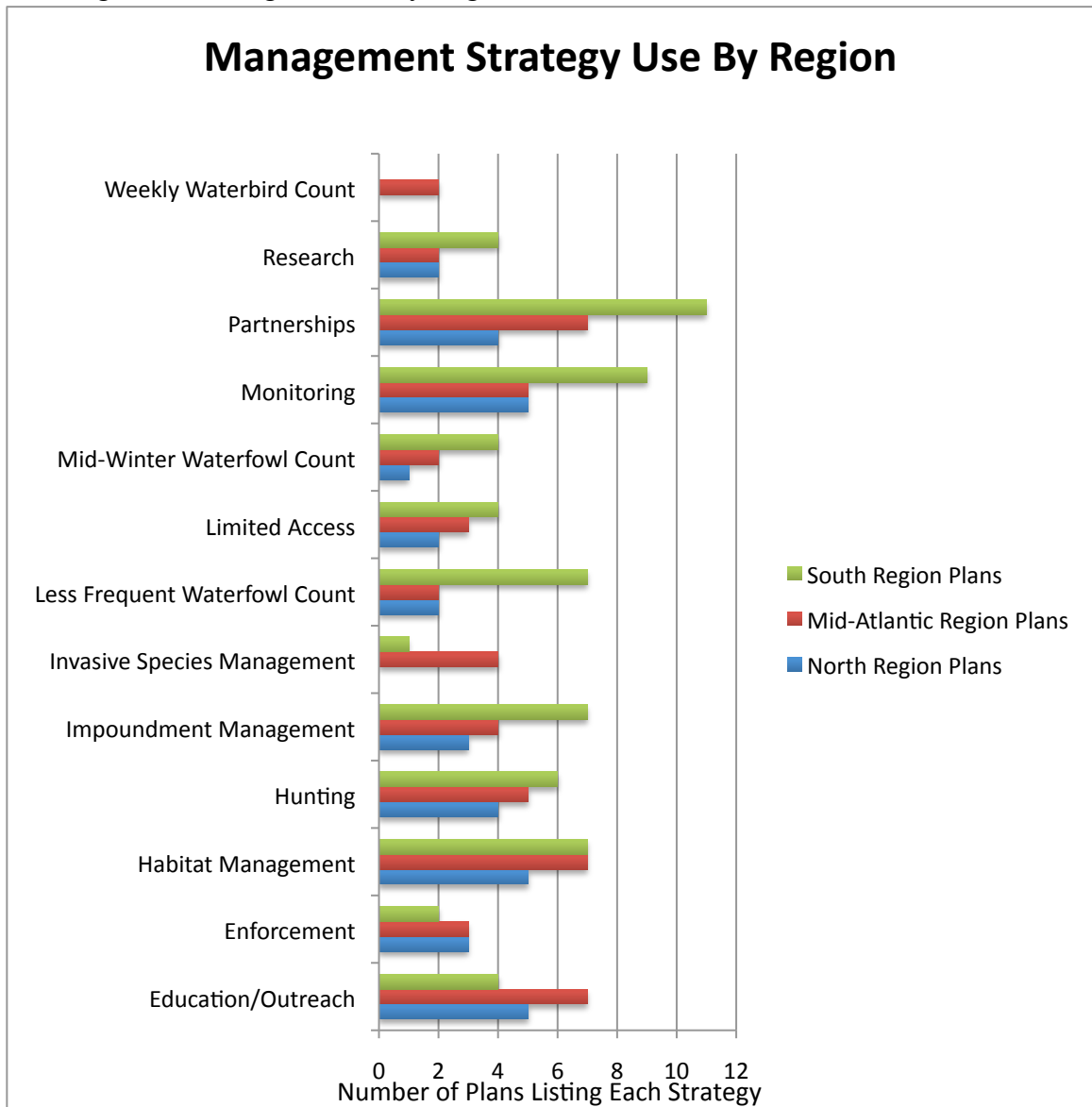
	<b>North Region</b>	<b>Mid-Atlantic Region</b>	<b>South Region</b>
Total Managed Area	71,182.37	123,945.51	1,572,367.36
Total USFWS Managed Area	20,176.53	104,147.09	421,768.63
Total NPS Managed Area	50,366.44	19,424.90	675,902.47
Total Other Area	639.40	373.52	474,696.26
Total Management Plans	12	12	19
Active Plans	6	8	17
Total CCPs	7	10	12
Total GMPs	4	1	5
Total Other Plans	1	1	3
Total Physical Sites	43	28	24
Total Physical USFWS Sites	37	22	16
Total Physical NPS Sites	5	1	5
Total Other Sites	1	5	3

Currently, no resource is available that identifies waterfowl management strategies currently implemented by individual sites, within the ACJV regions, or within the Atlantic Flyway. This study derived 13 waterfowl management strategies from the NAWMP, the ACJV Strategic Plan, a panel of waterfowl management experts, and several site management plans and review of the administrative history of waterfowl management, as strategies that should be utilized for successful management of waterfowl. Those 13 management strategies were then assessed by use in the 43 site management plans to identify if management strategy use differed by ACJV region.

Figure 6 illustrates the number of management plans that note using each waterfowl management strategy by ACJV region. It is important to note only plans that specifically stated the use of a management strategy for waterfowl management were included in the totals. For example, a management plan could state using education and outreach for water quality improvement, but not state how that strategy relates to the management of waterfowl; thus, that

plan would not be listed as using education and outreach in this study. The totals in Figure 6 only reflect the number of plans that specifically cited a management strategy for the management of waterfowl.

Figure 6. Management Strategies Used By Region



Waterfowl management strategies used did differ by ACJV region. First, there were waterfowl management strategies not used by any management plans within the North and South Regions. No management plans within the North Region listed invasive species management or weekly waterbird counts as strategies used for waterfowl management. No management plans within the South Region listed weekly waterbird counts as a strategy used for waterfowl

management. No individual management plan anywhere stated using all 13 waterfowl management strategies.

Within the North Region, the most used waterfowl management strategies were those that had five plans stating their use. Those strategies were (1) education and outreach, (2) habitat management, (3) monitoring. The most used waterfowl management strategies within the Mid-Atlantic Region were those that had seven plans stating their use. Those strategies were (1) education and outreach, (2) habitat management, and (3) partnerships. Within the South Region the most used waterfowl management strategies were those that had 11 and nine plans stating their use. Those strategies were (1) partnerships and (2) monitoring. From this it is gained that education and outreach, habitat management, monitoring, and partnerships are the more widely used waterfowl management strategies across the three regions. Perhaps, it can be suggested that these waterfowl management strategies are more accessible to management agencies than others, either through lower cost of implementation or staffing needs. Perhaps also, these strategies are more widely used due to overlap in management goals. That is, management strategies such as habitat management and partnerships can have multiple goals for multiple species of interest. For example, it is possible to provide habitat management for submerged aquatic vegetation, and then have those management actions benefit waterfowl.

Within the North Region, the least used waterfowl management strategies were those that had zero to one plan stating their use. Those strategies were (1) invasive species management, (2) weekly waterbird count, and (3) mid-winter waterfowl count. The least used waterfowl management strategies within the Mid-Atlantic Region were those that had two or fewer plans stating their use. Those strategies were (1) less frequent waterfowl count, (2) mid-winter waterfowl count, (3) research, and (4) weekly waterbird count. Within the South Region, the

least used waterfowl management strategies were those that had zero to one plan stating their use. Those strategies were (1) weekly waterbird count and (2) invasive species management. From this it can be gained that invasive species management, weekly waterbird counts, mid-winter waterfowl count, and research are not widely used among the three regions.

The most used strategy among all regions was partnerships. The least used management strategy among all regions was weekly waterbird count. The Mid-Atlantic Region was the only region that had at least one plan state using each of the 13 waterfowl management strategies.

Table 21: Management Strategies by Agency

<b>Management Strategies</b>	<b>USFWS (N=29)</b>	<b>NPS (N=9)</b>	<b>USFS (N=3)</b>	<b>State (N=1)</b>	<b>NOAA (N=1)</b>
Education & Outreach	15	1	0	0	0
Law Enforcement	8	0	0	0	0
Habitat Management	17	0	1	1	0
Waterfowl Hunting	14	0	1	0	0
Impoundment Management	13	0	1	0	0
Invasive Species Control	5	0	0	0	0
Less Frequent Waterfowl Count	11	0	0	0	0
Limited Access	8	1	0	0	0
Mid-Winter Waterfowl Count	7	0	0	0	0
Monitoring	17	1	1	0	0
Partnerships	20	1	1	0	0
Research	7	0	0	1	0
Weekly Waterbird Count	2	0	0	0	0

Table shows number of plans that listed using each management strategy for waterfowl management and management plan agency.

There is consistency within agencies for type of management plans used for individual sites. The USFWS uses Comprehensive Conservation Plans (CCP), the NPS uses General Management Plans (GMP), and the USFS uses Land and Resource Management Plans. Table 22 shows the number of management plans that stated using the 13 waterfowl management

strategies by management agency. From this study's sample, five management agencies were identified (1) United States Fish and Wildlife Service (USFWS), (2) National Park Service (NPS), (3) United States Forest Service (USFS), (4) State agencies (in this case, the state of Virginia Department of Conservation and Recreation), and (5) National Oceanic and Atmospheric Administration (NOAA). It is important to note only plans that specifically stated the use of a management strategy for waterfowl management were included in the totals.

There are some clear differences between management agencies and the use of waterfowl management strategies. First, the management plan from the NOAA site did not state using any of the 13 waterfowl management strategies. This could be due to the primary management goals of NOAA not being associated with waterfowl management, despite the NOAA site being located within the ACJV. Conversely, the USFWS had at least one management plan stating the use of each of the 13 waterfowl management strategies. The USFWS used the 13 waterfowl management strategies more heavily than the other four management agencies in this sample.

The state managed sites in Virginia mentioned using (1) habitat management and (2) research as waterfowl management strategies. The USFS management plans cited using (1) habitat management, (2) waterfowl hunting, (3) impoundment management, (4) monitoring, and (5) partnerships as waterfowl management strategies. The NPS management plans cited using (1) education and outreach, (2) limited access, (3) monitoring, and (4) partnerships as waterfowl management strategies. The USFWS management plans cited using all of the 13 waterfowl management strategies. No one USFWS management plan listed all 13 strategies as used for waterfowl management. The most frequently cited waterfowl management strategy was partnerships. The second most frequently cited waterfowl management strategies were habitat

management and monitoring. The least frequently cited waterfowl management strategy was weekly waterbird count.

Two waterfowl management strategies were listed in USFWS, NPS, and USFS management plans. Those strategies were monitoring and partnerships. Six management strategies were cited in only the USFWS management plans. Those strategies were (1) law enforcement, (2) invasive species control, (3) less frequent waterbird count, (4) mid-winter waterfowl count, and (5) weekly waterbird count. The use of the 13 waterfowl management strategies did vary by management agency. The USFWS more frequently listed all 13 management strategies than the other four agencies.

Table 22: Management Strategies by Area

Management Strategies	0 -10,000 (N=20)	10,001- 20,000 (N=8)	20,001- 30,000 (N=4)	30,001- 40,000* (N=0)	40,001- 50,000 (N=2)	50,001- 60,000 (N=1)	60,001- 70,000 (N=2)	70,001- 80,000 (N=1)	> 80,001 (N=4)
<b>Education &amp; Outreach</b>	9	2	4	0	1	0	0	0	0
<b>Law Enforcement</b>	5	0	1	0	0	1	1	0	0
<b>Habitat Management</b>	10	1	4	0	1	1	2	0	0
<b>Waterfowl Hunting</b>	7	1	4	0	0	1	2	0	0
<b>Impoundment Management</b>	6	1	4	0	1	1	1	0	0
<b>Invasive Species Control</b>	2	1	2	0	0	0	0	0	0
<b>Less Frequent Waterfowl Count</b>	5	0	3	0	1	0	1	0	1
<b>Limited Access</b>	4	1	1	0	2	1	0	0	0
<b>Mid-Winter Waterfowl Count</b>	2	1	3	0	0	0	0	0	1
<b>Monitoring</b>	8	2	4	0	1	1	1	0	2
<b>Partnerships</b>	10	2	4	0	2	1	2	0	1
<b>Research</b>	4	1	1	0	1	0	1	0	0
<b>Weekly Waterbird Count</b>	0	1	1	0	0	0	0	0	0

\*No managed areas were within this size category. Table shows number of plans that listed using each management strategy and size of managed area.



The 43 management plans were divided by size of managed area. The plans were divided into eight size categories based on total hectares of managed area: (1) 0 to 10,000 hectares, (2) 10,001 to 20,000 hectares, (3) 20,001 to 30,000 hectares, (4) 30,001 to 40,000 hectares, (5) 40,001 to 50,000 hectares, (6) 50,001 to 60,000 hectares, (7) 60,001 to 70,000 hectares, (8) 70,001 to 80,000 hectares, and (9) greater than 80,001 hectares. These size categories were determined by number of site management plans within each range.

The use of waterfowl management strategies did vary by size (See Table 22). Generally, the management plans for larger managed areas listed fewer waterfowl management strategies than the management plans for smaller managed areas. This could be due to the increased frequency of smaller managed areas included in the sample. There were no managed areas included in this study within the *30,001 to 40,000* hectare size category. One management plan was included in the size category *70,001 to 80,000* hectares; this plan listed none of the 13 waterfowl management strategies.

Within the *zero to 10,000* hectares category the most frequently listed waterfowl management strategies were (1) habitat management, (2) partnerships, and (3) education and outreach. The least frequently listed strategy was weekly waterbird counts. Within the *10,001 to 20,000* hectares size category, the most frequently listed waterfowl management strategies were (1) education and outreach, (2) monitoring, and (3) partnerships. The least frequently listed strategies were (1) law enforcement and (2) less frequent waterfowl count. Within the size category *20,001 to 30,000* hectares, the most frequently listed waterfowl management strategies were (1) education and outreach, (2) habitat management, (3) waterfowl hunting, (4) impoundment management, (5) monitoring, and (6) partnerships. The least frequently used

strategies were (1) law enforcement, (2) limited access, (3) research, and (4) weekly waterbird count.

In the *40,001 to 50,000* hectares range, the most frequently listed waterfowl management strategies were (1) limited access and (2) partnerships. The least frequently listed strategies were (1) law enforcement, (2) waterfowl hunting, (3) invasive species control, (4) mid-winter waterfowl count, and (5) weekly waterbird count. Within the *50,001 to 60,000* hectares range, these waterfowl management strategies were listed (1) law enforcement, (2) habitat management, (3) waterfowl hunting, (4) impoundment management, (5) limited access, (6) monitoring, and (7) partnerships. No other strategies were listed. In the size category *60,001 to 70,000* hectares, the most frequently listed waterfowl management strategies were (1) habitat management, (2) waterfowl hunting, and (3) partnerships. Strategies not listed were (1) education and outreach, (2) invasive species control, (3) limited access, (4) mid-winter waterfowl count, and (5) weekly waterbird count. Within the size category greater than *80,000*, the most frequently listed waterfowl strategy was monitoring. The other strategies listed were (1) less frequent waterfowl count, (2) mid-winter waterfowl count, and (3) partnerships. Education and outreach, habitat management, and partnerships were listed most frequently in multiple size categories. Weekly waterbird count was listed least frequently overall.

It is important to note the overall frequency of management strategies listed in within the site plans. The management strategies most frequently listed overall were: (1) Partnerships, (2) Habitat Management, (3) Monitoring, and (4) Education and Outreach. The management strategy least frequently listed overall was Weekly Waterbird Count. The site management plan analysis will be discussed along with survey findings in Chapter Six of this dissertation.

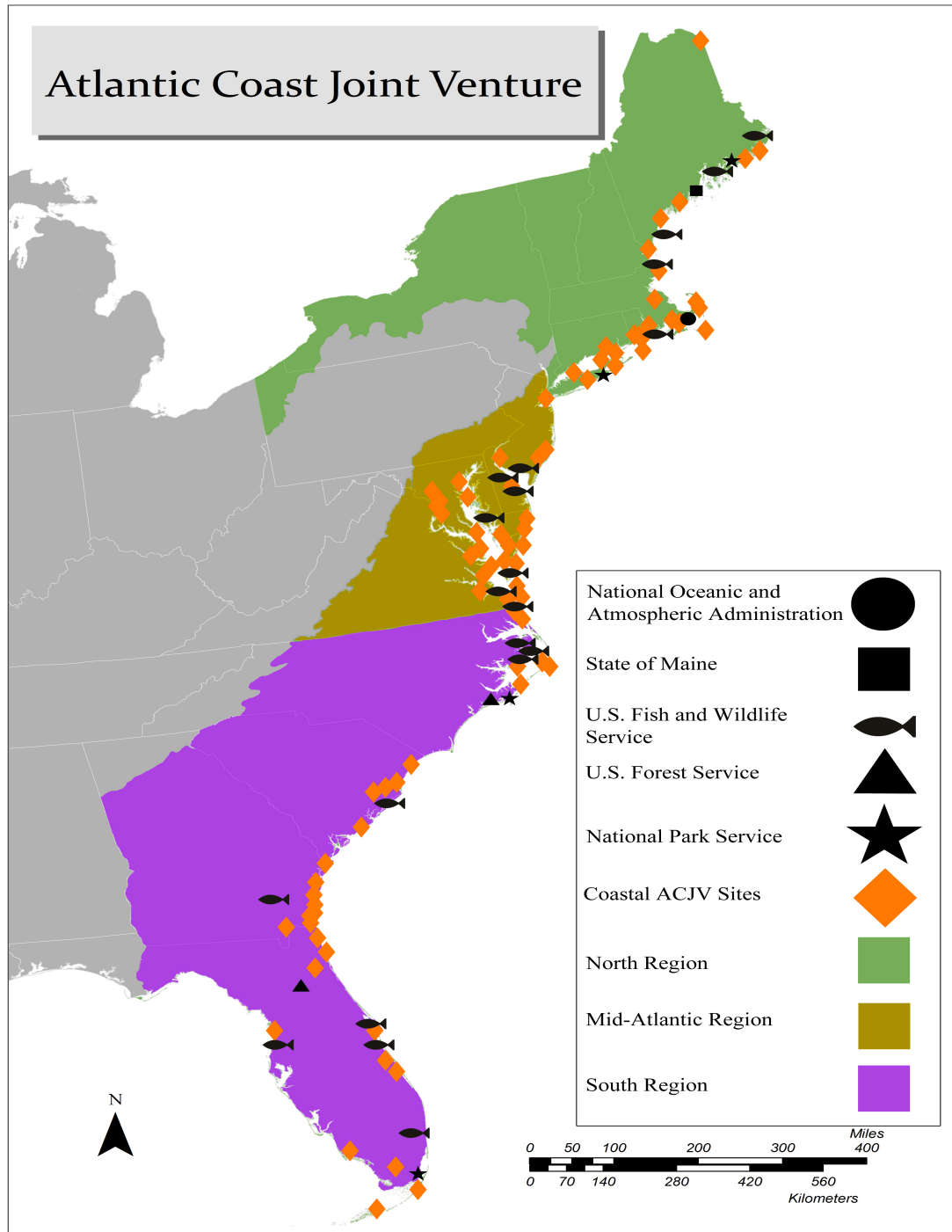
## CHAPTER V

### ANALYSIS OF SITE CHARACTERISTICS AND SURVEY FINDINGS

This chapter contains the analysis of survey findings. A total of 87 surveys were sent electronically to waterfowl management professionals working at 102 coastal ACJV sites identified for this study. 87 surveys were sent out of the 102 possible coastal ACJV sites due to sites being members of a complex, where multiple physical sites are managed by a few managers; and manager of sites removing themselves from the research because they were uninterested in participation or simply stated they did not manage for waterfowl. The survey timeline was May 2011 to July 2011. Thirty-five surveys were returned; however, not all respondents completed every question of the survey. In order to use the data that were collected, partially completed surveys were used in data analysis, which resulted in 40.23% response rate. Data analysis was only run on data collected; missing data were listed as missing. Data analysis was completed using SPSS 19.0 Statistical Software and Qualtrics Reporting Software.

Thirty-four respondents out of the 35 returned surveys reported the site where they were currently employed during the survey data collection timeline. Figure 7 shows a geographic representation of respondents' sites. The figure also denotes ACJV Regions and site management agency. Respondent sites for this study were representative of coastal sites within the ACJV.

Figure 7. Map of Survey Sites, ACJV Region, and Management Agency



Source: Adapted from the Atlantic Coast Joint Venture (2009a). This maps identifies survey sites, 102 coastal ACJV sites identified for this study, ACJV Regions, and Management Agency.

## Sites

The participants were also asked what agency they were employed by. Employment agency was divided into four categories: United States Fish and Wildlife Service (USFWS), National Park Service (NPS), United States Forest Service (USFS), and Other. The USFWS accounted for 76.5% of employment with 26 participants, NPS accounted for 11.8% with four participants, USFS accounted for 5.9% with two participants, and Other also accounted for 5.9% with two participants. Table 23 displays employment agency and percentages.

Table 23: Employment Agency

<b>Agency</b>	<b>N</b>	<b>%</b>
United States Fish & Wildlife Service	26	76.5
National Park Service	4	11.8
United States Forest Service	2	5.9
Other	2	5.9

## Respondents' Demographics

The sample for this survey yielded 15 males (44.1%) and 19 females (55.9%). Race/ethnicity was reported. Twenty-nine respondents were Anglo or White (87.9%), one was African American or Black (3.0%), one was Hispanic American (3.0%), and two were Asian American (6.1%). Respondents were asked to report their age. Age responses were then grouped into three categories. Eleven respondents (34.4%) reported being between the ages of 22 and 37, 13 respondents (40.6%) were between the ages of 41 and 51, and eight respondents (25.0%) were between the ages of 52 and 64.

Regarding education, 13 respondents stated having a college degree (38.2%) and 21 respondents stated having a graduate or professional degree (61.8%). Degree type was coded into Biology Degree (BS, MS, PhD) or Other (all others listed). Biology degrees accounted for 55.9% of respondents. More than half of the respondents earned a masters degree (52.9%), while

13 (38.2%) respondents obtained a bachelors degree and three (8.8%) earned a doctoral degree. The majority of participants (61.8%) had one to 20 years of experience while only (23.5%) listed 12 to 30 years of experience, and 14.7% of participants listed 31 to 40 years of experience. Job title was categorized as Biologist, Manager, or Other. Biologists accounted for the majority of respondents (67.6%), managers (11.8%), and other (20.6%). Table 24 shows respondents' socio-demographic profile.

Table 24: Respondents' Socio-demographics

<b>Sex</b>	<b>N</b>	<b>%</b>	<b>Degree</b>	<b>N</b>	<b>%</b>
Male	15	44.1	PhD	3	8.8
Female	19	55.9	MA/MS	18	52.9
			BA/BS	13	38.2
<b>Race/Ethnicity</b>			<b>Years of Experience</b>		
Anglo/White	29	87.9	1-20	21	61.8
African American	1	3.0	21-30	8	23.5
Hispanic American	1	3.0	31-40	5	14.7
Asian American	2	6.1			
<b>Age</b>			<b>Job Title</b>		
22-37	11	34.4	Biologist	23	67.6
38-51	13	40.6	Manager	11.4	11.8
52-64	8	25.0	Other	20	20.6

### Site Characteristics

The following section addresses site characteristics gleaned from the survey data. Respondents were asked a variety of questions concerning their site and waterfowl management.

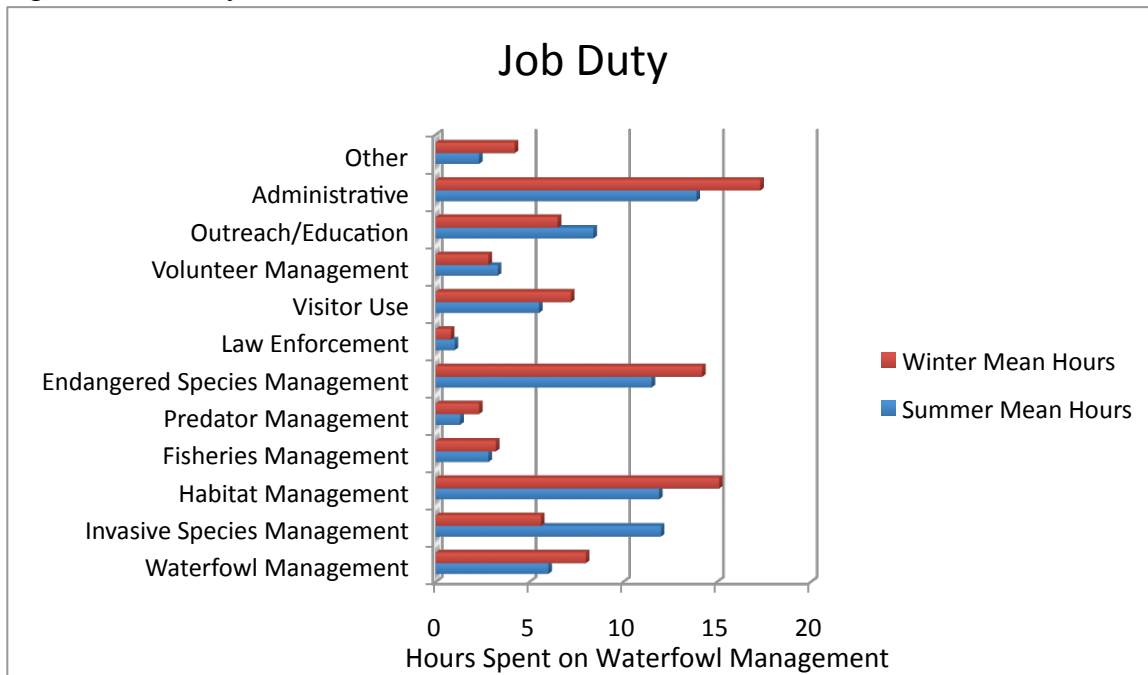
While waterfowl management is the primary focus for this study, identifying respondents' time management outline is useful in understanding waterfowl management strategy selection and implementation. Resource managers are responsible for multiple job

duties, in addition to waterfowl management. Job duties were addressed by asking how many hours per week the respondent spends on 12 duties, in both summer and winter seasons. The mean hours for each duty are listed in Figure 8. Respondents spent the most hours on administrative duties for both summer (13.9 hours) and winter (17.3 hours) seasons. The least time was spent on law enforcement for both summer (1.0 hour) and winter (0.8 hours) seasons.

Respondents reported waterfowl management was more time consuming in the winter (8.0 hours), than in summer (6.0 hours). This remained the same among all regions. Five job duties were more time consuming than waterfowl management in summer: invasive species management (12 hours), endangered species management (11.5 hours), outreach and education (8.4 hours), and administrative duties (13.9 hours). Waterfowl management was more time consuming than five job duties: fisheries management (2.8 hours), predator management (1.3 hours), law enforcement (1.0 hours), volunteer management (3.3 hours), and other (2.3 hours). Moreover, time spent on waterfowl management increased in winter, while time spent on invasive species management decreased.

Despite the fact that waterfowl management hours increased in the winter for all regions, there may be differences between regions in the overall amount of increase that has occurred. Although the dataset lacks the statistical power to test for significance on this variable, differences between regions are further discussed in the Regional Analysis section of this document.

Figure 8: Job Duty for Summer and Winter

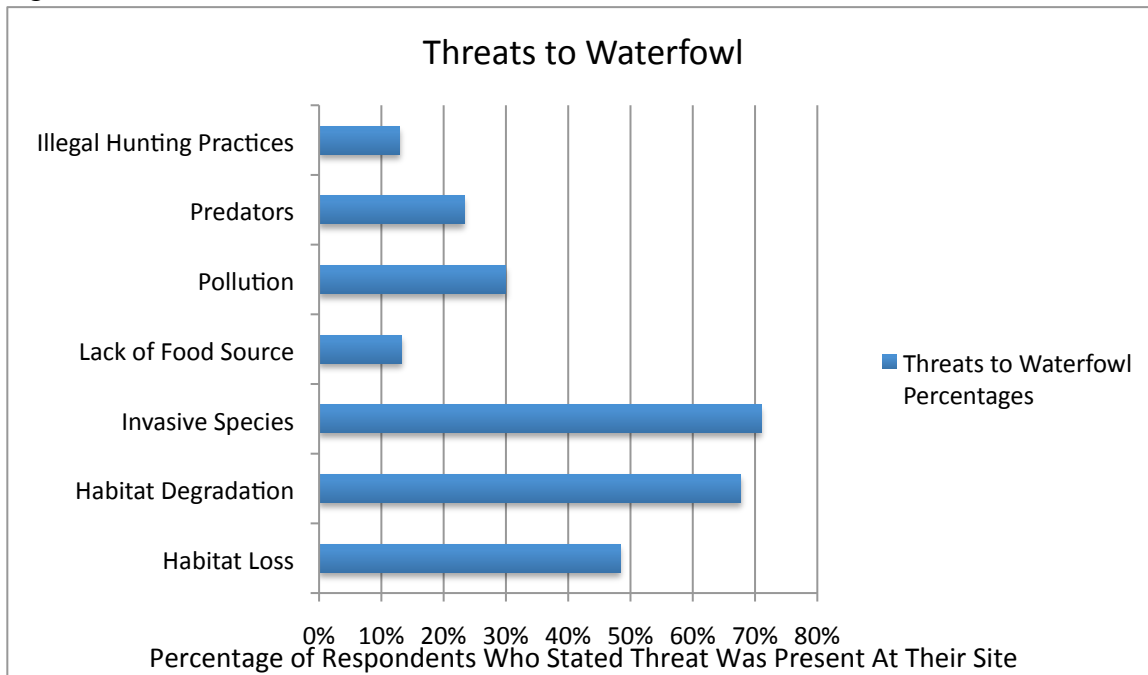


Threats to waterfowl influence how waterfowl are managed and reflect why waterfowl are managed in certain areas. Seven potential threats to waterfowl were identified through literature review (U.S. Fish & Wildlife Service 2004; Melinchuk 1995; & Baldassarre & Bolen 1994) and from the expert opinions of waterfowl management professionals at John Heinz NWR. Respondents were asked to identify which of these threats to waterfowl existed at their site. Figure 9 reflects the number, and percentage, of respondents who stated having the threat to waterfowl at their site.

Seven potential threats were listed in the survey. The threat of invasive species was identified most often as a threat to waterfowl from respondents (71.0%); conversely, the threat of illegal hunting practices was identified least often as a threat to waterfowl (12.9%). The threat of habitat degradation was frequently listed as a threat to waterfowl by respondents (67.7%), making it the most common threat indicated by respondents.



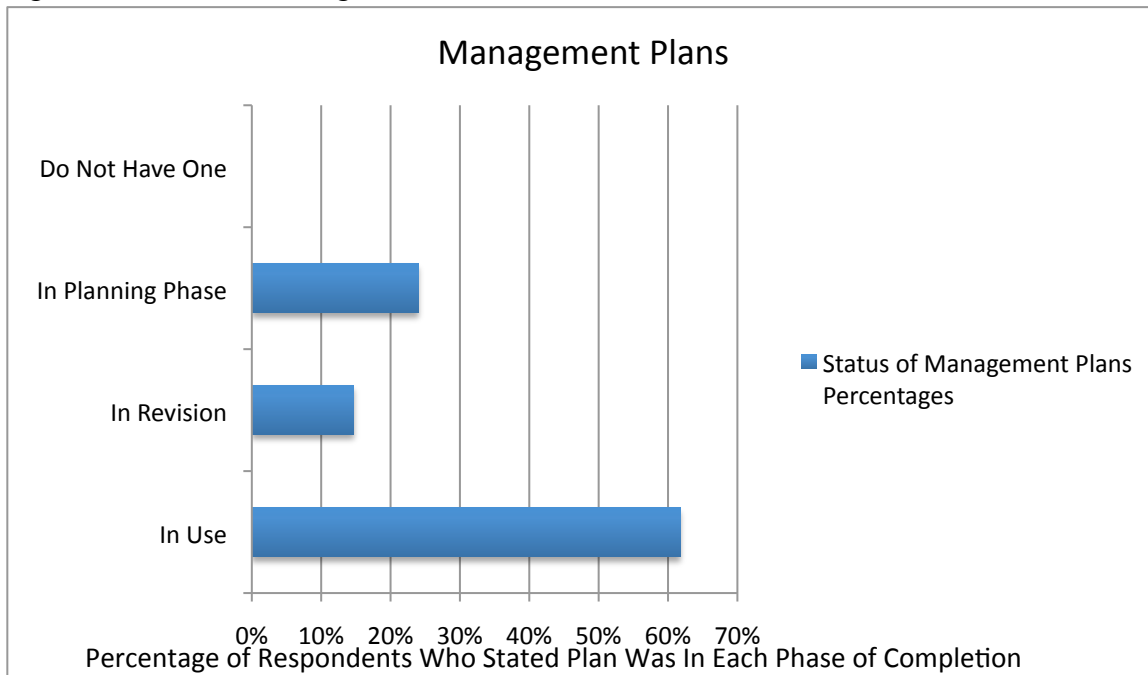
Figure 9: Threats to Waterfowl



Site management plans are essential for meeting management goals and accessing needs at the site level. When identifying management strategies used by a site, it is important to know the status of the site management plan. Plans in revision or in the planning phase suggest new, adapted, or revised management goals, and that strategy selection is in progress for the site. Active plans suggest long-term goals in place for the site, and current implementation of specific management strategies. Figure 10 reflects the number and percentage of respondents who reported their management plan status.

Site management plans were addressed by asking respondents to identify the status of their site management plan. Twenty-one plans were in use (61.8%), five plans were in revision (14.7%), eight plans were in the planning phase (23.5%), and no sites were without a plan.

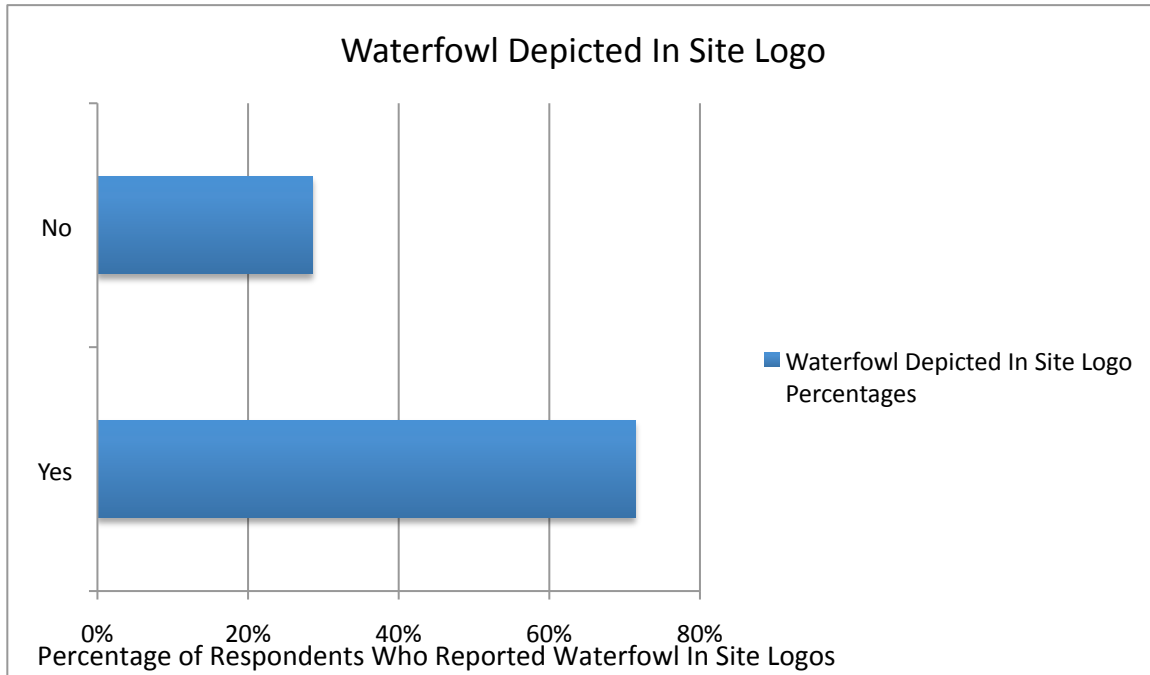
Figure 10: Status of Management Plans



Logos for coastal ACJV sites are an important indicator of site identity and values. If waterfowl are depicted in a site logo, then they are tied to that site's identity, and they reflect a value of that site that waterfowl are important. Further, if waterfowl are depicted in a site logo, it can be assumed that waterfowl are, or once were, present at the site. Figure 11 shows the number and percentages respondents who stated waterfowl were depicted in their site logo.

Respondents were asked if waterfowl were depicted in their site logo. In 71.4% of cases, respondents stated waterfowl were depicted in their site logo.

Figure 11: Site Logo

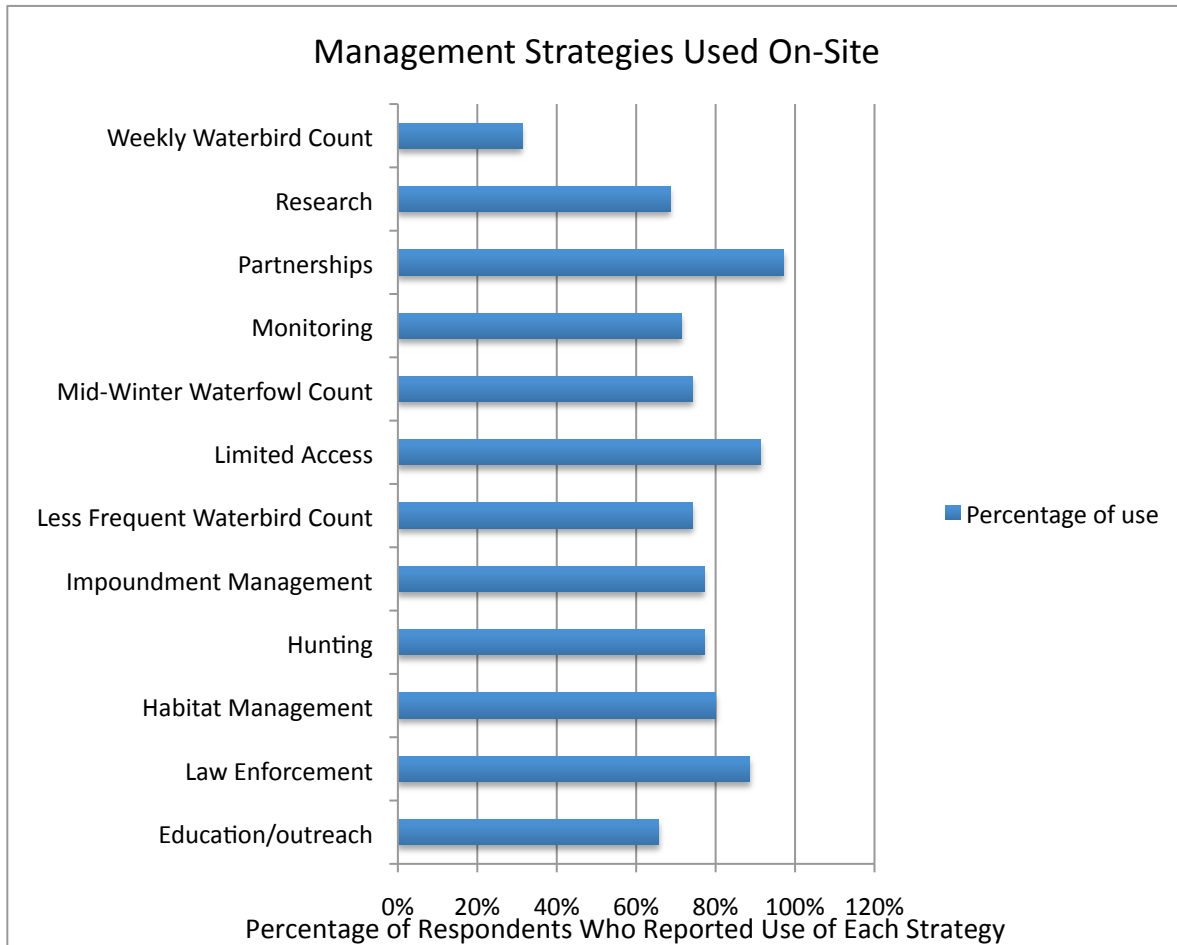


### Management Strategies

A primary function of this survey was to identify what waterfowl management strategies are used along the Atlantic coast. Twelve waterfowl management strategies were assembled from literature review, the NAWMP, the ACJV Strategic Plan, and waterfowl management professionals at John Heinz NWR. Respondents were asked to identify which of the 12 management strategies they use on-site for waterfowl management. Figure 12 shows the number and percentage of respondents who stated using the waterfowl management strategies.

All waterfowl management strategies were used, but some strategies were used more often than others (or by more sites). 97.1% of respondents used partnerships for waterfowl management, while 91.4% of respondents used limited access for waterfowl management, the two most frequently used management strategies. Weekly waterbird count was used the least with 31.4% of respondents.

Figure 12: Management Strategy Use



### Perceptions of Waterfowl Management

Perceptions of waterfowl management from professionals implementing waterfowl management practices provide important information for adapting management strategies and creating best management practices. Perceptions of waterfowl management were gauged through a series of questions focused on value statements, perceived importance, and perceived effectiveness.

Value statements for waterfowl were derived from the NAWMP (1986 & 2004) and ACJV (2004) management documents. Respondents were asked to rate how much they agree

with each value statement on a five-point likert scale (0=strongly disagree, 1=disagree, 2=neither disagree or agree, 3=agree, 4=strongly agree). Table 25 displays the percentage of respondents who stated the ‘agreed’ and ‘strongly agreed’ with each value statement.

Table 25: Waterfowl Value Statements

<b>Value Statement</b>	<b>N</b>	<b>%</b>
Waterfowl are valuable/important as a natural resource.	32	100
Conserving waterfowl for future generations is our ethical duty.	30	93.7
Waterfowl populations should be sustained at objective levels across their natural ranges to provide ecological and socioeconomic benefits.	32	100
Protection of waterfowl requires long-term planning at regional and/or continental scales.	32	100
Sustainable waterfowl harvests are desirable and consistent with waterfowl conservation goals.	29	90.7
Partnerships at all levels of government and with interest groups are necessary for successful waterfowl conservation and management.	30	93.7
Adaptive management regimes are effective for waterfowl management.	29	90.7
Habitat loss, fragmentation, and degradation are major threats to waterfowl populations on the Atlantic coast.	31	96.9
Habitat conservation on public and private lands is essential to waterfowl protection.	31	96.9
A scientific base for management decisions is critical for successful waterfowl management.	32	100
Education and outreach are important components for successful waterfowl management.	29	90.7

**Table lists value statements included in questionnaire and number and percentage of respondents who reported agreeing and strongly agreeing with each statement.**

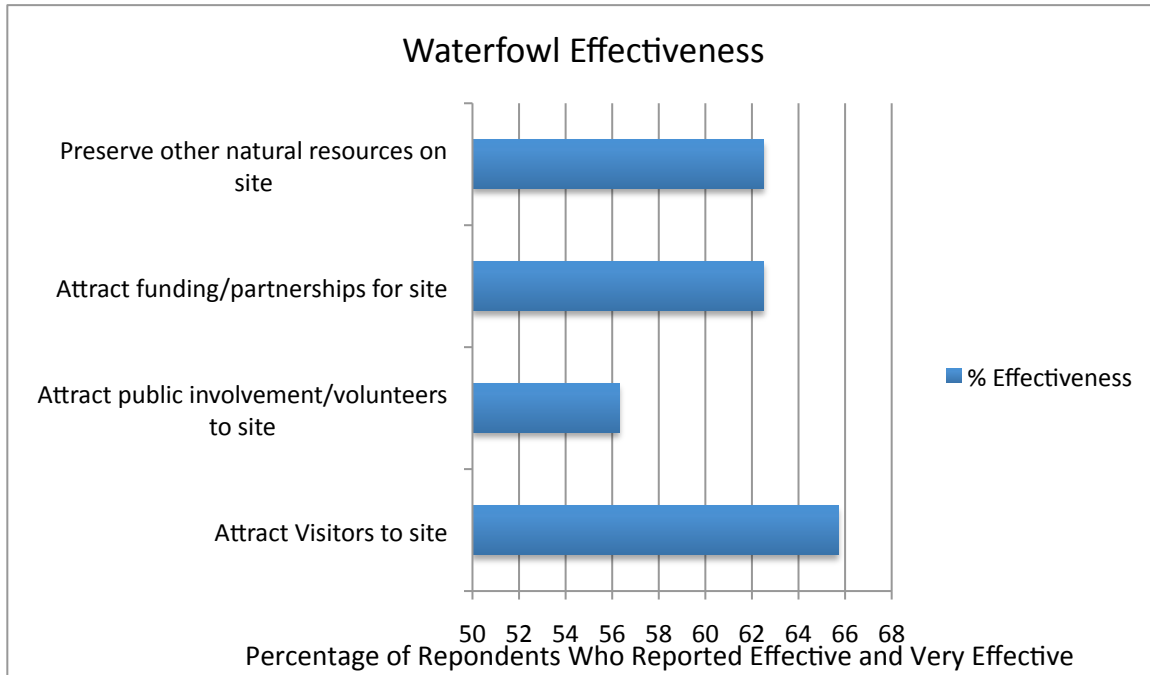
Four value statements were agreed with 100%. Those statements were: (1) *Waterfowl are valuable/important as a natural resource*; (3) *Waterfowl populations should be sustained at objective levels across their natural ranges to provide ecological and socioeconomic benefits*; (4) *Protection of waterfowl requires long-term planning at regional and/or continental scales*; and (10) *A scientific base for management decisions is critical for successful waterfowl*

*management*. All other statements, while lacking all respondents' agreement, were strongly agreed with by the majority of respondents.

Waterfowl effectiveness was addressed by identifying waterfowl's ability to provide certain benefits to the site. Four potential site benefits were derived from an expert panel of waterfowl management professionals at John Heinz NWR, and included the effectiveness of waterfowl to: (1) attract visitors to the site, (2) attract public involvement and/or volunteers to the site, (3) attract funding and/or partnerships for the site, (4) preserve other natural resources on-site. Effectiveness of waterfowl was measured on a five-point likert scale, asking respondents to rate the effectiveness of providing potential site benefits (0= very ineffective, 1= ineffective, 2 = neither ineffective or effective, 3= effective, 4= very effective). Figure 13 shows the number and percentage of respondents who found waterfowl to be 'effective' and 'very effective' at providing benefits to their site.

65.7% of respondents found waterfowl to be effective at attracting visitors to their site. Followed by waterfowl's effectiveness at attracting funding/partnerships to the site (62.5%) and preserving other natural resources on-site (62.5%). Waterfowl were found least effective at attracting public involvement and/or volunteers to sites (56.3%).

Figure 13: Waterfowl Effectiveness to Provide Benefits to Site



Respondents were asked their perceptions of waterfowl population trends at their site, as well as in the Atlantic Flyway. They were asked to identify whether waterfowl population trends were declining, stable, or thriving. Table 26 shows the number and percentage of respondents who stated waterfowl populations were declining, stable, or thriving at their site and within the flyway.

Table 26: Perceptions of Waterfowl Population Trends

<b>Trends at Site</b>	<b>N</b>	<b>%</b>
Declining	11	34.4
Stable	17	53.1
Thriving	4	12.5
<b>Trends in Atlantic Flyway</b>		
Declining	17	53.1
Stable	15	46.9
Thriving	0	0

53.1% of respondents stated waterfowl population trends were stable at their sites. 34.4% of respondents reported declining populations at their sites. 12.5% of respondents thought populations were thriving at their site. Perceptions of waterfowl population trends differed in the Atlantic Flyway. 53.1% of respondents reported declining population trends in the Atlantic Flyway. 46.9% of respondents reported stable population trends in the Flyway. No respondents perceived thriving population trends in the Atlantic Flyway.

It is important to note that while the majority of respondents' perceived waterfowl population trends as stable at their sites, waterfowl populations were perceived as declining in the flyway. This could be due to respondents' involvement in waterfowl management at their individual sites, which they perceive as being effective at a site level, but perhaps not as effective at a regional level. If respondents who reported waterfowl populations thriving at their sites also manage impoundments, then the report could simply reflect the large number of migrating waterfowl using impoundments as stopover sites during the fall and spring seasons. The USFWS 2012 Waterfowl Status Report stated total duck numbers from "the 2012 Atlantic Flyway Breeding Waterfowl survey were 1.3 million, which was similar to the 2011 estimate and to the long-term (1993-2011) average of 1.4 million" (United States Fish and Wildlife Service 2012, p. 33). This would imply that breeding waterfowl populations within the Atlantic Flyway are at least stable.

Perceptions of waterfowl management were also measured by asking respondents what factors influence waterfowl management strategy selection. Seven potential influence factors were derived from literature review and expert opinions of waterfowl management professionals at John Heinz NWR. The potential influence factors were: location of site, management plan type, visitor use, hunting on site, wetlands on site, manager's background, manager's years of



experience. Importance of influence was measured on a five-point likert scale (0= not at all important, 1= very unimportant, 2= neither important nor unimportant, 3= very important, 4= extremely important). Table 27 shows the number and percentage of respondents who reported the influence factors as being ‘very important’ and ‘extremely important’.

Table 27: Waterfowl Management Strategy Selection Influence Factors

<b>Influence Factors</b>	<b>N</b>	<b>%</b>
Site Location	22	68.8
Management Plan Type	19	59.4
Visitor Use	19	59.4
Hunting	15	48.4
Wetlands	31	96.9
Manager’s Background	19	59.4
Manager’s Years of experience	18	56.3

Table reflects number and percentage of respondents who stated waterfowl management strategy influence factors were very important and extremely important.

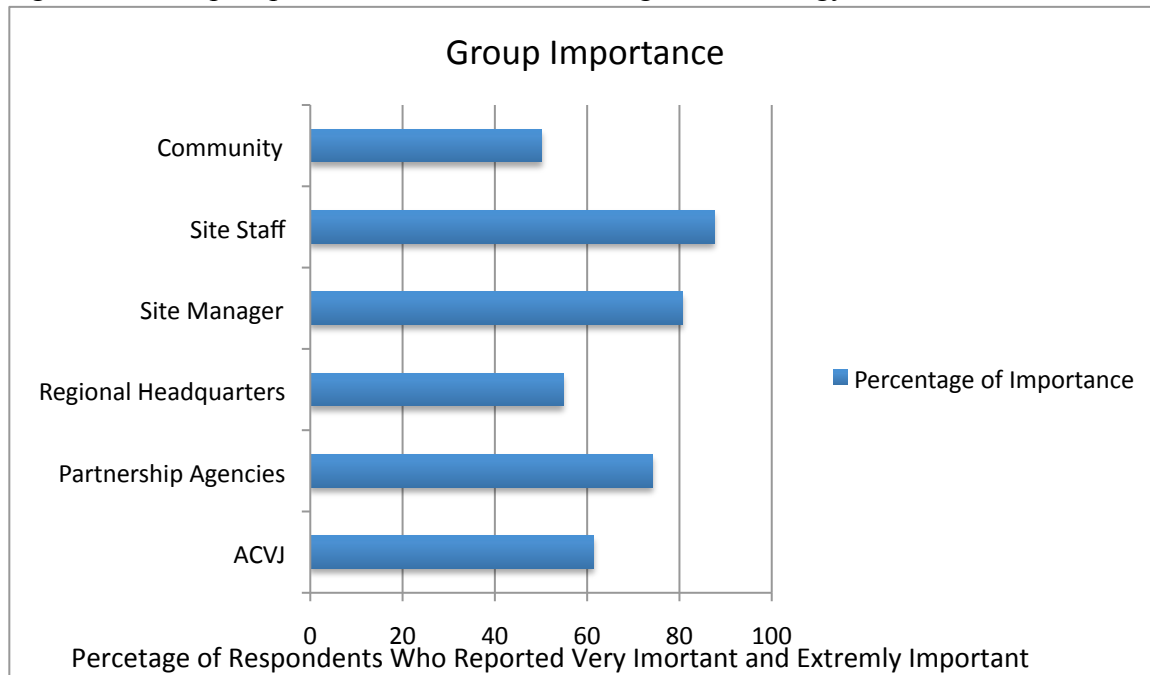
Respondents reported wetlands as being most important to influencing waterfowl management strategy selection (96.9%), followed by site location (68.8%). Hunting was listed as least influential in management strategy selection (48.4%).

Multiple groups are involved in the selection process for waterfowl management strategies. Management strategy selection also takes place on several levels, national, regional, state, and site. Respondents were asked to identify which groups were most important in management strategy selection. The groups included: the Atlantic Coast Joint Venture (ACJV), partnership agencies, headquarters for management agency, site manager, site staff, and community. These groups were determined from literature review (North American Waterfowl Management Plan 2004, & Atlantic Coast Joint Venture 2004) and experts in the field of waterfowl management from John Heinz National Wildlife Refuge in Philadelphia, Pennsylvania. Importance was ranked on a five-point likert scale (0= not at all important, 1=

very unimportant, 2= neither important nor unimportant, 3= very important, 4= extremely important). Figure 14 shows the number and percentage of respondents who reported group importance to management strategy selection to be ‘very important’ and ‘extremely important’.

Site Staff (87.5%) and Site Manager (80.6%) were perceived as most important groups to waterfowl management strategy selection. The next most important groups are as follows: Partnership Agencies (74.2%), ACJV (61.3%), and Regional Headquarters (54.9%), with the least important group, Community (50.1%). It is important to note that as a group, site staff and site manager are perceived as most important in waterfowl management strategy selection; however, manager characteristics (background and years of experience) were not perceived to be influential in waterfowl management strategy selection.

Figure 14: Group Importance in Waterfowl Management Strategy Selection



Effectiveness of waterfowl management strategies can aid in allocating limited financial resources and staff. Identifying which strategies are perceived as effective, or ineffective, can

also guide future research and management strategy selection for sites. Respondents were asked to rate the effectiveness of each of the 12 waterfowl management strategies. Effectiveness was ranked on a five-point likert scale (0= very ineffective, 1= ineffective, 2= neither effective nor ineffective, 3= effective, 4= very ineffective). Table 28 shows the number and percentage of respondents who stated the waterfowl management strategies were ‘effective’ and ‘very effective’.

Table 28: Waterfowl Management Strategy Perceived Effectiveness

<b>Management Strategy</b>	<b>N</b>	<b>%</b>
Education/Outreach	23	74.2
Law Enforcement	29	90.7
Habitat Management	30	96.8
Hunting	19	61.3
Impoundment Management	27	90.0
Less Frequent Waterbird Count	5	16.1
Limited Access	23	71.9
Mid-Winter Waterfowl Count	24	75.1
Monitoring	28	90.4
Partnerships	28	90.4
Research	27	90.0
Weekly Waterbird Count	15	48.4

This Table reflects the number and percentage of respondents who perceived each waterfowl management strategy as effective and very effective.

Habitat management was rated as the most effective waterfowl management strategy (96.8%). This could be due to respondents identifying habitat management as an umbrella strategy for several waterfowl management strategies. For example, habitat management at certain sites included impoundment management, monitoring, limited access, and research. Followed by law enforcement (90.7%), monitoring (90.4%), partnerships (90.4%), impoundment management (90.0%), and research (90.0%). Less frequent waterbird count was rated least effective (16.1%). Weekly waterbird count was also perceived as ineffective (48.4%). Waterbird counts could be seen as ineffective due to human error in the counting process, and the time

consuming nature of the waterbird counts. Another reason for this finding could be that counting waterbirds on a weekly basis is not actually effective since they migrate. It may in fact be much more effective to count waterbirds on a seasonal or annual basis, such as the Atlantic Flyway Breeding Waterfowl Survey or the Mid-Winter Waterfowl Survey. Waterbird counts for breeding populations within the Atlantic Flyway were established in 1989 to collect abundance data to help inform management of eastern breeding populations (Migratory Bird Data Center 2012). These seasonal counts are heavily relied upon for waterfowl habitat and population management decisions throughout the United States.

### **Hypothesis Testing**

This study had two objectives. The first objective was: *To describe and analyze waterfowl management strategies planned by coastal Atlantic Coast Joint Venture sites*. In order to meet this objective one hypothesis was tested. H1 stated:

*H1: Waterfowl management strategy use by sites will vary by agency.*

Asking respondents which agency employed them identified agency. Agency was then divided into two categories, USFWS and Other. A Chi Square was performed to test the significance between waterfowl management strategy use (dependent variable) and agency (independent variable).

Table 29: Chi Square for Agency and Waterfowl Management Strategy Use

Management Strategy	Strategy Used (n)	Chi Square (r)	P-value
Education/Outreach	23	0.01	0.94
Law Enforcement	31	0.00	0.97
Habitat Management	28	0.04	0.85
Hunting	27	0.95	0.33
Impoundment Management	27	3.20	0.07
Less Frequent Waterfowl Count	26	0.08	0.78
Limited Access	32	0.10	0.75
Mid-Winter Waterfowl Count	26	0.08	0.78
Monitoring	25	0.24	0.63
Partnerships	34	0.36	0.56
Research	24	0.02	0.89
Weekly Waterbird Count	11	0.02	0.89

Management strategy use did not vary significantly by agency. This is possibly due to top-down-directives from the NAWMP, and also that there were too few respondents employed by other agencies than the USFWS. This finding supports consistency in waterfowl management at a regional scale. Conversely, a relationship could exist between impoundment management and agency ( $p = 0.07$ ). Thus, Hypothesis 1 was not supported.

The second objective of this study was: *To examine perceived implementation and effectiveness of waterfowl management strategies used at coastal Atlantic Coast Joint Venture sites*. In order to meet this objective, three hypotheses were tested.

*H2: Waterfowl management strategy use at individual sites within the ACJV are influenced by:*

*H2a: Managers' professional background*

*H2b: Visitor use*

*H2c: Hunting on site*

*H2d: Type of site management plan*

*H2e: Wetlands on site*

Cross Tabs with Chi Square was used to measure respondents' perception of managers' professional background as an influence on waterfowl management strategy selection.

Managers' professional background was grouped into two categories, Biology background or Other background, and served as the independent variable. Each management strategy was coded as Used or Not Used, and served as dependent variables. Table 42 illustrates the number of respondents who used each management strategy, along with the chi square value (r) and the p-value.

The Chi Square test found no significant relationship between managers' professional background and any of the 12 management strategies. This is inconsistent with earlier reporting on group importance to management strategy selection, where site managers were found to be very important in waterfowl management strategy selection (See Figure 12 on Group Importance to Waterfowl Management Strategy Selection).

Table 30: Chi Square for Managers' Professional Background & Management Strategies

<b>Management Strategy</b>	<b>Strategy Used (n)</b>	<b>Chi Square (r)</b>	<b>P-value</b>
Education/Outreach	22	0.88	0.35
Law Enforcement	30	0.67	0.41
Habitat Management	27	0.86	0.35
Hunting	26	0.19	0.67
Impoundment Management	26	0.19	0.67
Less Frequent Waterfowl Count	25	2.52	0.11
Limited Access	31	0.16	0.69
Mid-Winter Waterfowl Count	25	0.65	0.42
Monitoring	24	1.45	0.23
Partnerships	33	0.81	0.37
Research	23	0.72	0.40
Weekly Waterbird Count	10	0.20	0.66

Based on the Chi Square test above, Hypothesis 2a was not supported.

A t-test was used to measure respondents' perception of four factors' influence on waterfowl management strategy selection. There were originally six factors, but location and

managers' years of experience were not included due to software warnings for insufficient data for inferential statistics. Four influence factors were the independent variable, and were tested against each of the 12 waterfowl management strategies, which were the dependent variable.

The t-test found none of the four influence factors to be significant, at the 95% confidence interval, in choosing education/outreach as a waterfowl management strategy. Visitor use and hunting were expected to be significant influences in the selection of education/outreach as waterfowl management strategy due to both factors requiring a certain level of education and outreach in themselves. Perhaps respondents assumed the educational component of these two factors were already accounted for, and therefore did not directly link hunting and visitor use with education/outreach selection. The factor that possessed the highest mean was wetlands (3.60) and the lowest was visitor use (2.25).

Table 31: Influences on Strategy Selection – Education/Outreach

<b>Influences</b>	<b>Use strategy mean (n=20)</b>	<b>Do not use strategy mean (n=12)</b>	<b>T</b>	<b>P-value</b>
Visitor Use	2.25	2.65	-1.12	0.27
Hunting	2.35	1.55	-1.72	0.10
Management Plan Type	2.80	2.75	-0.16	0.87
Wetlands	3.60	3.58	-0.08	0.94

The t-test showed none of the four influence factors to be significant in choosing law enforcement as a waterfowl management strategy. This finding is inconsistent with coastal ACJV sites in this study, which all require some level of law enforcement. Further, hunting requires regulation and law enforcement, therefore it was expected that hunting on site would significantly impact law enforcement on site. The opposite was found with hunting on site having the lowest mean (2.15). Wetlands on site had the highest mean (3.57).

Table 32: Influences on Strategy Selection - Law Enforcement

<b>Influences</b>	<b>Use strategy mean (n=28)</b>	<b>Do not use strategy mean (n=4)</b>	<b>T</b>	<b>P-value</b>
Visitor Use	2.57	2.00	-1.09	0.28
Hunting	2.15	1.50	-0.94	0.36
Management Plan Type	2.75	3.00	0.56	0.58
Wetlands	3.57	3.75	0.59	0.56

The t-test found no significance between the four influence factors and habitat management selection as a waterfowl management strategy. This finding is inconsistent with the coastal ACJV site management plans, which all contain habitat management step-down plans. Further, wetlands on site were expected to significantly influence choosing habitat management since wetlands are a primary cause for habitat management on coastal ACJV sites. Wetlands did have the highest mean (3.68), while hunting had the lowest mean (2.12).

Table 33: Influences on Strategy Selection - Habitat Management

<b>Influences</b>	<b>Use strategy mean (n=25)</b>	<b>Do not use strategy mean (n=7)</b>	<b>T</b>	<b>P-value</b>
Visitor Use	2.56	2.29	-0.65	0.52
Hunting	2.12	1.83	-0.48	0.63
Management Plan Type	2.68	3.14	1.32	0.20
Wetlands	3.68	3.29	-1.70	0.10

No significant influence was found between the four factors and selection of hunting as a waterfowl management strategy. Hunting on site was expected to significantly influence the choice of hunting as a waterfowl management strategy. Perhaps this relationship was not found due to waterfowl hunting not being allowed on site. It is still possible that hunting on site would influence waterfowl hunting as a management strategy ( $p = 0.07$ ). Wetlands had the highest mean (3.63), while hunting had the lowest mean (2.29).



Table 34: Influences on Strategy Selection - Hunting

<b>Influences</b>	<b>Use strategy mean (n=24)</b>	<b>Do not use strategy mean (n=8)</b>	<b>T</b>	<b>P-value</b>
Visitor Use	2.54	2.38	-0.41	0.69
Hunting	2.29	1.29	-1.89	0.07
Management Plan Type	2.71	3.00	0.86	0.40
Wetlands	3.63	3.50	-0.54	0.59

None of the four influence factors were shown to have significant importance in choosing impoundment management. Management plan type was suspected to have significant influence in selecting impoundment management due to impoundments mainly being a habitat feature on USFWS sites. The highest mean was wetlands (3.63) and the lowest mean was hunting (1.96).

Table 35: Influence on Strategy Selection - Impoundment Management

<b>Influences</b>	<b>Use strategy mean (n=24)</b>	<b>Do not use strategy mean (n=8)</b>	<b>T</b>	<b>P-value</b>
Visitor Use	2.46	2.63	0.41	0.69
Hunting	1.96	2.43	0.85	0.41
Management Plan Type	2.71	3.00	0.86	0.40
Wetlands	3.63	3.50	-0.54	0.59

The t-test found wetlands to have significant importance in choosing less frequent waterfowl counts as a waterfowl management survey (p-value 0.02). This could be due to wetlands on site being necessary habitat for foraging, breeding and/or wintering waterfowl. For a less frequent waterfowl count to be successfully implemented, waterfowl would need to be on site cyclically. A site containing preferred habitat for waterfowl would increase that outcome.

None of the other factors were found to have significant importance in choosing less frequent waterfowl count. The highest mean was wetlands (3.74), while the lowest was hunting (2.09).

Table 36: Influence on Strategy Selection - Less Frequent Waterfowl Count

<b>Influences</b>	<b>Use strategy mean (n=23)</b>	<b>Do not use strategy mean (n=9)</b>	<b>T</b>	<b>P-value</b>
Visitor Use	2.65	2.11	-1.42	0.17
Hunting	2.09	2.00	-0.16	0.87
Management Plan Type	2.70	3.00	0.93	0.36
Wetlands	3.74	3.22	-2.53	*0.02

\*Significant >0.05

None of the factors were found to have significant importance, in the 95% confidence interval, in choosing limited access. It was expected that visitor use would be important to limited access selection due to the potential conflict between high visitation rates and site conservation goals. It was also expected that hunting would significantly influence limited access due to sites creating hunting zones and following hunting regulation seasons. Again, the highest mean was wetlands (3.59), while the lowest mean was hunting.

Table 37: Influence on Strategy Selection - Limited Access

<b>Influences</b>	<b>Use strategy mean (n=29)</b>	<b>Do not use strategy mean (n=3)</b>	<b>T</b>	<b>P-value</b>
Visitor Use	2.45	3.00	0.92	0.36
Hunting	2.07	2.00	-0.09	0.93
Management Plan Type	2.80	2.67	-0.25	0.81
Wetlands	3.59	3.67	0.23	0.82

The t-test found no significant importance between the four factors and mid-winter waterfowl count selection. Similar to expectations with the less frequent waterfowl count,

wetlands on site were expected to have a significant influence on mid-winter waterfowl count due to wetlands providing habitat for foraging, breeding, and/or nesting. Wetlands did have the highest mean (3.65), and hunting once again had the lowest mean (2.13).

Table 38: Influence on Strategy Selection - Mid-Winter Waterfowl Count

<b>Influences</b>	<b>Use strategy mean (n=23)</b>	<b>Do not use strategy mean (n=9)</b>	<b>T</b>	<b>P-value</b>
Visitor Use	2.61	2.22	-0.99	0.33
Hunting	2.13	1.88	-0.48	0.64
Management Plan Type	2.91	2.44	-1.46	0.16
Wetlands	3.65	3.44	-0.94	0.35

The t-test found none of the four factors to be significant in choosing monitoring as a waterfowl management strategy. Management plan type was expected to show significance due to plan type representing agency. The USFWS consistently follows adaptive management regimes, which rely heavily on monitoring. The highest mean was wetlands (3.68), and the lowest mean was hunting (2.05).

Table 39: Influence on Strategy Selection - Monitoring

<b>Influences</b>	<b>Use strategy mean (n=22)</b>	<b>Do not use strategy mean (n=10)</b>	<b>T</b>	<b>P-value</b>
Visitor Use	2.64	2.20	-1.17	0.25
Hunting	2.05	2.11	0.13	0.90
Management Plan Type	2.68	3.00	1.00	0.32
Wetlands	3.68	3.40	-1.34	0.20

The t-test found no significance between the four influence factors and partnership selection as a waterfowl management strategy. The four influence factors can also be labeled as site characteristics. Partnerships occur in a more administrative/managerial setting. Perhaps no significance was found because site characteristics do not heavily influence administrative operations. Wetlands had the highest mean (3.58), while hunting had the lowest (2.03).

Table 40: Influence on Strategy Selection - Partnerships

<b>Influences</b>	<b>Use strategy mean (n=31)</b>	<b>Do not use strategy mean (n=1)</b>	<b>T</b>	<b>P-value</b>
Visitor Use	2.48	3.00	0.51	0.61
Hunting	2.03	3.00	0.73	0.47
Management Plan Type	2.74	4.00	1.52	0.14
Wetlands	3.58	4.00	0.73	0.47

No significant relationship was found between the four influence factors and research selection as a waterfowl management strategy. The agencies represented in this survey sample (USFWS, NPS, USFS) have a research component to their management goals. A possible explanation for lack of significance could be respondents assumed research was being conducted with or without the four factors influencing research selection. The highest mean was again wetlands (3.62), while the lowest was hunting (1.95).

Table 41: Influence on Strategy Selection - Research

<b>Influences</b>	<b>Use strategy mean (n=21)</b>	<b>Do not use strategy mean (n=11)</b>	<b>T</b>	<b>P-value</b>
Visitor Use	2.62	2.27	-0.94	0.35
Hunting	1.95	2.27	0.66	0.51
Management Plan Type	2.71	2.91	0.62	0.54
Wetlands	3.62	3.55	-0.35	0.73

The t-test found wetlands to be significant ( $p= 0.02$ ) in the selection of weekly waterbird counts as a strategy for waterfowl management. The explanation for this relationship is in keeping with the relationship found with less frequent waterfowl count. Wetlands on site are necessary habitat for foraging, breeding and/or wintering waterfowl. For a weekly waterbird count to be successfully implemented, waterfowl would need to be on site regularly. A site containing preferred habitat for waterfowl would increase waterfowl presence at the site (Stralberg et al 2011). Wetlands had the highest mean (4.00) and hunting had the lowest mean (2.00).

Table 42: Influence on Strategy Selection - Weekly Waterbird Count

<b>Influences</b>	<b>Use strategy mean (n=8)</b>	<b>Do not use strategy mean (n=24)</b>	<b>T</b>	<b>p-value</b>
Visitor Use	2.75	2.42	-0.83	0.42
Hunting	2.00	2.09	0.16	0.87
Management Plan Type	2.88	2.75	-0.36	0.72
Wetlands	4.00	3.46	-2.58	*0.02

\*Significant  $>0.05$

Based on the t-tests above, Hypothesis 2b, 2c, and 2d were not supported. Hypothesis 2e was supported.

*H3: The perceived effectiveness of waterfowl management strategies depends on the survey participants' professional background.*

A t-test was used to measure respondents' perceived effectiveness of waterfowl management strategies and respondents' professional background. Perceived effectiveness of waterfowl management strategies was the dependent variable and respondents' professional background was the independent variable.

Table 43: Management Strategy Effectiveness and Respondents' Background

<b>Strategies</b>	<b>Biology degree mean</b>	<b>Other degree mean</b>	<b>T</b>	<b>P-value</b>
Education/outreach**	2.50	3.08	2.53	*0.01
Law Enforcement	2.90	3.23	1.36	0.18
Habitat Management	3.37	3.58	0.40	0.40
Hunting	2.58	2.67	0.26	0.80
Impoundment Management	3.16	3.45	0.82	0.42
Less Frequent Waterbird Count	1.74	1.67	-0.22	0.83
Limited Access	2.68	3.00	1.13	0.23
Mid-Winter Waterfowl Count	3.05	2.54	-1.67	0.12
Monitoring	3.11	2.92	-1.06	0.30
Partnerships	3.16	3.58	1.59	0.13
Research	3.16	3.17	0.04	0.97
Weekly Waterfowl Count	2.68	2.42	-0.85	0.40

\*significant at  $p < 0.05$ ; \*\*equal variances not assumed

A significant positive relationship was found between respondents' professional background and the perceived effectiveness of education/outreach. It makes intuitive sense that a manager's professional background would impact their perception of the effectiveness of educating the public. However, equal variances cannot be assumed between the two variables. The t-test found no other significant relationships. Based on these findings, Hypothesis 3 was not supported.

*H4: The perceived effectiveness of waterfowl management strategies depends on the survey participants' years of experience in the field.*

A Pearson's correlation was run to measure respondents' perceived effectiveness of management strategies and respondents' years of experience. The dependent variable was perceived effectiveness of management strategies, and years of experience was the independent variable.

Table 44: Management Strategy Effectiveness and Respondents' Years of Experience

Management Strategy	Respondents' Years of Experience		
	N	Correlation	Sig.
Education/outreach	34	0.03	0.86
Law Enforcement	32	0.03	0.98
Habitat Management	31	0.25	0.17
Hunting	31	-0.18	0.32
Impoundment Management	30	0.21	0.28
Less Frequent Waterbird Count	31	-0.01	0.95
Limited Access	32	-0.14	0.43
Mid-Winter Waterfowl Count	32	-0.13	0.49
Monitoring	31	-0.02	0.94
Partnerships	31	0.20	0.29
Research	31	0.18	0.32
Weekly Waterfowl Count	31	-0.40	*0.03

\*significant  $p < 0.05$

The correlation showed a significant negative relationship between respondents' years of experience in the field and perceived effectiveness of weekly waterfowl count. This finding is the opposite of what was expected; that with more years of experience waterfowl managers would not choose to implement weekly waterbird counts because that management strategy is perceived as not effective. This could be due to staffing short falls in that weekly counts are not effective enough giving the time and staff needed to dedicate to this activity each week. Also, due to the seasonal influx of waterfowl at these sites, a weekly count may not be as beneficial to

waterfowl monitoring as mid-winter counts or some form of less frequent waterbird counts. No other significant relationships were found. Based on these findings, Hypothesis 4 is supported.

Table 45: Summary of Hypotheses & Findings

<b>Hypotheses</b>		<b>Outcome</b>
H1:	Waterfowl management strategy use by sites will vary by agency.	Not Supported
H2a:	Waterfowl management strategies used at individual sites within the ACJV are influenced by Managers' professional background.	Not Supported
H2b:	Waterfowl management strategies used at individual sites within the ACJV are influenced by visitor use.	Not Supported
H2c:	Waterfowl management strategies used at individual sites within the ACJV are influenced by hunting on site.	Not Supported
H2d:	Waterfowl management strategies used at individual sites within the ACJV are influenced by type of site management plan.	Not Supported
H2e:	Waterfowl management strategies used at individual sites within the ACJV are influenced by wetlands on site.	Supported
H3:	The perceived effectiveness of waterfowl management strategies depends on the survey participants' professional background.	Not Supported
H4:	The perceived effectiveness of waterfowl management strategies depends on the survey participants' years of experience in the field.	Supported

### **Regional Patterns**

In addition to descriptive and inferential statistics, relevant variables from the survey data were mapped in order to determine if spatial patterns existed. Fourteen variables were considered relevant, meaning these variables should potentially show some variation between



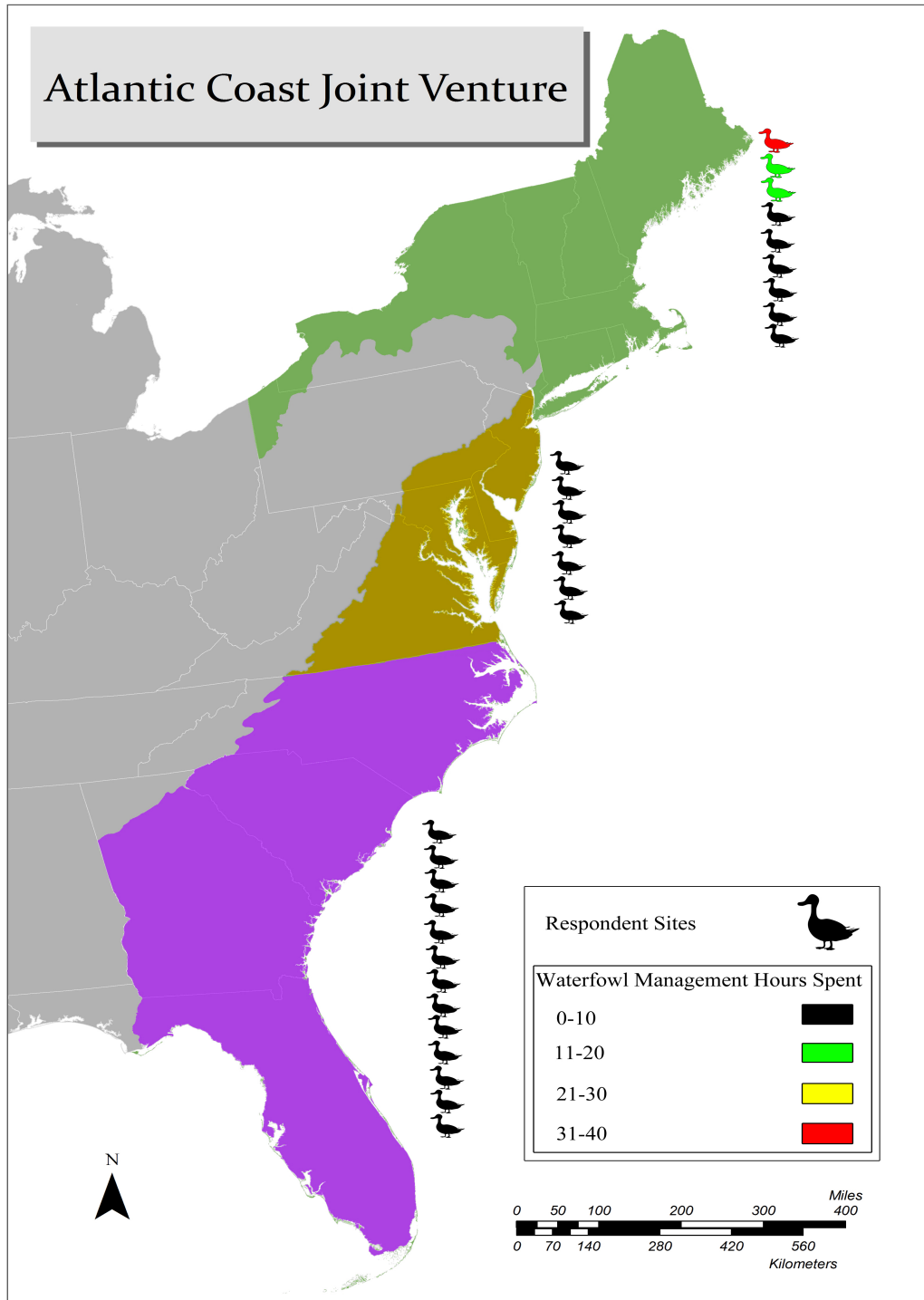
ACJV regions due to waterfowl migration patterns and the use of specific waterfowl management strategies for breeding and wintering waterfowl on-site. These variables were the number of hours per week respondents reported spending on waterfowl management in the summer season and in the winter season; in addition to all 12 waterfowl management strategies at the site level reported by respondents. Each variable was mapped within the ACJV boundaries and ACJV regions. To keep the anonymity of the survey respondents, the findings from this regional analysis will be described by ACJV region and management agency. Further, not all relevant variables displayed spatial patterns. Those variables that displayed patterns or anomalies were considered important variables. The maps of these important variables were adapted to maintain respondent anonymity and are included within their findings below.

First, the numbers of hours per week respondents reported spending on waterfowl management were mapped for summer and winter hours (See Figures 15 and 16). The majority of respondents (90%) conducted waterfowl management activities between zero and ten hours per week during the summer season. 10% of respondents stated waterfowl management activities were conducted more than 10 hours per week during the summer season. The 10% of respondents conducting more than 10 hours of waterfowl management during the summer season were all located in the North Region of the ACJV (See Figure 15). It is not surprising that sites within the North Region of the ACJV would conduct more hours of waterfowl management during the summer season since those sites would be mostly inactive due to harsh weather conditions during the winter season.

Next, the majority of respondents (87%) reported conducting waterfowl management between zero and ten hours per week during the winter season. 17% of respondents reported waterfowl management was conducted more than 10 hours per week during the winter season.

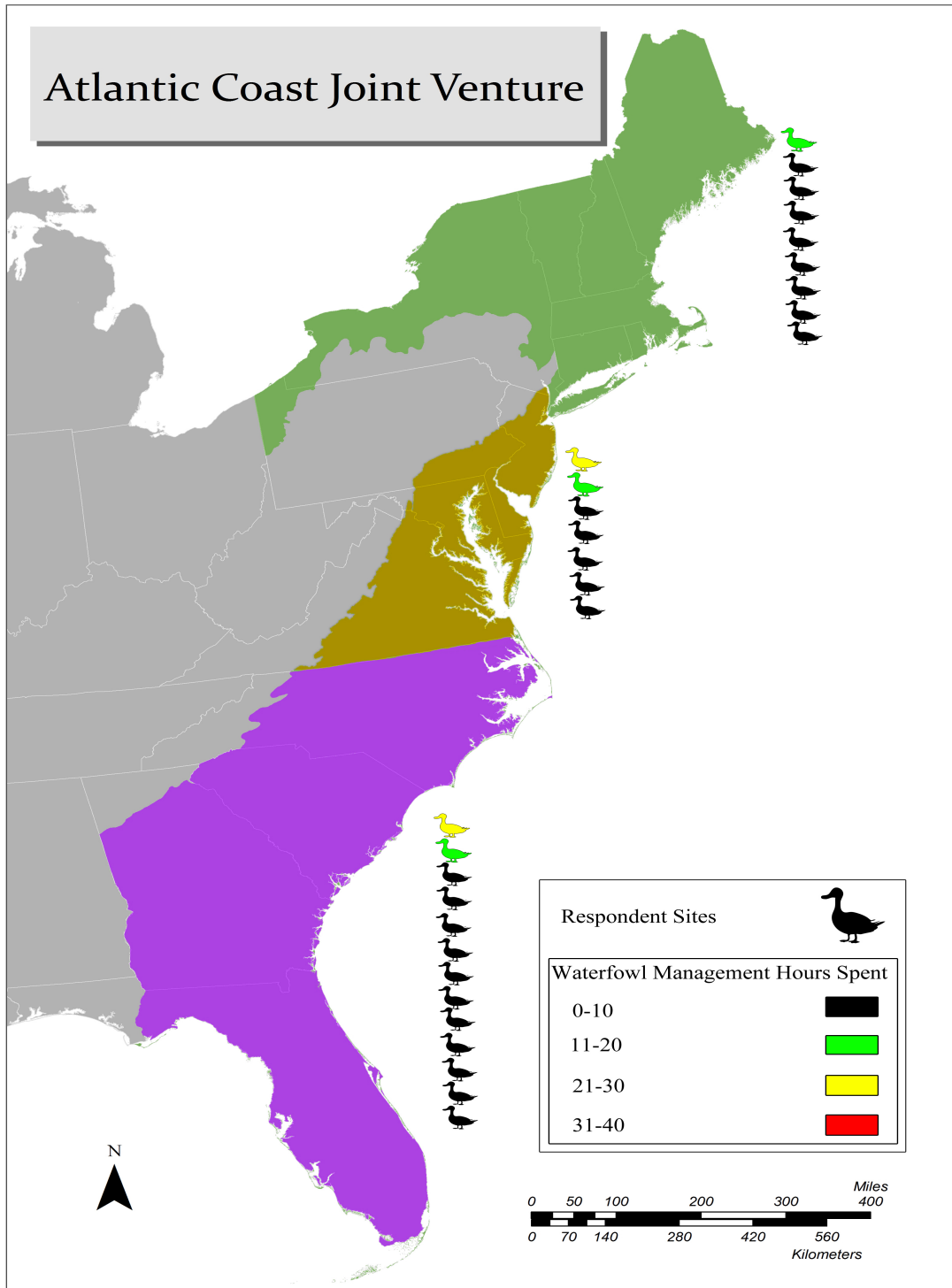
Those sites reporting more than 10 hours per week on waterfowl management were clustered on the border of the Mid-Atlantic and South Regions of the ACJV (See Figure 16). There was also one report of greater hours spent on waterfowl management in the North Region. The clustering of increased hours on the border of the Mid-Atlantic and South Regions is not surprising giving the lower latitudes would spend more hours on waterfowl management in the winter season due to fall migrations. Also, the states along those borders, Virginia and North Carolina, consist of multiple conservation sites that provide preferred wetland habitat for migrating waterfowl (Atlantic Coast Joint Venture 2009a). This particular area also contains numerous Important Bird Areas which point strongly to these areas containing specific habitats needed for a variety of bird species in addition to waterfowl and a need for continued management of these areas for waterfowl and native bird species (Cecil, Sanchez, Stenhouse, & Hartzler 2009).

Figure 15. Number of Hours per Week For Waterfowl Management in Summer



Source: Adapted from the Atlantic Coast Joint Venture (2009a). This map identifies number of responses for this variable by ACJV region and respondents' number of hours per week spent on waterfowl management during the summer season.

Figure 16. Number of Hours per Week for Waterfowl Management in Winter



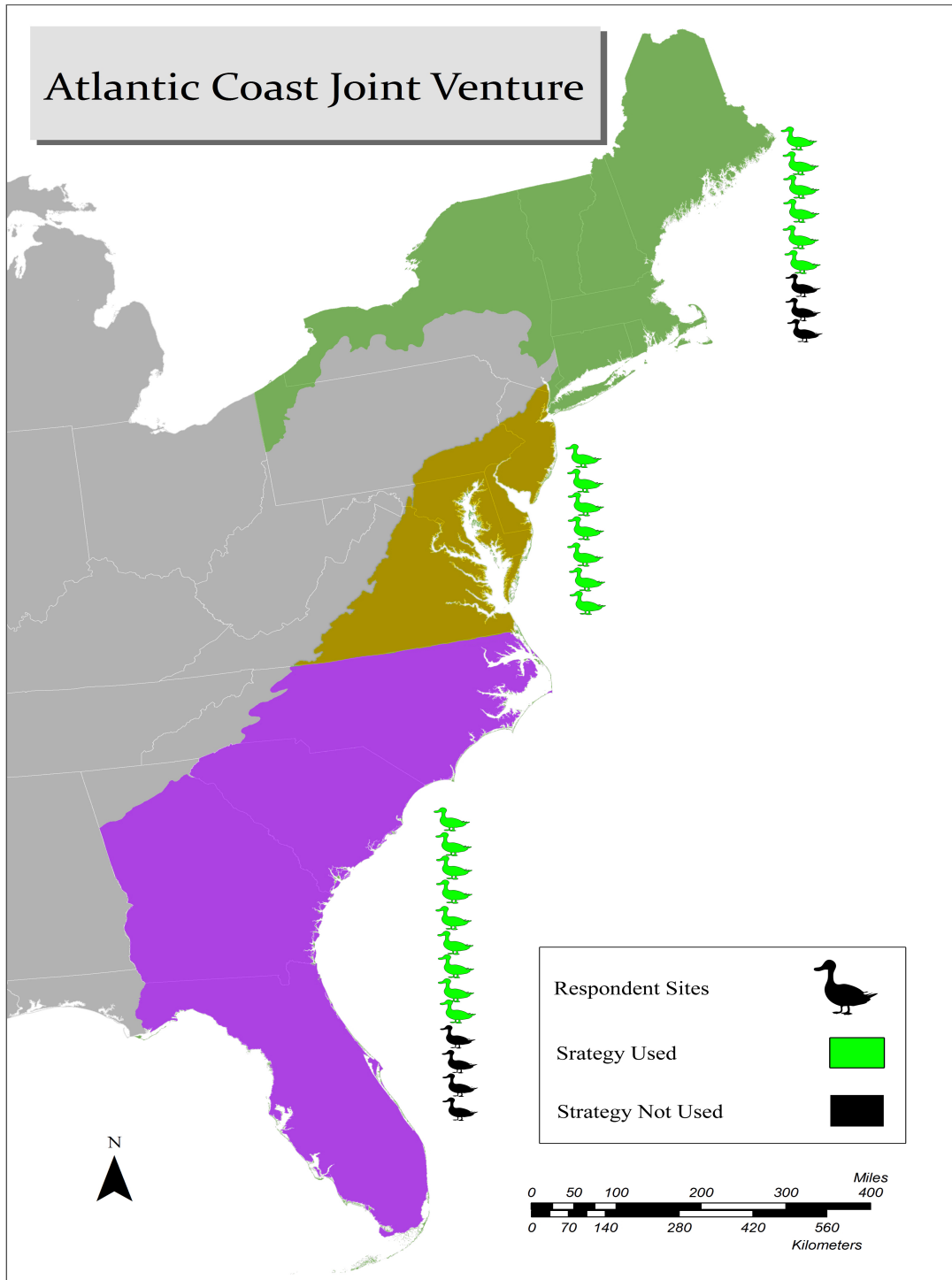
Source: Adapted from the Atlantic Coast Joint Venture (2009a). This map identifies number of responses for this variable by ACJV region and respondents' number of hours spent per week on waterfowl management during the winter season.

Second, Education and Outreach, Law Enforcement, Habitat Management, and Hunting were management strategies mapped independently for strategy use by respondents. No geographic patterns were found by ACJV region and no differences were identified by management agency.

Third, Less Frequent Waterfowl Count, Limited Access Impoundment Management, and Mid-Winter Waterfowl Count were management strategies mapped independently for strategy use by respondents. No geographic patterns were identified for Less Frequent Waterfowl Count; however, this strategy was used consistently by the USFS. Limited Access was reported as used by all respondents in the North and Mid-Atlantic Regions of the ACJV. This strategy was also used consistently by the NPS. Impoundment Management and Mid-Winter Waterfowl Count were reported as used by all respondents within the Mid-Atlantic Region of the ACJV (See Figures 17 and 18).

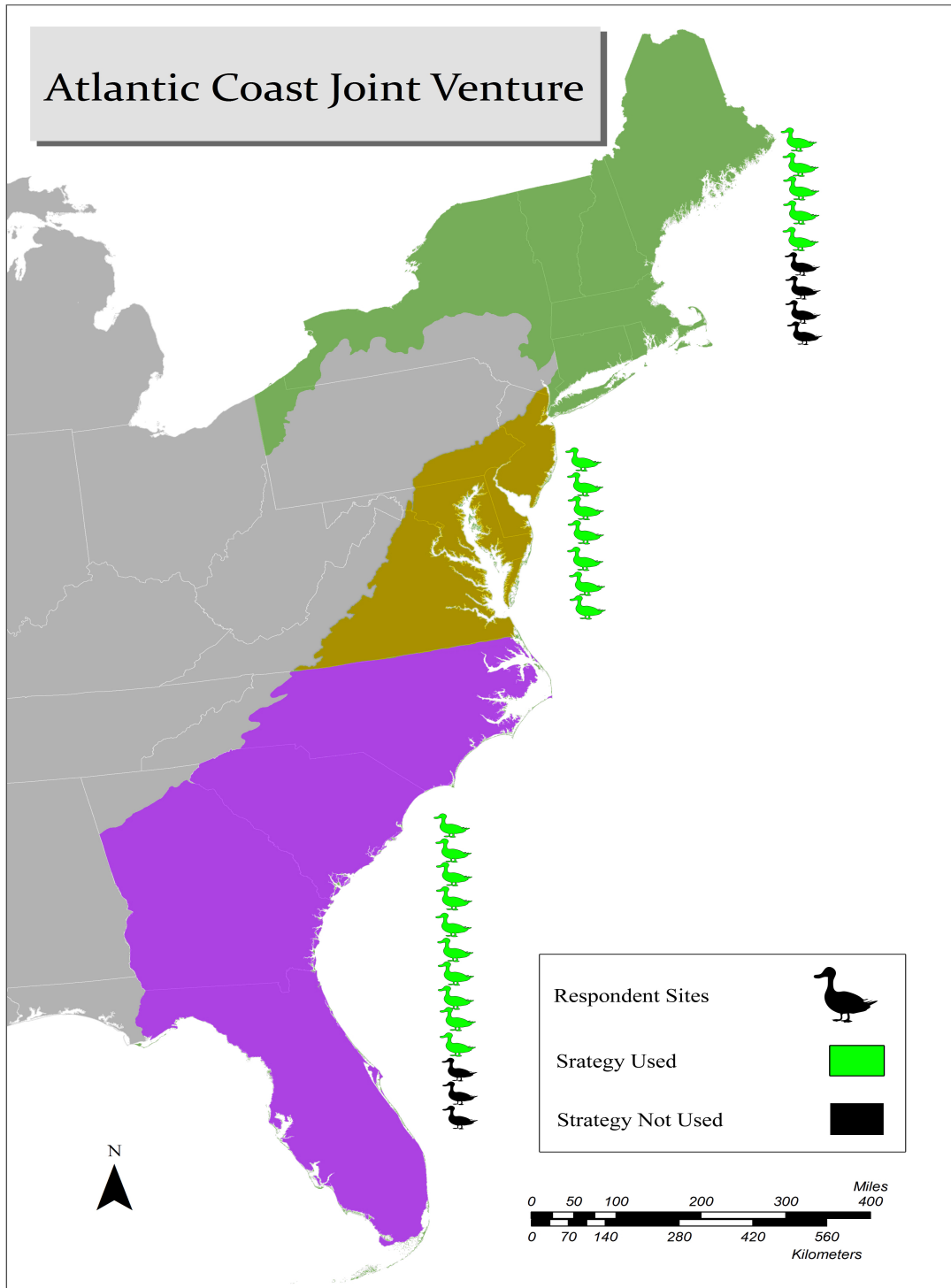
Impoundments are used as stopover and overwintering sites for waterfowl and are managed for migratory shorebirds and waterfowl; while the Mid-Winter Waterfowl Count is done consistently during the winter months to gauge waterfowl population trends within the ACJV. That being said, the United States has a total of 878 species of birds, 226 of which are waterfowl (BirdLife International 2013). Additionally, there is a minimum of 30 Important Bird Areas (IBAs) along the coast of the ACJV boundary which are conservation areas targeted at globally significant species and migratory and congregatory species of birds (BirdLife International. 2013). The fact that these two management strategies were reported as used by all respondents within the Mid-Atlantic Region of the ACJV identifies this region as heavily managed for waterfowl along the coast and implies large numbers of waterfowl fluctuating seasonally within this region.

Figure 17. Impoundment Management Use by Respondents



Source: Adapted from the Atlantic Coast Joint Venture (2009a). Map identifies number of respondents in each region of the ACJV and impoundment management strategy use within regions.

Figure 18. Mid-Winter Waterfowl Count Use by Respondents

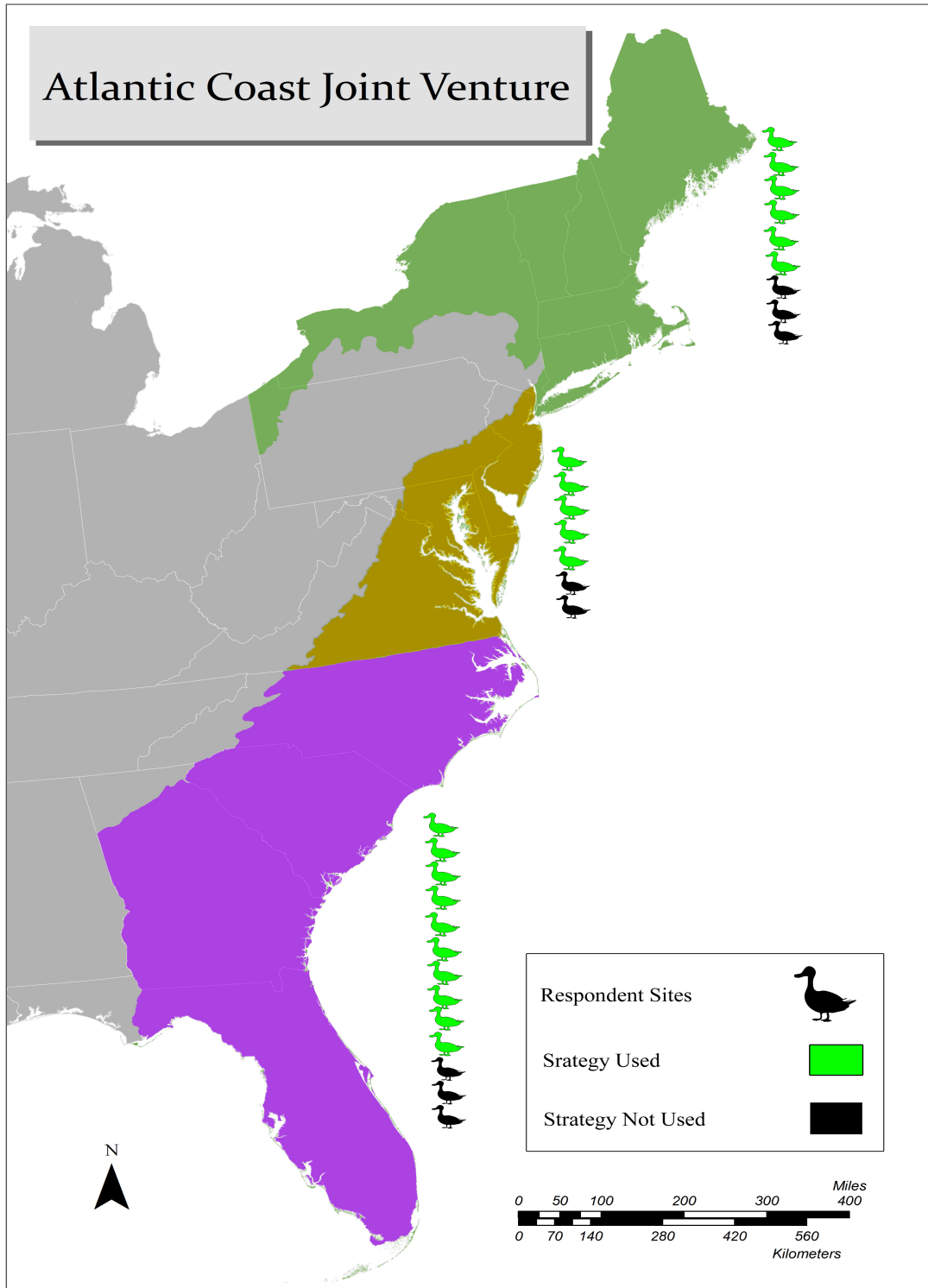


Source: Adapted from the Atlantic Coast Joint Venture (2009a). Map identifies number of respondents in each region of the ACJV and impoundment management strategy use within regions.

Fourth, Research, Partnerships, Monitoring, and Weekly Waterbird Count were management strategies mapped independently for strategy use by respondents. No geographic patterns or differences between management agencies were identified for the use of Research as a waterfowl management strategy. On the contrary, Partnerships were reported as used by all respondents. Monitoring was found to be inconsistent within ACJV Regions; conversely, USFS consistently used monitoring, as did the NPS in the South Region of the ACJV (See Figure 19). The NPS in the North Region of the ACJV did not use monitoring. One possible explanation for inconsistent use of Monitoring as a waterfowl management strategy is the interpretation of monitoring. Monitoring can include multiple management actions, such as nesting boxes, banding, and waterfowl counts. Respondents could have assumed a specific implication to monitoring and therefore not listed it as a strategy used at their site, when in fact it is potentially used. Weekly Waterbird Count was clustered around the border of the Mid-Atlantic and South Regions of the ACJV (See Figure 20). This pattern is similar to patterns seen for Mid-Winter Waterfowl Count. Again, this pattern not surprising giving the numbers of waterfowl migrating through the Mid-Atlantic Region (Bird Life International 2013)

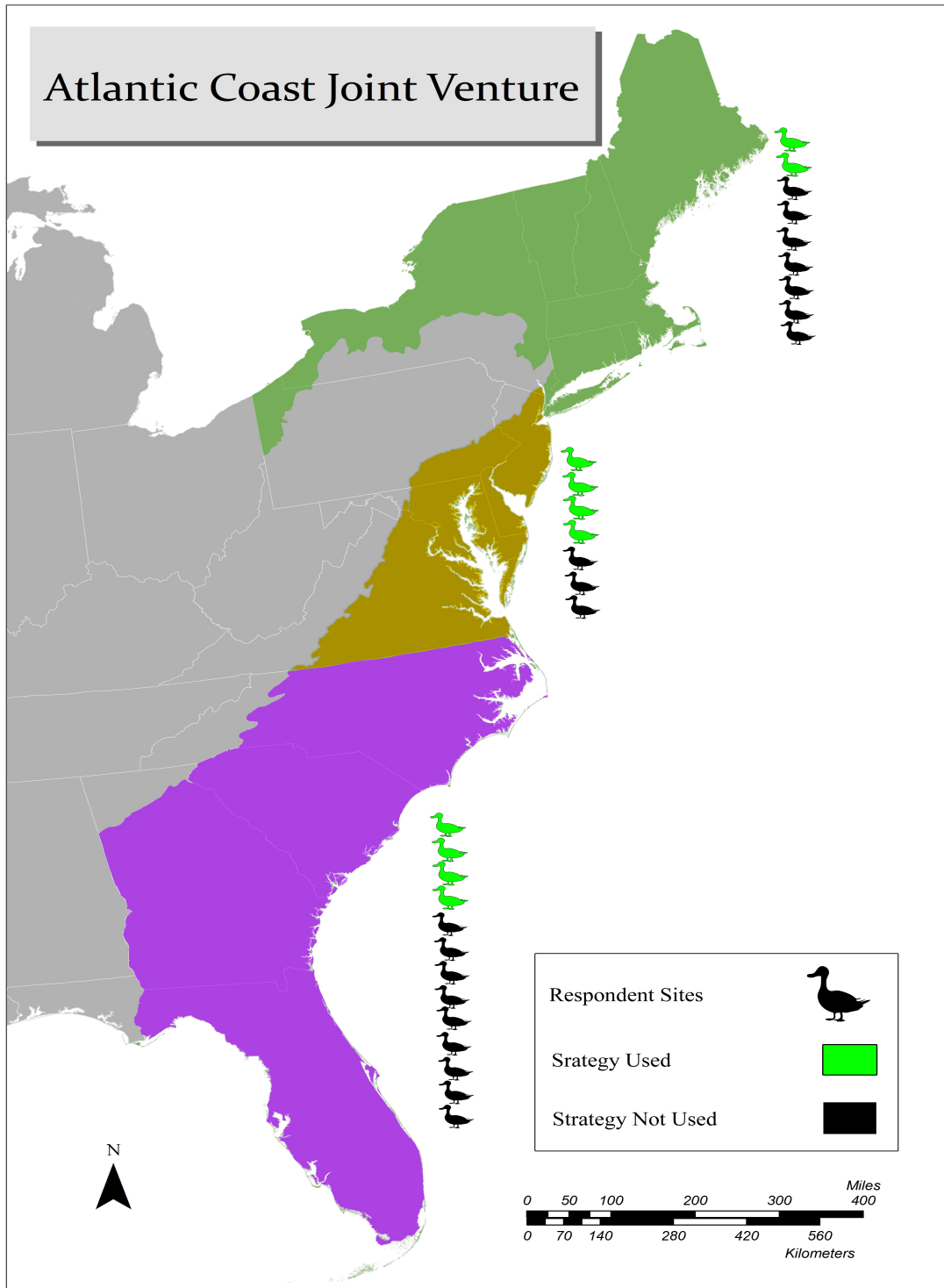


Figure 19: Monitoring Use by Respondents



Source: Adapted from the Atlantic Coast Joint Venture (2009a). Map identifies number of respondents in each region of the ACJV and monitoring management strategy use within regions.

Figure 20. Weekly Waterbird Count Use by Respondents



Source: Adapted from the Atlantic Coast Joint Venture (2009a). Map identifies number of respondents in each region of the ACJV and weekly waterbird count management strategy use within regions.

## CHAPTER VI

### WATERFOWL MANAGEMENT - IMPLICATIONS FOR CHANGE

#### **Summary of Research Purpose**

The purpose of this dissertation was to identify management strategies used for waterfowl management and the perceived effectiveness of these strategies at coastal sites within the ACJV. Currently there is a gap in knowledge that is three-fold: (1) There is no framework available for linking waterfowl management goals listed within site management plans to management strategies used on-site. (2) No resource is available that identifies waterfowl management strategies currently implemented by individual sites, within the ACJV regions, or within the Atlantic Flyway, and (3) No evaluation of waterfowl management professionals' view of waterfowl management at the site-level has been tackled in recent years.

This study addressed these knowledge gaps through three specific research objectives:

*Objective 1:* To identify and analyze waterfowl management strategies utilized by coastal sites within the Atlantic Coast Joint Venture.

*Objective 2:* To determine whether waterfowl management strategy use is consistent among coastal sites within the Atlantic Coast Joint Venture.

*Objective 3:* To examine waterfowl management strategy use and value by identifying waterfowl management professionals' perception of strategy effectiveness for coastal sites within the Atlantic Coast Joint Venture.

## **Key Findings: Objective I**

The first research objective stated: *To identify and analyze waterfowl management strategies utilized by coastal sites within the Atlantic Coast Joint Venture*. This objective was met through two actions (1) a review and discussion of waterfowl management administrative history, influential federal policies, the evolution of wildlife management theories and environmental values, and (2) an analysis of site management plans.

### *Rubric Development*

The review and discussion of the complex components of waterfowl management history is the start of a discourse of waterfowl management in coastal habitats and lays the foundation for identifying the state of practice. This information was used in the development of a rubric for the site management plan analysis and to discern a list of waterfowl management strategies. The rubric developed for this study is an important contribution to waterfowl management because it is an instrument that allows researchers to identify what waterfowl management authorities list as best management practices for waterfowl at the site level.

### *Extraction of Waterfowl Management Strategies*

Moreover, the extensive review of waterfowl management's administrative history and management theories, along with a select review of site management plans, are used to create a list of waterfowl management strategies, which should be implemented at the site level. Thirteen waterfowl management strategies are identified as being potentially implemented within the ACJV. These strategies are:

1. Education and Outreach
2. Enforcement

3. Habitat Management (vegetation cover, food source)
4. Hunting
5. Impoundment Management
6. Invasive Species Management
7. Less Frequent Waterbird Count
8. Limited Access
9. Mid-winter waterfowl count
10. Monitoring (nest boxes, banding, wing counts)
11. Partnerships
12. Research
13. Weekly waterbird count

Identifying these waterfowl management strategies is important because it establishes a list of management strategies identified by site management plans as necessary for waterfowl management at that scale. This list can be utilized by individual site across the ACJV as a reference for best practices in waterfowl management. To date, there is no other source for this information.

#### *Site Management Plan Analysis*

The site management plan analysis contributed three main findings. First, the site management plan analysis found consistency in the type of site management plan used by agencies. USFWS used Comprehensive Conservation Plans (CCPs) universally; the NPS used General Management Plans (GMPs) universally; the USFS used Land and Resource Management Plans. Second, the analysis found consistency of management strategies listed within plans. Specifically, there was consistency in the use of four waterfowl management strategies:

1. Partnerships (51.2% of plans)
2. Habitat Management (44.2% of plans)
3. Monitoring (44.2% of plans)
4. Education and Outreach (37.2% of plans)

Lastly, this site management plan analysis found constancy in management strategies not listed often with site management plans. Specifically, the management strategy, weekly waterbird count, was rarely listed in site management plans (4.7% of plans).

The rubric development and site management plan analysis is the first step in the establishment of a framework for linking waterfowl management strategies listed in the site management plans to those strategies implemented at the site level. This is valuable in light of numerous CCPs being in the process of revision, which was identified through the management plan analysis and also through the survey of waterfowl management professionals, along with the NAWMP (2012) revisions. Identifying areas of discrepancy between site management plans and on-site management will aid in the revisions and updates of site management plans, as well as, regional management plans by bringing to light management goals that are unattainable or unable to be implemented at the site level, and conversely management actions that are omitted within planning documents.

### **Key Findings: Objective II**

The second objective stated, *To determine whether waterfowl management strategy use is consistent among coastal sites within the Atlantic Coast Joint Venture.* This objective was met through a survey of waterfowl management professionals at coastal sites within the ACJV. The questionnaire developed for this study used the waterfowl management strategies derived from the review of history, policy, and site management plans to identify what management strategies were currently implemented at coastal sites within the ACJV. Only 12 waterfowl management strategies were used in the questionnaire. Invasive species management was removed from the list of strategies after an expert panel of reviewers thought the strategy would be viewed by

respondents as separate from waterfowl management instead of a strategy for the management of waterfowl.

### *Waterfowl Management Strategy Use*

The survey found that all 12 management strategies were used by at least one site in the survey sample. However, some strategies were reported as used more often than others (by more sites/respondents). The most frequently used waterfowl management strategies were:

- Partnerships (97.1% of respondents)
- Limited Access (91.4% of respondents)

The least frequently used waterfowl management strategy was weekly waterbird count (31.4% of respondents). This finding supports a level of consistency between management strategies listed within site management plans and those management strategies currently implemented at the site level since less than half of respondents stated using the strategy and a very low percentage of waterfowl management plans (4.7%) listed the strategy. Partnerships was reported as being currently used by 97.1% of respondents and was also listed most frequently in the site management plans (51.2% of plans). Similarly, Weekly Waterbird Count was reported least often as currently used (31.4% of respondents), and was listed least frequently in site management plans (4.7% of plans).

A few discrepancies were noted between the survey findings and the site management plans analysis regarding strategy use. First, the site management plan analysis found Habitat Management (44.2% of plans), Monitoring (44.2% of plans), and Education and Outreach (37.2% of plans) to be listed quite frequently within the site management plans, but these strategies were not reported as frequently used by survey respondents. Second, Limited Access

was reported by 91.4% of respondents as being currently used for waterfowl management at the site level, but only 21% of site management plans listed this strategy.

These findings reveal a disconnect between site management plans and site-level management. The waterfowl management authorities developing the site management plans identify priorities and needs for the sites that are not currently being implemented by managers. Managers are implementing strategies on-site that are not addressed in great depth (or at all) within the site management plans. How this disconnect effects waterfowl management is a research area in need of examination.

#### *Waterfowl Management Strategy Perceived Effectiveness*

Survey respondents were asked to rank the effectiveness of each management strategy.

The management strategies perceived as most effective were:

1. Habitat management (96.8% of respondents)
2. Law enforcement (90.7% of respondents)
3. Monitoring (90.4% of respondents)
4. Partnerships (90.4%)
5. Impoundment management (90.0% of respondents)
6. Research (90.0% of respondents)

Less Frequent Waterbird Count was perceived as least effective (16.1% of respondents). Despite Habitat Management being perceived as the most effective management strategy, it was not one of the most frequently used management strategies by respondents. However, Habitat Management was listed by 44.2% of site management plans. This finding is curious, because if waterfowl management authorities list Habitat Management within the site management plan to be used for waterfowl management, and waterfowl management professionals perceive Habitat Management as an effective waterfowl management strategy, then



it stands to reason that Habitat Management should be reported as used by a majority of respondents. Perhaps there are other influence factors responsible for this strategy selection; or perhaps respondents viewed Habitat Management as strategy used outside of waterfowl management that also happens to benefit waterfowl, instead of a strategy for the management of waterfowl. While respondents perceived Law Enforcement, Monitoring, Impoundment Management, and Research as effective, but these strategies were not often reported as used at the site level. Monitoring is another example of a strategy listed frequently in site management plans (44.2% of site management plans), perceived as effective by respondents, but not reported as being frequently used at the site level.

These finding point to a gap between the process of site management plan development and the selection of waterfowl management strategies at the site level. This is important because it highlights the need for greater input from waterfowl management professionals' in the planning process. Regardless of whether a management strategy is perceive as effective, the site may not have the necessary funding or staff to implement the strategy; other influence factors may play a significant role in management strategy selection at the site level.

Partnerships was a management strategy consistently listed frequently within site management plans, reported as frequently used at the site level by respondents, and perceived as effective by respondents. This finding supports the mission of the ACJV to champion partnerships in an effort to improve waterfowl conservation. Moreover, the NAWMP & Atlantic Flyway both have administrative boards consisting of partners from various government and non-profit agencies. These partnerships are the foundational basis for current waterfowl management administration. This foundation is funneled down to the site level where

Partnerships was the only waterfowl management strategy consistent within all three areas of analysis.

These findings compose the second component of the framework for linking strategies listed in site management plans to those strategies used at the site level. This study goes one step further and connects waterfowl management professionals' perceptions of efficacy to management strategies listed in site management plans and reported as used at the site level.

#### *Waterfowl Management Strategy Use By Agency*

A Chi Square was performed to test significance between waterfowl management strategy use and management agency. The first Hypothesis stated: *Waterfowl management strategy use at individual sites within the ACJV will vary by agency.* Management strategies used did not vary by management agency. Since the majority of study sites were USFWS, this finding supports consistency of waterfowl management within the USFWS. It also points to regional continuity of waterfowl management within the ACJV. This stability of management could be due to top-down directives from the NAWMP. There was a possible relationship between impoundment management and agency ( $p=0.07$ ). This finding could indicate the instance of impoundments occurring more often on USFWS lands. These findings are important because continuity of waterfowl management could streamline the planning process, and enable managers and researchers to more accurately determine strategy effectiveness. Currently, the NAWMP (2012) is under revision to include an integrated waterfowl management approach. The integrated waterfowl management approach is designed to account for variations in management agency and other factors that vary across the Atlantic coast could potentially impact waterfowl management decisions, in an effort to improve waterfowl management efficacy. This study

identifies an existing level of consistency of management within the ACJV that affirms the new direction of the continental Plan.

### **Key Findings: Objective III**

The third objective stated, *To examine waterfowl management strategy use and value by identifying waterfowl management professionals' perception of strategy effectiveness for coastal sites within the Atlantic Coast Joint Venture.*

This objective was met through a survey of waterfowl management professionals at coastal sites within the ACJV. The questionnaire contained questions addressing influences on waterfowl management strategy selection, waterfowl management values, and perceived effectiveness of management strategies.

An extensive review of administrative history, pertinent literature (See Chapter II), and site management plans, potential waterfowl management strategy selection influence factors were identified. These factors are important because they have the potential impact strategy selection at the site level. Five influence factors were tested against management strategy selection. Those factors were: managers' professional background, visitor use, hunting on site, type of site management plan, and wetlands on site. The second Hypothesis stated, *Waterfowl management strategy use at individual sites within the ACJV is influenced by:*

*H2a: Managers' professional background*

*H2b: Visitor use*

*H2c: Hunting on site*

*H2d: Type of management plan*

*H2e: Wetlands on site*

Hypothesis testing was undertaken in two steps. First, a Cross Tab with Chi Square was used to test H2a, respondents' perception of managers' professional background influence on

management strategy selection. No significance was found between managers' professional background and management strategy selection.

The overwhelming majority of respondents had a professional background in Biology. As such, it is expected to have little-to-no variation. This finding is consistent with other studies (Riley, et al 2002) that focused on effectiveness of wildlife managers and the transformation of wildlife management over the 21<sup>st</sup> century, stated a need for "integration of multiple disciplines in management" (p. 585). Moreover, this study found site managers were perceived to be one of the most influential groups in selecting management strategies for waterfowl. This finding is important because as management of waterfowl adapts and evolves, there is immense potential to effect positive change in waterfowl management through the education and training of site managers.

Next, a series of t-tests were used to measure H2b through H2e. Two significant relationships were noted. 'Wetlands on site' was found to significantly influence less frequent waterfowl count selection ( $p=0.02$ ) and weekly waterbird count selection ( $p=0.02$ ). This could be due to wetlands on site being necessary habitat for foraging, breeding and/or wintering waterfowl. For a less frequent waterfowl count or weekly waterbird count to be successfully implemented, waterfowl would need to be on site regularly. A site containing waterfowl's preferred habitat would increase that outcome. This finding supports earlier studies (Stralberg, et. al. 2011; Melinchuk 1995; & Baldassarre & Bolen 1994) stressing the importance of maintaining wetland habitat for waterfowl.

A t-test was administered to measure respondents' perceived effectiveness of waterfowl management strategies and respondents' professional background. Hypothesis 3 stated: *The perceived effectiveness of waterfowl management strategies depends on the survey participants'*

*professional background*. One relationship was found to have significance (education and outreach effectiveness), however, due to sample size, equal variances could not be assumed for each variable, rendering the finding moot. Again, since the majority of respondents reported a professional background in biology, it is not surprising no variation was found. This finding is important because it reiterates the need for interdisciplinary waterfowl management professionals and higher education programs.

A Pearson's correlation was run to measure respondents' perceived effectiveness of management strategies and respondents' years of experience. Hypothesis 4 stated: *The perceived effectiveness of waterfowl management strategies depends on the survey participants' years of experience in the field*. The correlation showed a significant relationship between respondents' years of experience in the field and perceived effectiveness of Weekly Waterbird Count ( $p=0.03$ ). This correlation was negative, meaning the more years of experience a respondent had, the less effective they viewed Weekly Waterbird Counts.

This finding is in keeping with management strategies listed within the site management plans, in that, Weekly Waterbird Counts were listed least frequently, and therefore not regularly mandated for use in administrative documents. This finding could simply be due to more years of experience linking managers to working in more diverse sites. Managers with experience from multiple conservation sites have a wide-ranging management repertoire and have increased opportunities to witness management strategies' successful implementation. Or simply, this finding could be due to managers not seeing Weekly Waterbird Counts listed in their site management plans and thus, not implementing it.

This finding is important because current waterfowl management professionals are reaching retirement. The goals and management practices of coastal environments are shaped by

the worldview of those people managing them, and those views are changing (Olsen 1998). As new managers enter the field, new perceptions of waterfowl management strategy effectiveness will influence strategy selection.

### **Regional Patterns**

By mapping important variables from the survey data, regional patterns were found for four waterfowl management strategies. From these findings five points of discussion were derived. First, the combined geographic patterns suggest USFWS does not have one management plan that is used in different contexts for each individual site, but that the variation in respondents' responses suggests some inclusion of bottom-up management, in that sites are able to focus management strategies for waterfowl based on individual site needs. If all management actions originated from a single top-down source, then there would be little to no variation among USFWS respondents, but that is not the case in this study. This is intriguing because the NAWMP (2004 & 2012) is used as a waterfowl management standard on a continental scale. Giving this overarching plan, little variation in strategy use would be assumed within the ACJV, however, the 2004 Plan did not account for differing management agency missions. Since USFWS are the dominant management agency among coastal sites within the ACJV, and proportionally within the total ACJV boundary, this means there could be additional management strategy choice and use differences within the ACJV as a whole. These differences may not be spatially variable. The 2012 Plan revisions address these issues of management agency, as well as other factors of uncertainty through an integrated waterfowl management approach.

The two prongs of waterfowl management are habitat and population management through the NAMWP (1986) and harvest management through the Adapted Harvest Management and the Flyway system (Johnson 2011). These two systems of management developed independently from one another, which causes consequences in governance (Wilson 2006); these consequences can be seen in variations of management strategy use. The lack of connection between these two management regimes has become an issue for managers to overcome since conserving wetland habitat for waterfowl directly impacts harvestable numbers of waterfowl (Johnson 2011; & Runge, Johnson, Anderson, Koneff, Reed, & Mott 2006).

Second, the variation in number of hours spent on waterfowl management during the winter is a point of interest. The South Region of the ACJV was expected to invest significant hours on waterfowl management during the winter season when waterfowl are wintering on site (James & Cooper 2013). The fact that this was not reported could be that managers were simply dividing their time evenly between multiple management activities (habitat management, invasive species management, fisheries management), since waterfowl management is not the primary purpose of these coastal conservation sites.

Moreover, staffing and budgets are issues all federal agencies must negotiate. Lack of staff and funding are potential reasons for not investing more time in waterfowl management activities, along with habitat differences at individual sites. This could be a function of an adaptive management approach, where managers are working toward short and long-term conservation goals, but must adapt and shift human capital and funding to those management activities that are determined as critical to the site (Moir & Block 2001). This management assessment and redirection may not always include waterfowl management activities.

These findings, related to number of hours spent on waterfowl management, show how work load for natural resource managers shifts with seasonal migrations of waterfowl. Many factors influence waterfowl migration (James & Cooper 2013). Future impacts of climate change may impact waterfowl migration patterns. Any seasonal variability may require future consideration by managers on time allocation for waterfowl management.

Third, since weekly waterbird counts were clustered in the Mid-Atlantic Region of the ACJV, and waterfowl management hours for that region were higher during the winter season, it can be surmised that this region potentially conducts more weekly waterbird counts and managers at these sites may demonstrate some expertise in this particular waterfowl management strategy. The same inference can be made for impoundment management and mid-winter waterfowl count. The Mid-Atlantic Region of the ACJV has large numbers of waterfowl fluctuating seasonally within its boundaries. Additionally there are 30 plus IBAs along the coast of the ACJV boundary (BirdLife International. 2013). Knowing this, it is not surprising that this region of the ACJV would participate more heavily in monitoring waterfowl through counts because they have the bird numbers to make the action meaningful.

Fourth, mid-winter waterfowl count use varied within the North and South Regions of the ACJV. The Mid-Winter Waterfowl Count is a routine and standard practice in waterfowl management for estimating waterfowl populations (United States Fish & Wildlife Service 2012), not participating in the count would imply low staffing numbers, budget restraints, or trend of no waterfowl on site. This finding could also be the result of adaptive management. Adaptive management is founded on monitoring (Moir & Block 2001); the Mid-Winter Waterfowl Count is a longstanding monitoring endeavor. Managers could have chosen to not participate in this management action due to previous years of the count being uneventful, or budgetary restraints.



Fifth, partnerships were a management strategy consistently used geographically within the ACJV and across management agencies. It is clear from this finding that this strategy is important for waterfowl management. The revised NAWMP (2012) highlights this strategy in its new integrated waterfowl management approach. From this it is inferred that partnerships is a strategy that is perceived as effective from the top-down and bottom-up. This strategy is also used widely throughout North America for bird conservation, which reinforces its importance for waterfowl conservation and management (Cecil, Sanchez, Stenhouse, & Hartzler 2009). White (1984) noted the value of stakeholders' opinions with regard to waterfowl management, and Johnson (2011) stated waterfowl managers should come to appreciate the opinion of stakeholders and their ever-changing values, especially when those values are reflections of management actions. Partnerships are a good example of stakeholder involvement with waterfowl management. With changing environments, particularly along the coast, and changing stakeholder opinions, managers are now being to include these concerns in their management process (Johnson 2011). Based on this, it is not surprising that all respondents stated the use of partnerships. It is also an indication that managers take seriously the new direction of waterfowl management and see the value of community, stakeholders, and partner participation in the management process.

### **Implications for Management**

Many management implications can be drawn from this research. This section discusses five implications. First, the framework for analysis this study created, along with the list of management strategies determined to be 'best practice' are a huge step forward for waterfowl management evaluation at the site and regional level. This information provides knowledge for

site management plans currently in the ‘planning phase’ by identifying what strategies are currently in use at coastal ACJV sites, and by providing a list of 13 management strategies for creating a good waterfowl management plan. This information also has the potential to improve continuity of waterfowl management within the ACJV by making standardized waterfowl management strategy information accessible to all waterfowl management professionals and waterfowl management authorities within the ACJV.

Second, waterfowl management should not be separated from habitat management, namely wetlands. Habitat Management was perceived as the most effective waterfowl management strategy by survey respondents, while ‘wetlands on site’ was the only factor found to influence management strategy selection. Moreover, across all management agencies, site management plans contained step-down habitat management plans, while no site management plans contained step-down waterfowl management plans. This indicates an understanding of the importance habitat management has to overall site management. Future management plans for waterfowl need to address sustainable use of the critical habitat since migratory bird and coastal habitat conservation are linked (Davidson & Stroud, 1996).

Third, more data should be collected regarding the use of the adaptive management approach for coastal sites within the ACJV and what management actions are taken toward monitoring and evaluation of waterfowl at the site level. Adaptive management is widely used by conservation and management agencies, including the USFWS. Monitoring was a management strategy perceived as effective by survey respondents, however it was not reported as frequently implemented at the site level. This finding could be accounted for by Monitoring being perceived by waterfowl management professionals as being inherent in the overall management approach for their individual site, verses being a strategy specifically used for the management of

waterfowl. The primary components of adaptive management include “monitoring, feedback, capacity to learn from past mistakes, and incentives to experiment with new adaptations” (Ascher 2001, p. 744). Williams and Johnson (1995) stated, “through adaptive management, we can actively pursue the information needed to more effectively manage waterfowl populations” (p. 430).

The right hand of monitoring is evaluation. This study created a framework for evaluating waterfowl management in coastal environments. The creation of the site management plan rubric, detailed administrative history and policy review, as well as the survey responses, allow connections to be made between regional management goals, management strategies implemented on site, and waterfowl management professionals’ perspectives on the state of waterfowl management as a conservation process.

Evaluation of waterfowl management should be a priority for waterfowl management professionals. Colt (1994) stated, “a comprehensive evaluation seeks to identify the actual causal relationships, or links, between management goals, actions (outputs), and outcomes” (p. 87). More specifically, “comprehensive evaluation seeks to verify the actual outcomes of particular management actions and to generate insight into how particular management reforms will enhance the attainment of management goals” (Colt 1994, p. 87).

Fourth, as additional research is conducted, and sites continue the good fight of on-site management, it is imperative that waterfowl management includes a component of education and outreach. Education and Outreach was frequently listed in site management plans, meaning waterfowl management authorities see the value of including this strategy as a component of waterfowl management. Managers should be cognizant of education and outreach being an integral aspect of waterfowl management, and all natural resource management. The most

effective way to effect change is through education. Erwin (2002) stated that, “under all circumstances, however, additional public education is needed to demonstrate the ecological and aesthetic roles of waterbirds in their wetland environments” (p. 10). Sites that facilitate environmental education and community outreach increase awareness of important conservation issues at their site, and also foster community partnerships with non-profit organizations and schools. These partnerships lead to funding, research opportunities, community stewardship, and a strong volunteer base.

Lastly, there is a need for an interdisciplinary management approach to waterfowl management. The majority of respondents received advanced degrees in Biology. On the one hand, consistency in manager training, a professional background in biology, is helpful in providing continuity in waterfowl management strategy implementation. However, the introduction of additional professional backgrounds would add additional perspectives and potentially link waterfowl management to new and improved approaches. As stated in Chapter Two of this dissertation, there is a decline in waterfowl scientists, and presumably waterfowl managers. And those managers currently working with waterfowl are reaching retirement. The addition of disciplines other than Biology could increase the potential waterfowl management professional pool.

Humans have lived in coastal areas and used coastal resources for thousands of years, however, our understanding of coastal processes, and in turn our need to control/manage these processes have also changed over time (Kay & Alder 1999). As our environment and needs to management it change, so should our approach. Waterfowl management, as well as coastal environments, have issues that are interdisciplinary in nature. As such, these areas should be managed with an interdisciplinary approach.

## Limitations

This study focused on a limited geographic area on the Atlantic coast. Out of the limited area, this study selected for sites containing waterfowl in an effort to understand waterfowl management strategy selection and perceptions. As such, conducting this study in another joint venture, with more diverse habitat and climate could reveal relationships between management strategy selection and influence factors not seen in this sample.

Another limitation of this study was sample size. Though the study obtained a usable response rate (40.23%), the sample was too small to complete certain parametric tests. Due to the small sample size, the findings of this study are only relevant to coastal sites within the ACJV.

A large portion of site management plans from the survey data were ‘in revision’ (14.7%) or ‘in planning phase’ (23.5%). Therefore, waterfowl management strategies reported as in use at those sites may not be accurately reflected due to lack of top-down-directives and management protocol. Moreover, the survey included five influence factors for waterfowl management strategy selection. Additional factors could help explain influences for strategy selection, such as top-down directives or climate change.

Defining terms accurately is essential for generating truthful responses in survey research. By asking respondents to rate effectiveness and importance of waterfowl management strategies and other factors, the term *perceived* was avoided. This technique created more clearly stated questions and a more comprehensible questionnaire.

## **Implications for Research**

This study was a necessary starting point to understand waterfowl management strategy selection and perceived effectiveness, and to connect individual sites to site waterfowl management plans. During the course of this study, the need for future research was discovered.

First, waterfowl management is composed of two opposing and related prongs, in that, waterfowl management is most effective at the regional scale, and manageability of waterfowl is more difficult as spatial scale increases (Erwin 2002). This study should be conducted again, with an expanded geographic area to include the entire ACJV. Wildlife management is most successful at a large scale (temporal, spatial, and social) (Erwin 2002). Equally important is cohesive landscape or regional scale management of waterfowl, without losing sight of individuals (Kaminski 2002). An expanded geographic area to include the entire ACJV and the entire Atlantic Flyway would identify if waterfowl management is truly cohesive at the regional scale, while maintaining the connection with individual sites and site management plans.

Second, spatial analysis of management strategy use could reveal patterns and trends within the ACJV regions. Moreover, land use maps of the ACJV combined with management strategy use data could identify relationships between land use and waterfowl management strategy selection in coastal environments; specifically, these types of maps could assist in identifying if agricultural or urban land use adjacent to conservation areas influence waterfowl management strategy selection. Also, identifying management strategy use patterns within all four flyways would allow geographic comparison of waterfowl management at a continental scale. This study found variation in management strategy use among ACJV Regions. It would be valuable for waterfowl managers and for site management plan revisions, to see if similar variation existed within other flyways, or if this finding is specific to the Atlantic Flyway. This

information would assist in creating more effective site and regional management plans and informs waterfowl management decisions.

Third, further research needs to identify current management plans (in-use plans) prior to data collection to insure a large enough sample size. A larger study would identify regional patterns and relationships between management strategy selection, perceived efficacy, and potentially identify new strategy selection influence factors.

Fourth, additional research focusing on waterfowl management professionals' perceptions of the state of practice and efficacy of management strategies is advised. Perceived efficacy is useful in determining manager preferences and influences on management strategy selection. Environmental perceptions and the "relationship between attitudes and behavior has led to interest in environmental attitudes as predictors of environmentally based actions and participation decisions" (Kotchen & Reiling 1999, p. 95). Moreover, social-science literature as established "attitudes as important predictors of behavior, behavioral intentions, and explanatory factors or variants in individual behavior" (Kotchen & Reiling 1999, p. 95). The more information obtained about environmental attitudes toward waterfowl and their management, the more accurate predictions can be made regarding manager behavior, strategy selection, and variation in strategy use among coastal ACJV sites.

Fifth, additional research focused on efficacy of waterfowl management strategies within the ACJV is a valuable next step for waterfowl management research. True efficacy of waterfowl management strategies would be useful in allocating limited funds and staff for the purpose of waterfowl management, as well as creating and implementing meaningful, achievable management goals, and creating better management plans.

Sixth, more data should be gathered regarding management strategy implementation, specifically, waterfowl monitoring techniques and waterfowl management evaluation techniques. Future studies should also select for a wider range of management agencies to obtain a more accurate view of waterfowl management across administrative boundaries. The conservation of migratory waterfowl, and shorebirds, “will require a diversity of conservation strategies executed at a variety of scales” (Stralberg, et al. 2011). With increased agency diversity a more exhaustive discourse on the state of waterfowl management could be compiled and discussed. Finally, the survey contained an open-ended last question asking respondents for any additional comments. Numerous comments mentioned climate change as a new concern for waterfowl management. Future research should include climate change as an influence factor for waterfowl management strategy selection.

### **Concluding Comments**

Migratory waterfowl have “large-scale habitat needs that stretch the limits of conservation planning and implementation” (Stralberg, et al. 2011, pl. 20). This study highlighted waterfowls’ ability to link humans to the landscape (Adams, Leifester, & Herron 1997) and made clear the notion of ever changing management needs and human valuation of the nature and its parts. Waterfowl are valuable cultural and natural resources. As such, waterfowl conservation and management should occur in three areas (1) population, (2) harvest, and (3) habitat. As the human population expands and “wetlands continue to be modified, stronger management is required at many levels to determine the appropriate conservation tactics for waterbirds” (Erwin 2002, p. 10).



Numerous agencies, policies, management strategies and plans, and jurisdictions are involved in waterfowl management of the ACJV. Understanding what management strategy selection influences and perceived efficacy of waterfowl management strategies are the first step in determining management consistency, adaptability, and efficacy. With so much uncertainty about waterfowl management and habitat, “at minimum, for each species, harvest and habitat managers should be explicitly aware of the efforts of the other and should be working toward common ends” (Runge, Johnson, Anderson, Koneff, Reed, & Mott 2006, p. 1236). Creating this framework of analysis so that the many facets of waterfowl management can be intelligently linked together is crucial to successful waterfowl management in the future.

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APPENDIX A: IRB APPROVAL

**Date:** June 7, 2011  
**Principal Investigator:** April Whichard Evans, PhD student  
**Dept./Ctr./Institute:** Coastal Resources Management, Institute of Coastal Science & Policy  
**Mailstop or Address:** 1601 Pulley Gordon Road  
Zebulon, NC 27597

**RE:** **Exempt Certification**  
**UMCIRB#** **11-0367**  
**Funding Source:** Unfunded

**Title:** “Getting Our Ducks in a Row: Perceptions of Waterfowl Management within the Northeast and Southeast Regional Ecosystems of the Marine Protected Area Network.”

Dear April Evans:

On 6/6/11, the University & Medical Center Institutional Review Board (UMCIRB) determined that your research meets ECU requirements and federal exemption criterion #2 which includes research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects and any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

It is your responsibility to ensure that this research is conducted in the manner reported in your Internal Processing Form and Protocol, as well as being consistent with the ethical principles of the Belmont Report and your profession.

This research study does not require any additional interaction with the UMCIRB unless there are proposed changes to this study. Any change, prior to implementing that change, must be submitted to the UMCIRB for review and approval. The UMCIRB will determine if the change impacts the eligibility of the research for exempt status. If more substantive review is required, you will be notified within five business days.

The UMCIRB Office will hold your exemption application for a period of five years from the date of this letter. If you wish to continue this protocol beyond this period, you will need to submit an Exemption Certification Request at least 30 days before the end of the five-year period.

Sincerely,

Chairperson, University & Medical Center Institutional Review Bo

## APPENDIX B: PERMISSION LETTER

### Waterfowl Management Study

This study is being administered to 100 coastal Atlantic Coast Joint Venture (ACJV) sites. The goal of this study is to identify waterfowl management strategies used by coastal ACJV sites. Participants of this study include managers and staff of coastal ACJV sites who are involved in the management of waterfowl. This study seeks participants' perceptions of waterfowl management strategy effectiveness. The results from this study will be used to inform waterfowl managers, as well as coastal resource managers on the Atlantic coast, and help managers allocate funds and staff to the most effective management efforts for waterfowl conservation. In addition, results will be used to complete some of the requirements for a Doctorate degree at East Carolina University.

Your participation is voluntary and no compensation is provided for returning completed questionnaires. We estimate that you will need between 10 and 15 minutes to complete the questionnaire. We hope you take this opportunity to tell us about waterfowl management strategies for your management site and your perceptions of how waterfowl management can be improved at local and regional scales. Be assured that all responses will remain confidential and you can skip any question that makes you uncomfortable. You may withdraw from the study at any time.

If you have further questions about this study or the questionnaire you have received, please feel free to contact me at the following address and phone number:

April Whichard Evans  
Coastal Resources Management  
East Carolina University  
Greenville, NC 27858-4353  
252-328-5197  
evansa00@students.ecu.edu

This study has been reviewed and approved by East Carolina University and the University and Medical Center Institutional Review Board. For research-related problems or questions regarding subjects' rights, you may contact this office through Dr. Susan L. McCammon at 600 Moye Boulevard, Greenville, NC 27834 or by calling (252) 744-2914.

This information sheet is for your records. By completing the questionnaire, you are giving voluntary consent to participate in this study.

APPENDIX C: MANAGEMENT PLAN RUBICS

Site Management Plan Rubric #1

<i>Site Name:</i>		Acadia National Park
<i>Size (ha):</i>		35,500 acres (14,366.34ha)
<i>Latitude/Longitude:</i>		44-23'22.69" -68-12'15.58"W
<i>Primary Management Agency:</i>		NPS
<i>ACJV Region:</i>		North
<i>Origin of Management Plan:</i>		General Management Plan - Acadia National Park administrators, local communities, public hearings
<i>Date of Plan:</i>		October 1992
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
Cooperatively protect species and habitats of value to the park: coordinate collaborative efforts to understand and manage resources of value to the park (birds)	Monitoring	Development of a long-term inventory and monitoring program to assess the health of park resources (birds).
	Limited Access	Limit public access to offshore breeding sites (not species specific)
Research, habitat & species management goals & objectives but not specific to waterfowl in document.		

Site Management Plan Rubric #2

<i>Site Name:</i>		Moosehorn NWR
<i>Size (ha):</i>		24,400 acres (9,874.33ha)
<i>Latitude/Longitude:</i>		45-3'46.27" -67-18'8.09"
<i>Primary Management Agency:</i>		USFWS
<i>ACJV Region:</i>		North
<i>Origin of Management Plan:</i>		Habitat Management Plan, CCP in progress-Prepared by site biologist, manager, regional biologist, & regional supervisor



<i>Date of Plan:</i>		2007
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
	Partnerships	Black Duck Joint Venture
	Monitoring & Hunting	Preseason banding for Adaptive Harvest Management program, Avian Influenza sampling in 2006
	Habitat Management	Wetland management (fresh, tidal, river); modeling using black ducks & wood ducks as target species; ranking wetlands for quality;
	Education/Outreach	Provide quality wildlife-dependent recreation and education opportunities
	Impoundment Management	16 impoundments managed for water level; surveys for waterfowl broods during 1984 & 1985 conducted in impoundments; refuge staff evaluated 5 impoundments for waterfowl production & waterbird breeding season use; management for erosion of dikes adjacent to impoundment due to high waters; replacement/repair of 5 water gauges
	Waterfowl surveys	Brood surveys in impoundments & wetlands in 2006

### Site Management Plan Rubric #3

<i>Site Name:</i>		Maine Coastal Islands NWR
<i>Size (ha):</i>		3277.9
<i>Latitude/Longitude:</i>		44 40'7.15", -67 58'20.68"
<i>Primary Management Agency:</i>		USFWS
<i>ACJV Region:</i>		North
<i>Origin of Management Plan:</i>		CCP-USFWS, state, local partners, community, refuge neighbors, private landowners.
<i>Date of Plan:</i>		2005
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
Protect the high quality wetland communities on the	Midwinter waterfowl survey	Survey conducted annually-most common species is the common eider; harlequin ducks winter in the refuge and are listed

refuge's islands to benefit nesting and migrating shorebirds and waterfowl.		by the MDIFW as threatened;
	Hunting & Enforcement	Refuge Hunting Plan that is updated regularly; hunter orientation program on the refuge; hire additional LE officers to administer program and provide visitor outreach;
	Limited Access	Restricted public access on seabird nesting islands during nesting season (benefits the common eider, which is the primary waterfowl nesting on the islands);
	Impoundment Management	3 impoundments maintained for waterfowl; water structure management; dike and culvert maintenance; water level management for waterfowl;
	Habitat Management	Plan to increase wild rice in impoundments for waterfowl foraging; seek acquisition of 95 acre salt marsh for American black duck habitat; evaluate seasonal use of wetlands by waterfowl; provide high quality fresh-water wetlands over time; provide high quality salt-marsh over time;
	Monitoring	Initiate surveys to document use of saltmarshes as feeding areas for species of concern (black duck) during breeding; and migration seasons; map and monitor wild rice production in impoundments; within 2 years of CCP approval conduct baseline biological inventories; within 1 year of CCP approval determine effects of present and proposed commercial agricultural facilities in the waters adjacent to the refuge on waterfowl; initiate a habitat and species inventory and monitoring plan within 2 years of CCP approval; adaptive management is the management form used within the CCP;
	Education/Outreach	Within 5 years of CCP approval have 25% of school children within 15 miles of refuge participate in environmental education program each year; hire staff to implement and evaluate environmental

		education programs;
	Research	Partnered with MDIFW and USGS for a common eider survival and recruitment study;

Site Management Plan Rubric #4

<i>Site Name:</i>		Rachel Carson NWR
<i>Size (ha):</i>		2142.0
<i>Latitude/Longitude:</i>		43-22'27.70" -70-29'48.71"
<i>Primary Management Agency:</i>		USFWS
<i>ACJV Region:</i>		North
<i>Origin of Management Plan:</i>		CCP-Refuge staff, refuge neighbors, friends, regional office planning & GIS staff, regional biologist, representative from Maine Department of Inland Fisheries and Wildlife (MDIFW).
<i>Date of Plan:</i>		2007
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
Tidal River, Estuary, and Bay conservation/restoration (wintering habitat for black ducks, common eiders, scoters, mallards, red-breasted mergansers, and buffleheads).	Habitat Management	Create Habitat Management Plan; restore 3,844 acres of saltwater marshes for breeding, wintering, and migratory habitat for species of concern (black duck); hire biologist to assist with saltmarsh restoration efforts;
Protect nearshore and offshore marine waters and identify key sites for the benefit of wintering migratory and breeding waterfowl and waterbirds, and anadromous fish.	Partnerships	Atlantic Coast Joint Venture & Eastern Habitat Joint Venture for the American black duck; annually promote land conservation with partners to maintain ecological integrity of coastal Maine watersheds; establish regional partnerships for water quality in tidal rivers and estuaries; work with partners on watershed management initiatives
Develop the Rachel Carson NWR as an outstanding center for research and	Monitoring	Within 5-10 years of CCP determine frequency and intensity of waterfowl surveys needed; develop targeted monitoring program for high-priority

demonstration emphasizing land management techniques for restoring and sustaining healthy estuarine ecosystems in concert with National Land Management Research and Demonstration (LMRD) program.		bird species (black duck); Annually conduct waterfowl aerial and ground count surveys; recruit volunteers to conduct minimal waterfowl and shorebird surveys; hire biologist to assist with monitoring efforts; hire refuge operations specialist; identify SAV habitat;
	Research	Identify key sites for feeding, wintering, and breeding waterbirds (common eiders, red-breasted mergansers)
	Education & Outreach	Develop and deliver educational materials and programs on marine ecosystems; Participate in establishment and development of the Rachel Carson MPA; provide service curriculum annually to local schools; support regional environmental education programs; establish corps of volunteers and Friends Group;
	Hunting	Refuge adopts state regulations for hunting migratory birds; minimize habitat impacts; create minimal conflict with other priority wildlife-dependent recreational uses or refuge operations; incorporate message of stewardship and conservation in hunting opportunities.

#### Site Management Plan Rubric #5

<i>Site Name:</i>	Parker River NWR (also manages Great Bay NWR-CCP in planning process; no info on site available via internet)
<i>Size (ha):</i>	1,886.6 ha
<i>Latitude/Longitude:</i>	42-44'45.61" -70-47'55.12"
<i>Primary Management Agency:</i>	USFWS
<i>ACJV Region:</i>	North
<i>Origin of Management Plan:</i>	CCP in development
<i>Date of Plan:</i>	In preplanning stage (state 1)
<i>Individual Waterfowl Management Plan:</i>	Unknown

Site Management Plan Rubric #6

<i>Site Name:</i>		Cape Cod National Seashore
<i>Size (ha):</i>		17,646.3ha
<i>Latitude/Longitude:</i>		42-0'48.93" -70-2'36.01"
<i>Primary Management Agency:</i>		NPS
<i>ACJV Region:</i>		North
<i>Origin of Management Plan:</i>		General Management Plan-National Seashore staff & Cape Cod National Seashore Advisory Commission, onsite planner, general management plan subcommittee (consisting of representatives from advisory committee, Cape Cod commission, 6 local communities, the Mass Coastal Zone Management Office).
<i>Date of Plan:</i>		1998
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
Goals for general wildlife and habitat management (waterfowl not specifically mentioned).	Education/Outreach	Waterfowl decoy carving;

Site Management Plan Rubric #7

<i>Site Name:</i>		Waquoit Bay National Estuarine Research Reserve (WBNERR)
<i>Size (ha):</i>		Approximately 639.4ha
<i>Latitude/Longitude:</i>		41-34'55.03" -70-31'30.45"
<i>Primary Management Agency:</i>		Part of Mass. State Parks System; Mass. Department of Conservation & Recreation and NOAA.
<i>ACJV Region:</i>		North
<i>Origin of Management Plan:</i>		Management Plan-Produced by Elizabeth Fuller Valentine (management plan coordinator) & staff members of WBNERR.
<i>Date of Plan:</i>		2006-2011 (update from 2000)
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management</b>	<b>Waterfowl Management Actions</b>

	<b>Strategies</b>	
(No goals specifically for waterfowl) Waterfowl are mentioned as assets to the reserve as natural resources; Waterfowl are mentioned as using wetland & coastal habitat for feeding, breeding, & wintering.		
Reserve has research and education goals, as well as habitat management, restoration, and conservation-though not specific to waterfowl.		

Site Management Plan Rubric #8

<i>Site Name:</i>		Block Island NWR
<i>Size (ha):</i>		41.6ha
<i>Latitude/Longitude:</i>		41-13'40.30" -71-34'27.78"
<i>Primary Management Agency:</i>		USFWS
<i>ACJV Region:</i>		North
<i>Origin of Management Plan:</i>		CCP-Prepared by Nancy McGarigal (refuge planner) & Refuge Manager, Regional Manager
<i>Date of Plan:</i>		2002
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
Priority listed for the Connecticut River/Long Island Sound Ecosystem, which Block Island is a part of: Protect, restore, and enhance populations of colonial nesting waterbirds, shorebirds, and waterfowl...with special emphasis on coastal areas and major rivers.	Partnerships	Atlantic Coast Joint Venture; Black Duck Joint Venture; Audubon Society;

Establish a land protection program that fully supports accomplishments of species, habitat, and ecosystem goals (through partnerships; migratory birds & waterfowl)	Habitat Management	Grasslands & wetland management
Control of invasive, non-native, or overabundant plant and wildlife species (mute swans)	Hunting is not allowed on Block Island, but is allowed in other NWRs within the Rhode Island Complex (waterfowl)	
	Enforcement	Formal notices of violations (waterfowl hunting in closed areas)
	Education, Outreach, Monitoring, Research all listed in CCP, but not specifically directed toward waterfowl within plan.	

Site Management Plan Rubric #9

<i>Site Name:</i>	Stewart B. McKinney NWR
<i>Size (ha):</i>	323.7ha
<i>Latitude/Longitude:</i>	41-18'27.82" -72-28'19.20"
<i>Primary Management Agency:</i>	USFWS
<i>ACJV Region:</i>	North
<i>Origin of Management Plan:</i>	Refuge Planner & Refuge Staff
<i>Date of Plan:</i>	CCP-Scheduled to begin in 2011- in the Scoping Stage of the CCP process
<i>Individual Waterfowl Management Plan:</i>	No

Site Management Plan Rubric #10

<i>Site Name:</i>	Long Island NWR Complex - 7 refuges, 1 refuge sub unit, 1 wildlife management area
<i>Size (ha):</i>	2,630.4ha

<i>Latitude/Longitude:</i>		40-47°54.05” -72-52’46.91”
<i>Primary Management Agency:</i>		USFWS
<i>ACJV Region:</i>		North
<i>Origin of Management Plan:</i>		CCP- Regional Director & Thomas Bonetti (planning team leader)
<i>Date of Plan:</i>		2006
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
Restore the biological health of aquatic habitats to high quality conditions on the Complex salt Marshes, bays, tidal tributaries, and impoundments to benefit waterfowl and shorebirds dependent on these systems...(p.1-17)	Partners	Atlantic Coast Joint Venture; Arctic Goose Joint Venture; Black Duck Joint Venture; Sea Duck Joint Venture; Long Island Sound Study (LISS); MBP; North American Bird Conservation Initiative (NABCI) brings together multiple plans to protect and restore all native bird populations and their habitats in North America – uses bird conservation regions to guide landscape scale approaches to conservation (New England/Mid-Atlantic Coast BCR);Ducks Unlimited;
Managing for black duck & other wintering waterfowl (p. 4-2).	Monitoring	Migratory Bird Program (MBP) seeks to conserve and manage migratory bird populations and their habitat through bird population monitoring & habitat management – MBP identified benefit of using standardized monitoring protocols and habitat assessments on refuges to determine region-wide trends;
	Habitat Management	Habitat Management Plan in development; invasive species management of common reed and mute swans populations to limit impacts to black ducks and other wintering waterfowl; fencing used to protect restoration planting from geese;
	Impoundment Management	Big Fish Creek impoundment at Wertheim managed for waterfowl &



		shorebirds;
	Less frequent waterfowl surveys	Conduct waterfowl & shorebird surveys in impoundment;
	Education/Outreach	<p>Within 5 years of CCP work with Town of Oyster Bay, Friends of the Bay, The Waterfront Center, &amp; Theodore Roosevelt Audubon Bird Sanctuary to develop interpretive exhibits and programs for Oyster Bay; Within 3 years from work with Audubon Society Chapters to provide interpretive programs at Wertheim, Target Rock, &amp; Morton refuges; Maintain observation &amp; photography platforms &amp; blinds &amp; spotting scopes; Within 3 years develop photography club to provided annual wildlife photography workshops; participate in and promote Jr. Duck Stamp Program for NY state with DU; Work with local schools on environmental education programs; Teacher workshops; Within 5 years attain 50% increase in number of adults on Long Island that are able to identify refuge management priorities for migratory bird conservation &amp; threatened/endangered species; work with media sources &amp; maintain website/factsheet; Within 2 years develop annual volunteer recruitment;</p>
	Hunting	<p>Within 1 year implement outreach plan to educate public on hunting in refuges; establish monitoring protocol for evaluating quality of experience for hunters &amp; non-hunters during hunting season; annual hunter education class; work with DU for hunting programs for women, youth and people with disabilities; Within 5 years determine feasibility of limiting duck hunting at Wertheim to youth and hunters with disabilities;</p>

		Within 5 years work with DU and surrounding communities about retrieving waterfowl; Annually review Hunting Plan; Avoid take during presence of Federally Listed species;
	Enforcement	Routine patrols on refuge lands both open and closed to hunting;

#### Site Management Plan Rubric #11

<i>Site Name:</i>	Fire Island National Seashore
<i>Size (ha):</i>	7,832ha
<i>Latitude/Longitude:</i>	40-44'20.16" -72-54'14.04"
<i>Primary Management Agency:</i>	NPS
<i>ACJV Region:</i>	North
<i>Origin of Management Plan:</i>	General Management Plan- Develop Planning Alternatives stage (step 5/11) – Planning team, park staff, community residents, visitors, partners, stakeholders.
<i>Date of Plan:</i>	Previous General Management Plan 1978;
<i>Individual Waterfowl Management Plan:</i>	No

#### Site Management Plan Rubric #12

<i>Site Name:</i>	Gateway National Recreation Area-3 sites, Sandy Hook NJ, Jamaica Bay NY, Staten Island NY
<i>Size (ha):</i>	10,521.8ha
<i>Latitude/Longitude:</i>	40-34'10.68" -73-54'42.83"
<i>Primary Management Agency:</i>	NPS
<i>ACJV Region:</i>	North
<i>Origin of Management Plan:</i>	General Management Plan-In planning stage
<i>Date of Plan:</i>	Plan scheduled for approval Fall 2012; Fall 2010-Spring 2011 is Develop and present preliminary alternatives stage
<i>Individual Waterfowl Management Plan:</i>	No

#### Site Management Plan Rubric #13

<i>Site Name:</i>	Edwin B. Forsythe NWR
<i>Size (ha):</i>	22,905.2ha
<i>Latitude/Longitude:</i>	39-29'2.06" -74-26'41.04"

<i>Primary Management Agency:</i>		USFWS
<i>ACJV Region:</i>		Mid-Atlantic
<i>Origin of Management Plan:</i>		CCP-Prepared by USFWS Region 5, Division of Planning, & Forsythe NWR
<i>Date of Plan:</i>		2004
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
Purpose for the refuge states honoring the Migratory Bird Conservation Act, Fish & Wildlife Act, and Emergency Wetlands Resources Act as they pertain to migratory birds	Partnerships	Atlantic Coast Joint Venture; Partners in Flight (black duck breeding habitat); Black Duck Joint Venture; Develop partnership with NJ Department of Environmental Protection;
Protect and enhance Federal trust resources and other species and habitats of special concern (p. 35).	Invasive Species Control	Resident Canada Geese control; Control of White Geese (greater & lesser snow geese & Ross' geese);
	Mid-Winter Waterfowl Survey	Yearly survey for waterfowl (specifically black duck, Atlantic brant, & snow geese);
	Weekly waterfowl counts	Conducted at the Brigantine Division Impoundments;
	Monitoring	Aerial surveys of the wetlands are conducted to observe/count waterfowl; Inventory, map and monitor Refuge wildlife and habitat (comprehensive baseline flora & fauna surveys); establish long-term monitoring program; monitor species before and after habitat management projects using models and GIS;
	Habitat Management	Forsythe Refuge wetlands are classified as Wetlands of International Importance under the Ramsar Convention (1/17 sites in the US); Revise Habitat Management Plan; Maintain existing marsh;
	Education/Outreach	Provide technical assistance to partners and communities on

		wildlife-related issues; provide wildlife observation & photography opportunities (at impoundment); increase access to environmental education & interpretation programs; Volunteers participate in waterfowl management activities;
	Impoundment Management	Manage water levels throughout the year;
	Hunting	Migratory bird hunting (waterfowl); Allow migratory game bird hunting in additional areas of refuge & limit access for hunting in other areas of refuge; provide maps of migratory game bird hunting units at refuge; monitor effects of hunting & other visitor use activities; Priority Wildlife-Dependent Recreation Plan (including hunting);
	Enforcement	Higher LE staff;

Site Management Plan Rubric #14

<i>Site Name:</i>	Great Dismal Swamp NWR	
<i>Size (ha):</i>	45,002.25 ha	
<i>Latitude/Longitude:</i>	36-38°58.89" -76-33°54.34"	
<i>Primary Management Agency:</i>	USFWS	
<i>ACJV Region:</i>	Mid-Atlantic	
<i>Origin of Management Plan:</i>	CCP-Refuge manager, regional manager, adjacent landowners, federal, state, local government representatives, NC & VA resource agencies, environmental organizations, sportsmen's groups, local businesses, affected people, FWS VA field office, Army Corps of Engineers, NC wildlife resources commission, VA department of game and inland fisheries.	
<i>Date of Plan:</i>	2006	
<i>Individual Waterfowl Management Plan:</i>	No	
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
Waterfowl Management	Partnerships	The Nature Conservancy; Evaluate

Program		the need to expand the refuge acquisition boundary to acquire those farmlands where public ownership would enhance their protection and restoration for waterfowl habitat (p. 4-91); Army Corps of Engineers, Dismal Swamp State Natural Area, Nansemond Indians, City of Suffolk VA, Old Dominion University,
Insure conditions for breeding and wintering waterfowl currently using the refuge are maintained (p. 4-90).	Habitat Management	Maintain 250 acres of remnant marsh for brood and feeding habitat for waterfowl; Maintain and/or restore hydrologic conditions to sustain or improve viability of wetland communities and their associated wildlife species [wood duck](p. 4-84); Insure conditions for breeding and wintering waterfowl currently using the refuge are maintained (p. 4-91); Support efforts by The Nature Conservancy, Virginia Department of Game and Inland Fisheries, and other organizations to protect farmlands that are used by waterfowl from development (p. 4-91); Cooperate and support protection of 7,000 acres of prior converted farmland east of the refuge for the purpose of restoring early successional habitat for waterfowl and other wildlife management needs within the watershed (p. 4- 94);
	Limited Access	Monitor and manage public access to Lake Drummond to allow the area to be used by wintering tundra swans and snow geese (p. 4-91);
	Education/Outreach	Host annual events highlighting conservation celebrations such as International Migratory Bird Day, National Wildlife Refuge Week,

		National Public Lands Day and the Great Dismal Swamp NWR Anniversaries (4-103);
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Site Management Plan Rubric #15

<i>Site Name:</i>		Cape May NWR Complex
<i>Size (ha):</i>		4,461.6ha
<i>Latitude/Longitude:</i>		39-8'57.24" -74-52'48.24"
<i>Primary Management Agency:</i>		USFWS
<i>ACJV Region:</i>		Mid-Atlantic
<i>Origin of Management Plan:</i>		CCP-Prepared by USFWS Region 5, Division of Planning, Cape May NWR
<i>Date of Plan:</i>		2004
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
Protect and enhance Federal trust resources and other species and habitats of special concern (p.31).	Partnerships	Atlantic Coast Joint Venture; Black Duck Joint Venture; Partners in Flight Program (black duck); The Nature Conservancy Delaware Bay Project; Hudson River/New York Bight Ecosystem Plan; Delaware River/Delmarva Coastal Ecosystem;
	Habitat Management	Marshes of Cape May are considered Wetlands of International Importance (black ducks are species of concern); other waterfowl that winter in the refuge include wood duck, blue-winged teal, green-winged teal, American wigeon, mallard, gadwall, northern shoveler, northern pintail, canvasback, greater scaup, lesser scaup, bufflehead, Canada goose; Complete Habitat Management Plan; Manage wetlands & marshes;
	Monitoring	Inventory, map and monitor wildlife and habitat; comprehensive baseline flora and fauna survey (birds); Monitor species before and after habitat management projects; use

		monitoring data and maps to revise management goals for wildlife populations;
	Education/Outreach	Provide technical assistance to communities and partners about wildlife and habitat issues; provide wildlife observation and photography opportunities; continue to provide education and outreach outside of the refuge;
	Hunting	Continue to provide waterfowl hunting opportunities; expand waterfowl hunting opportunities; monitor impacts of hunting on other refuge uses and limit hunting if conflict occurs;

#### Site Management Plan Rubric #16

<i>Site Name:</i>	Bombay Hook NWR
<i>Size (ha):</i>	6,576.5ha
<i>Latitude/Longitude:</i>	39-19'32.88" -75-26'45.10"
<i>Primary Management Agency:</i>	USFWS
<i>ACJV Region:</i>	Mid-Atlantic
<i>Origin of Management Plan:</i>	CCP-in Scoping stage, first public meetings held August 2011. Prepared by refuge staff, USFWS northeast regional office, Delaware department of natural resources & environmental control, local residents, communities, non-profit environmental & recreational organizations.
<i>Date of Plan:</i>	N/A
<i>Individual Waterfowl Management Plan:</i>	No

#### Site Management Plan Rubric #17

<i>Site Name:</i>	Assateague Island National Seashore
<i>Size (ha):</i>	19,424.9ha
<i>Latitude/Longitude:</i>	38-5'36.59" -75-14'3.75"
<i>Primary Management Agency:</i>	NPS
<i>ACJV Region:</i>	Mid-Atlantic
<i>Origin of Management Plan:</i>	General Management Plan-Summer 2011 Develop and present preliminary alternatives

<i>Date of Plan:</i>	Fall 2012 anticipated implementation
<i>Individual Waterfowl Management Plan:</i>	No

Site Management Plan Rubric #18

<i>Site Name:</i>	Chesapeake Marshland NWR Complex (includes Blackwater NWR & Chesapeake Island Refuges)
<i>Size (ha):</i>	13,691.7ha (approximate)
<i>Latitude/Longitude:</i>	38-23'1.14" -76-6'8.26"
<i>Primary Management Agency:</i>	USFWS
<i>ACJV Region:</i>	Mid-Atlantic
<i>Origin of Management Plan:</i>	CCP-
<i>Date of Plan:</i>	2006
<i>Individual Waterfowl Management Plan:</i>	No

<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
Provide habitats to sustain 10 percent of each of Maryland's wintering waterfowl populations of Atlantic Population (AP) Canada geese, snow geese, and dabbling ducks (as measured by the Midwinter Waterfowl Inventory) (p.4-113).	Partnerships	Atlantic Coast Joint Venture; Partners In Flight; Management Plan for Canada Geese in Maryland; Chesapeake Bay Waterfowl Policy & Management Plan; NAWCA Priority Waterfowl Species;
Create the most complete network of protected lands within the Chesapeake Bay watershed (p. 4- 138).	Education/Outreach	Provide environmental education and training that incorporates the refuge message for teachers and Students (p. 4-112); Provide compatible opportunities for wildlife observation, photography, hunting, and fishing (p.4-112); Public uses will not interfere with important nesting or wintering seasons of listed species (p. 4112);
Provide habitats to sustain	Midwinter	Areal midwinter inventory completed



<p>5 percent of each of Maryland's wintering waterfowl, as follows:  Atlantic  Population (AP) Canada goose, and dabbling duck population, as measured by the Midwinter Waterfowl Inventory [for areas in refuge other than Blackwater] (p. 4-152).</p>	<p>Waterfowl Survey</p>	<p>yearly;</p>
	<p>Monitoring</p>	<p>Blackwater NWR is managed primarily for wintering waterfowl - To support the objectives of the NAWMP, the Chesapeake Bay Program Waterfowl Management Plan (2000), and Maryland's Canada Goose Management Program, the refuge must maintain a credible monitoring program to assess the efficacy of management actions and to determine the contribution of Blackwater NWR to Maryland's waterfowl populations (p. 4-113); Bimonthly aerial surveys of wintering waterfowl populations; Maintain natural nesting habitats for wood ducks by 2017 (p. 4-115); Reduce the resident Canada goose population to its 1989 level by 2008 (p. 4-132); Summer ground surveys for waterfowl;</p>
	<p>Weekly Waterbird Counts</p>	<p>Weekly ground counts of impoundments, cropland, &amp; adjacent river;</p>
	<p>Habitat Management</p>	<p>Restore emergent marsh on Blackwater NWR to 1933 coverage level by 2017 [breeding habitat for</p>

		<p>blue-winged teal and black duck, foraging for wintering geese and dabbling ducks] (p. 4-113);</p> <p>Development of Habitat Management Plan; restore 420 acres of cropland to marshland for food sources for waterfowl; By 2011, develop programs to prevent the loss or degradation of habitats and develop programs and actions to restore and enhance waterfowl habitats within the Nanticoke protection area (p. 4-116); Strategic growth and protection of Blackwater NWR; On a broad scale, protect, restore, and enhance a mix of wetland habitat types throughout the island marshes by 2022 (p. 4-152);</p>
	Impoundment Management	Manage a minimum of 460 acres of impoundments to have food for waterfowl at onset of migration;
	Research	<p>By 2007, determine existing American black duck production and preferred habitat types (4-115);</p> <p>Determine the regional significance of the lesser snow goose population by 2010 (p. 4-116); Create an American Black Duck Initiative for the island refuges that will include a determination of existing black duck production, the factors affecting production, and the preferred nesting and brood habitat types by 2012 (p. 4-152); Determine to what extent predators are limiting production of ground-nesting waterbirds by 2012 (p. 4-152);</p>

	Invasive Species Management	Eradicate the mute swan population on Blackwater NWR by 2012 through egg addling & state policy, with summer survey to determine success;
	Hunting	Spring hunting for resident Canada geese; waterfowl hunting in accordance with state regulations;

Site Management Plan Rubric #19

<i>Site Name:</i>	Chincoteague NWR Complex
<i>Size (ha):</i>	5,665.6 ha
<i>Latitude/Longitude:</i>	38-0'17.35" -75-21'58.36"
<i>Primary Management Agency:</i>	USFWS
<i>ACJV Region:</i>	Mid-Atlantic
<i>Origin of Management Plan:</i>	CCP-Planning Phase (draft alternatives developed)
<i>Date of Plan:</i>	N/A
<i>Individual Waterfowl Management Plan:</i>	No

Site Management Plan Rubric #20

<i>Site Name:</i>	Back Bay NWR	
<i>Size (ha):</i>	3,690.7 ha	
<i>Latitude/Longitude:</i>	36-39'33.59" -75-55'55.23"	
<i>Primary Management Agency:</i>	USFWS	
<i>ACJV Region:</i>	Mid-Atlantic	
<i>Origin of Management Plan:</i>	CCP-Refuge group	
<i>Date of Plan:</i>	2010	
<i>Individual Waterfowl Management Plan:</i>	No	
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
Maintain and enhance the biological integrity and diversity of wetland habitats for migratory birds including species of conservation concern (p. 4-1).	Impoundment Management	Manage 906 acres of 13 freshwater impoundments for migratory waterfowl and shorebirds; Manage 165 acres of 2 freshwater impoundments at False Cape State Park for migratory waterfowl and shorebirds; Minimize use of the impoundments by competing non-migratory wildlife such as the

		<p>resident Canada goose, feral pig, nutria and feral horse (p. 4-3); Conduct ground surveys of vegetation in three larger impoundments once a year to assess waterfowl food production and monitor invasive species distributions (p. 4-3); Gradually flood for waterfowl during winter; draw-down for shorebirds and waterfowl during spring and fall migrations; and extreme draw-down for wading birds during mid-summer (p. 4-3); Provide maximum beneficial waterbird food-plant and invertebrate production, by draw-downs of moist soil units during spring; exposing substrates of the eastern sections of impoundments. Maintain wet soils in those eastern areas throughout growing season (p. 4-3); Within 5 years of CCP Convert 30 to 40 acres of old field in Tract 194 (adjacent to Muddy Creek Road) to a shallow, freshwater impoundment for migratory waterfowl and shorebirds (p. 4-8);</p>
	<p>Habitat Management</p>	<p>Manage 400 acres of emergent Marsh in spring for resting/roosting and feeding areas for migratory waterfowl; Manage shallow water mud flats in spring (200 acres) for feeding habitat for migratory waterfowl; Manage 350 acres of emergent marsh in fall for feeding and resting habitat for migratory waterfowl; Manage 830 acres of wetland mosaic in winter for feeding and resting habitats for waterfowl;</p>

		<p>Annually provide at least 325 acres of quality waterfowl stopover and wintering habitat, consisting of shallow, flooded wetlands (6"-18" water), dominated principally by large-seeded, perennial marsh vegetation, with some mixed, fine-seeded annuals (p. 4-2); Annually provide at least 350 acres of quality waterfowl stopover and wintering habitat consisting of shallow, flooded wetlands (&lt;7" water), dominated principally by mixed large and fine seeded, annual, moist-soil vegetation, with some perennials (p. 4-2); Annually provide at least 60 acres of open, deeper-water (&gt;1.5') wintering habitat for such diving ducks as the lesser scaup, ruddy duck, bufflehead, hooded merganser, coot and pied-billed grebe (p. 4-2); Year-round, provide a minimum of 25 acres of "watchable wildlife" habitat for the visiting public during the winter impoundments' closure period. "Watchable wildlife" species include the snow goose, ducks, herons, egrets and ibis (p. 4-3); Mow herbaceous and grassy, dense perennial vegetation. Follow with flooding to provide wintering waterfowl access to rootstocks. May be an occasional substitute for prescribed burning; but does not remove undesirable seed-stock (p. 4-3);</p>
	<p>Less frequent waterbird surveys</p>	<p>Conduct waterbird surveys in the impoundments up to three times per month to determine if impoundment</p>

		objectives aimed at sustaining moderate numbers of migrating and wintering waterbirds are being met (p. 4-3);
	Limited Access	Close dikes to public access from November through March to reduce public disturbance to wintering waterfowl (p. 4-3); prohibit dog walking on the Refuge. Since the Refuge mission consists of providing habitats for wintering and migrating birds that include waterfowl, shorebirds, wading birds, marshbirds and landbirds, minimizing those uses that provide the greatest potential conflicts and disturbances to those migratory bird species is a priority (p. 4-31); Prohibit waterfowl hunting in the Presidential Proclamation area composed of 4,600 acres of bay waters and the impoundments (p. 4-47);
	Monitoring	Monitor and evaluate waterfowl, shorebirds, and wading birds use of intensively managed Refuge habitats (p. 4-4); Monitor presence of Canada geese, feral hogs, and feral cats and control these species as necessary to protect refuge resources (p. 4-4);
	Invasive Species	Resident Canada goose. Addle impoundment resident Canada geese eggs by shaking, spraying with cooking oil or puncturing to reduce reproduction. (p. 4-7); Selectively control individual resident Canada geese by lethal means (i.e., shooting with small caliber rifle or shotgun) during their April-June breeding

		season (p. 4-7);
	Education/Outreach	Provide exhibits in the Visitor Contact Station (VCS) to communicate the history of the Refuge, cultural influences in the area (fishing & watermen, hunt clubs, decoy carving, etc.) and natural resource themes (p. 4-30); Provide environmental education for waterfowl hunting when approved; increase volunteer recruitment
	Hunting (not yet)	Fully analyze the potential of adding waterfowl hunting through a complete and separate NEPA analysis. The refuge intends to begin this analysis within 3 years of CCP approval(p. 4-34); Work with partners to implement waterfowl hunting off site;
	Enforcement	Conduct law enforcement patrols to ensure no migratory bird hunting is Occurring (p. 4-37);
	Partnerships	Maintain partnership with Ducks Unlimited, an important partner in wetland and waterfowl conservation (p. 4-39); VAA DGIF; Mackay Island NWR, ACJV, Atlantic Flyway; Partners in Flight;

Site Management Plan Rubric #21

<i>Site Name:</i>	Eastern Shore of Virginia NWR
<i>Size (ha):</i>	1,393 acres
<i>Latitude/Longitude:</i>	37-9'5.62" -75-57'30.39"
<i>Primary Management Agency:</i>	USFWS
<i>ACJV Region:</i>	Mid-Atlantic
<i>Origin of Management Plan:</i>	CCP- field staff, northeast regional

		office staff, USFWS Washington staff, local businesses, environmental agencies, adjacent landowners, sports groups, state fish & wildlife organizations...
<i>Date of Plan:</i>		2004
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
Protect, restore, and enhance migratory bird habitats and populations, with emphasis on the coastal migration Corridor (p. 1-15).	Partnerships	Joint Venture Plan for the State of Virginia; ACJV; Partners in Flight,
	Hunting	Provide waterfowl hunting opportunities by boat on a portion of the former Wise Point Corporation property. Waterfowl hunt season dates and bag limits will fall within the parameters of the State's waterfowl season and will be administered in a way that will cause the least amount of disturbance to neotropical migratory birds (p. 2-15,16); Allow waterfowl hunting on marsh blocks to be acquired that are 200 acres or larger. Most waterfowl hunting will occur on seaside marsh areas acquired. Waterfowl hunting on new lands will be subject to the conditions mentioned in Strategy 7 above (p. 2- 16);
	Education/Outreach	Work with partners (e.g. Coastal Virginia Wildlife Observatory) to enhance and expand, from March to May, interpretive migratory bird programs for the general public and students (p. 2-22); Co-sponsor and participate in local festivals and



		<p>events to promote nature-based tourism on the lower Eastern Shore. Major events include Eastern Shore of Virginia Birding Festival, International Migratory Bird Day, National Wildlife Refuge Week, National Hunting and Fishing Day, Earth Day, Chesapeake Bay Bridge Tunnel Walk/Bike Day, and Citizens for a Better Eastern Shore Biking Day (p.2-25); In cooperation with partners (e.g., Northampton County Chamber of Commerce, State agencies, and private landowners), continue planning International Migratory Bird Day activities on the refuge and work together on other special events (e.g., Birding Festival) (2-27);</p>
	Less frequent waterbird survey	Annually survey breeding birds;

Site Management Plan Rubric #22

<i>Site Name:</i>		Bethel Beach, Dameron Marsh, Hughlett Point, Saveage Neck Dunes Natural Area Preserves
<i>Size (ha):</i>		Includes 5 Natural Area Preserves (approximately 923 acres (373.52 ha))
<i>Latitude/Longitude:</i>		
<i>Primary Management Agency:</i>		Virginia DCR
<i>ACJV Region:</i>		Mid-Atlantic
<i>Origin of Management Plan:</i>		Virginia's Precious Heritage-produced by Virginia's Natural Heritage Program & the VA Dept. of Conservation & Recreation (DCR)
<i>Date of Plan:</i>		2003
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>

	Habitat Management	Some areas undergo habitat manipulation for the benefit of wildlife & waterfowl;
	Research	Technical Report: Vegetation Ecology of the Grafton Ponds, York County, VA with Notes on Waterfowl Use;

Site Management Plan Rubric #23

<i>Site Name:</i>		Mason Neck & Featherstone NWRs
<i>Size (ha):</i>		2,277 acres, 325 acres (approximately 1052.99 ha)
<i>Latitude/Longitude:</i>		
<i>Primary Management Agency:</i>		USFWS
<i>ACJV Region:</i>		Mid-Atlantic
<i>Origin of Management Plan:</i>		CCP-Regional director, refuge staff, public hearings...
<i>Date of Plan:</i>		2011
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
	Partnerships	ACJV, Black Duck Joint Venture, North American Waterbird Conservation Plan, Partners in Flight (black duck); Flyway Council (management for eastern population of tundra swans, management for Atlantic population of Canada geese, Mute swan plan); Audubon Society IBAs Program; Mid-Atlantic/Southern New England BCR 30;
	Monitoring	Avian Influenza Plan; Winter waterfowl banding in Great Marsh; inventory flora & fauna in Great Marsh with specific focus on waterfowl food sources; conduct inventories & monitoring of waterfowl & wading birds; Monitor bird responses to drawdown rates in impoundments; duck banding;

	Invasive Species control	Work with partners to remove mute swans & Canada geese;
	Habitat Management	Maintain Great Marsh area for waterfowl; Manage water levels in Little Marsh area for waterfowl; Identify habitat improvements for waterfowl;
	Limited Access	Prohibit public access to Great Marsh area & Little Marsh area (foot & boat); Great Marsh & Mason
	Enforcement	Enforce public closure sites;
	Impoundment Management	Determine water level regime by season for waterfowl;
	Hunting (not on refuge lands)	Support VDGIF program for waterfowl hunting, increase opportunities for more hunting participants;
	Education/Outreach	Promote visitor understanding of natural resources; train volunteers to complete needed tasks at refuge (duck banding, bird counts); Expand outreach programs like International Migratory Bird Day;

#### Site Management Plan Rubric #24

<i>Site Name:</i>	Presquile NWR
<i>Size (ha):</i>	1,329 acres (537.82 ha)
<i>Latitude/Longitude:</i>	38-53'27.72" -77-20'37.50"
<i>Primary Management Agency:</i>	USFWS
<i>ACJV Region:</i>	Mid-Atlantic
<i>Origin of Management Plan:</i>	CCP- Planning Stage
<i>Date of Plan:</i>	
<i>Individual Waterfowl Management Plan:</i>	

#### Site Management Plan Rubric #25

<i>Site Name:</i>	Alligator River NWR
<i>Size (ha):</i>	152,260 acres (61,617.43 ha)
<i>Latitude/Longitude:</i>	35-52'52.54" -75-51'38.15"
<i>Primary Management Agency:</i>	USFWS
<i>ACJV Region:</i>	South
<i>Origin of Management Plan:</i>	CCP-Refuge staff, interested citizens, conservation organizations, officials of local and state agencies
<i>Date of Plan:</i>	2008
<i>Individual Waterfowl Management Plan:</i>	No

<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
<p>Inventory, protect, and manage to maintain healthy and viable populations of threatened and endangered species (e.g., red wolf and red-cockaded woodpecker), other priority wildlife (migratory birds and black bear), and fish (p. 64).</p>	<p>Habitat Management</p>	<p>Significant Natural Heritage Area; Document the use of wintering habitat for 2,000 tundra swans and 6,000 dabbling ducks annually from November to March (p. 68); Maintain 2,000 to 3,000 acres of optimum quality emergent brackish marsh annually (p. 69); Protect about 1,582 acres of freshwater pools, ponds, lakes, creeks and canals continuously for the benefit of waterfowl, wading birds, fish, amphibians and other wildlife annually (p. 69); Protect and manage 19,014 acres of brackish marsh continuously for the benefit of waterfowl, wading birds, land birds, and other wildlife and fisheries (p. 69); Provide about 1,903 acres of managed wetlands continuously for a variety of wildlife, 1,200 acres of which will be managed to provide high quality moist soil habitat for the benefit of waterfowl, marsh birds, and shorebirds (p. 70); Manage water levels and vegetation to provide optimum conditions for waterfowl and marsh birds (p.70); Manage 3,481 acres of cropland continuously, 1,500 acres of which will be managed to produce food for wintering waterfowl, black bear, red wolf, and other wildlife; and 1,500 acres of which will be managed as filter strips to effect water quality and to provide habitat for grassland birds, ground-nesting birds, and other wildlife (p. 70);</p>

	Partners	ACJV, NC Wildlife Resource Commission, Partners in Flight, South Atlantic Migratory Bird Initiative; Ducks Unlimited, The Nature Conservancy, National Audubon Society;
	Less Frequent Waterbird Surveys	Conduct about 18 ground surveys from October through March (p. 68); Conduct about 12 aerial surveys bimonthly from October through March (p. 68); Conduct productivity surveys for tundra swans each winter as requested (p. 68);
	Monitoring	Monitor 40 wood duck nest boxes annually (p. 68); Assist others with and/or conduct banding activities as directed (p. 68); Meet annual wood duck quota (p. 68); Allow and assist minimal scientific evaluations of selected management activities (p. 69); Develop Biological Inventory/Monitoring Plan;
	Research	Assist others with and/or conduct studies and investigations to the extent possible, as requested (p. 68); Compile existing data for water quality to establish baseline (p. 69); Conduct studies and investigations on water quality parameters every five years (p. 69); Evaluate impacts to water quality and create management recommendations to improve conditions, where feasible (p. 69);

	Hunting	Provide annual opportunities for public hunting use days as follows: waterfowl, 350; other migratory birds, 125; upland game, 1,000; and big game, 2,400 (p. 74); Evaluate, develop and update refuge hunting regulations annually (p. 74); Meet annually with hunters and North Carolina Wildlife Resources Commission representatives to discuss refuge hunting (p. 74); allow hunting with and without dogs;
	Law Enforcement	Improve hunting experience & increase hunting information law enforcement;

Site Management Plan Rubric #26

<i>Site Name:</i>	Cape Hatteras National Seashore
<i>Size (ha):</i>	30,000 acres (12,140.57 ha)
<i>Latitude/Longitude:</i>	35-38'46.09" -75-29'33.19"
<i>Primary Management Agency:</i>	NPS
<i>ACJV Region:</i>	South
<i>Origin of Management Plan:</i>	General Management Plan-planning process
<i>Date of Plan:</i>	ETA- 2016
<i>Individual Waterfowl Management Plan:</i>	No

Site Management Plan Rubric #27

<i>Site Name:</i>	Cape Lookout National Seashore
<i>Size (ha):</i>	56 miles of coast line
<i>Latitude/Longitude:</i>	34-46'31.66" -76-26'24.45"
<i>Primary Management Agency:</i>	NPS
<i>ACJV Region:</i>	South
<i>Origin of Management Plan:</i>	General Management Plan
<i>Date of Plan:</i>	1982
<i>Individual Waterfowl Management Plan:</i>	No

Site Management Plan Rubric #28

<i>Site Name:</i>		Croatan National Forest
<i>Size (ha):</i>		161,000 acres (65,154.39 ha)
<i>Latitude/Longitude:</i>		34-56'11.79" -77-3'48.96"
<i>Primary Management Agency:</i>		FS
<i>ACJV Region:</i>		South
<i>Origin of Management Plan:</i>		Land & Resource Management Plan- Regional Forester & Forest Supervisor
<i>Date of Plan:</i>		2002
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
	Habitat Management	Maintain hardwood cypress wetlands & corridors(abundance of waterfowl, quality wood duck & waterfowl nesting/foraging habitat);
	Hunting	Expand hunting opportunities due to high public demand (waterfowl); construct accessible duck hunting blind for hunters with disabilities;
	Impoundment Management	Co-managed by NC Wildlife Resource Commission & FS for wildlife viewing & waterfowl hunting;
	Partnerships	NC Wildlife Resource Commission

Site Management Plan Rubric #29

<i>Site Name:</i>		Mattamuskeet NWR
<i>Size (ha):</i>		50,180 acres (20,307.12 ha)
<i>Latitude/Longitude:</i>		35-29'25.10" -76-17'20.62"
<i>Primary Management Agency:</i>		USFWS
<i>ACJV Region:</i>		South
<i>Origin of Management Plan:</i>		CCP- refuge manager, assistant refuge manager, contractor, along with public involvement, landowners, state and tribal agencies, non-profit agencies, and local governments.
<i>Date of Plan:</i>		2008

<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
Maintain, enhance, and where necessary, restore healthy populations of migratory birds, wildlife, and fish, including federal and state endangered and threatened species (p. 60).	Partners	North American Bird Conservation Initiative; North Carolina Natural Heritage Program (Significant Natural Heritage Area), ACJV, South Atlantic Migratory Bird Initiative; Partners in Flight, The Nature Conservancy, Audubon Society, Ducks Unlimited; Hyde Co. Waterfowl Association;
	Mid-winter Waterfowl survey	Continue this survey;
	Less frequent waterfowl survey	Continue to conduct monthly aerial and ground surveys during the migration period (October-March) annually. Consider bimonthly surveys (p. 60). Continue to conduct the tundra swan productivity survey following guidelines set forth in the standard operating procedures, which are provided by the Ad Hoc Eastern Population Tundra Swan Committee (p. 60).
	Monitoring	Continue to monitor trends in the resident Canada goose population on the refuge and take actions to reduce this population if migratory waterfowl are negatively impacted (p. 60). Continue to conduct pre-season wood duck banding annually (p. 60). Conduct winter banding and marking of tundra swan, Canada geese, and ducks as requested, continue to maintain and monitor 100 wood duck nest boxes during the nesting season (February-July), Monitor and investigate mortality of tundra swan and other species from disease annually, Note unusual waterfowl



		<p>observations by the staff and the public, Monitor the increasing lesser snow goose population on the refuge and study/observe possible negative impacts to other migratory waterfowl. If necessary, develop strategy to reduce negative impacts (p. 61).</p>
	Hunting	<p>Continue to collect harvest data on waterfowl collected during public hunts (p. 60). Consider hunting impacts to other public uses and wintering waterfowl when evaluating a feral swine hunt program (p. 75). Explore the possibility of making more of the waterfowl hunting blinds accessible-communicate with the North Carolina Handicap Sportsmen Association to facilitate this (p. 80). Continue to provide waterfowl hunting opportunities in permitted hunts on 1,000 acres for 1,000 hunter days in 16 blinds annually, Continue to conduct a two-day youth waterfowl hunt, Continue to provide September Canada geese (nonmigratory geese) hunting season opportunities on 45,000 acres, Explore the value of increasing the number of permits for the September Canada geese hunt, which is currently limited to 100 permits, Explore the value of increasing waterfowl hunting opportunities by participating in the early season waterfowl hunts, as well as the late season youth hunt (p. 81).</p>
	Research	<p>Assist cooperating agencies and universities with studies as needed,</p>

		Conduct needed research projects related to waterfowl (p. 61). Initiate studies in cooperation with universities and the NCWRC to improve the understanding of the impacts of nutria to aquatic vegetation and native wildlife, particularly waterfowl (p. 75).
	Habitat management	Construct and erect new wood duck boxes as needed, Maintain and intensively manage crop fields to benefit waterfowl and provide high-calorie foods (hot foods) during late winter (p. 61).
	Impoundment management	Intensively manage moist-soil impoundments to benefit waterfowl (p. 61). Manage impoundments for migratory birds (p. 68).
	Limited access	Maintain winter closure of public access to eastern impoundments and the back levees of the western impoundments to limit disturbance to waterfowl. Also, limit guided tours to these impoundment areas to no more than one tour per week to each area during the winter closure period (p. 61).
	Invasive species management	Evaluate impacts of resident waterfowl (Canada geese and mallards) and implement control measures as needed (p. 75).
	Education/Outreach	Use signs & exhibits to interpret waterfowl; install panels about swans and waterfowl at observation deck; Use signs to educate about waterfowl habitat; youth hunter orientation for youth waterfowl hunt day; provide opportunities to view waterfowl at observation decks and blinds.

		Conduct annual tour for viewing wintering waterfowl;
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Site Management Plan Rubric #30

<i>Site Name:</i>		Mackay Island NWR
<i>Size (ha):</i>		8,219 acres (3,326.11 ha)
<i>Latitude/Longitude:</i>		36-32'14.01" -75-57'53.88"
<i>Primary Management Agency:</i>		USFWS
<i>ACJV Region:</i>		South
<i>Origin of Management Plan:</i>		CCP-Refuge staff & regional management, state wildlife agencies, nongovernmental organizations, businesses, individual citizens.
<i>Date of Plan:</i>		2008
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
	Partners	NAWMP; NC Wildlife Resources Commission; VA Dept. of Wildlife & Inland Fisheries; ACJV;
	Monitoring	Identify diversity of waterfowl populations; monitor wood duck boxes; band wood ducks; annually check 120 wood duck boxes for productivity; band waterfowl as requested; band resident Canada geese;
	Less Frequent surveys	Monitor wintering waterfowl populations by conducting six bi-weekly aerial surveys and six biweekly ground surveys throughout the wintering waterfowl season. Coordinate monitoring with other refuges in the Roanoke-Tar-Neuse-Cape Fear ecosystem and submit data to the coordinated waterfowl website (p. 59).
	Research	Assist with waterfowl studies as requested; Cooperate with other

		agencies, universities, and organizations performing studies and investigations on the refuge (p. 59).
	Impoundment Management	Protect and manage 955 acres of impoundments to provide wintering habitat for migratory waterfowl, shorebirds, wading birds, and land birds, and breeding habitat for marsh birds and land birds (p. 61).
	Habitat Management	Manage 298 acres of cropland to provide a variety of habitats for wintering waterfowl, migratory landbirds, and resident wildlife, Utilize the cooperative waterfowl sanctuary program on private lands with the North Carolina Wildlife Resources Commission as available. (p. 62).
	Education/Outreach	Provide more opportunities for wildlife viewing in impoundments & blinds;
	Limited Access	Restrict impoundment and marsh during winter;

Site Management Plan Rubric #31

<i>Site Name:</i>		Pocosin Lakes NWR
<i>Size (ha):</i>		110,106 acres (44,558.32 ha)
<i>Latitude/Longitude:</i>		35-58'8.81" -76-15'2.20"
<i>Primary Management Agency:</i>		USFWS
<i>ACJV Region:</i>		South
<i>Origin of Management Plan:</i>		CCP-Refuge staff, state wildlife agencies, non-governmental agencies, businesses, individual citizens
<i>Date of Plan:</i>		2007
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
	Partners	'significant natural heritage area' -

		ACJV, Partners in Flight, Waterbirds for the Americas,
	Less frequent surveys	Annual aerial surveys; Monitor wintering waterfowl populations annually by conducting 12 aerial surveys performed every other week and 12 ground surveys performed every other week throughout the wintering waterfowl season (p. 76).
	Monitoring	Waterfowl banding; productivity surveys of tundra swans & snow geese as needed; check 100 wood duck boxes annually during nesting season; band summer wood ducks; construct 50 new wood duck boxes;
	Research	Assist outside agencies/universities with waterfowl studies;
	Habitat Management	Annually provide acres of grain and green browse for wintering waterfowl; manage moist soil habitat and wetlands for wintering habitat for waterfowl; manage water levels in increase wetlands for wintering waterfowl; manage water levels to maximize open water for wintering waterfowl;
	Limited Access	Restrict areas of impoundment for waterfowl rest areas; restrict pungo lake during wood duck breeding season;
	Impoundment management	Restrict access and water level management for waterfowl;

Site Management Plan Rubric #32

<i>Site Name:</i>	Cape Romain NWR
<i>Size (ha):</i>	66,287 acres (26,825.40 ha)
<i>Latitude/Longitude:</i>	33-14'52.35" -79-37'44.06"
<i>Primary Management Agency:</i>	USFWS
<i>ACJV Region:</i>	South
<i>Origin of Management Plan:</i>	CCP-planning phase
<i>Date of Plan:</i>	N/A
<i>Individual Waterfowl Management Plan:</i>	N/A

Site Management Plan Rubric #33

<i>Site Name:</i>	Francis Marion National Forest
<i>Size (ha):</i>	629,000 acres (254,547.27 ha)
<i>Latitude/Longitude:</i>	33-13'37.92" -79-43'30.13"
<i>Primary Management Agency:</i>	FS
<i>ACJV Region:</i>	South
<i>Origin of Management Plan:</i>	Land & Resource Management Plan- Regional Forester, Forest Supervisor,
<i>Date of Plan:</i>	1996
<i>Individual Waterfowl Management Plan:</i>	No

Site Management Plan Rubric #34

<i>Site Name:</i>	Waccamaw NWR	
<i>Size (ha):</i>	49,732 acres (20,125.83 ha)	
<i>Latitude/Longitude:</i>	33-24'22.92" -79-16'23.61"	
<i>Primary Management Agency:</i>	USFWS	
<i>ACJV Region:</i>	South	
<i>Origin of Management Plan:</i>	CCP-Refuge staff & management, Refuge biologist, outside biologist, stakeholders	
<i>Date of Plan:</i>	2008	
<i>Individual Waterfowl Management Plan:</i>	No	
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
	Partners	ACJV;
	Impoundment Management	Managed for waterfowl food; 500 acres of moist soil or impoundment management for migrating/wintering waterfowl;
	Hunting	Waterfowl hunting, begin a fee program for quota hunts; youth waterfowl hunt program;
	Habitat Management	As appropriate, consult with other refuges with experience in modifying hydrology by plugging ditches or leveling pine plantation beds to expedite each action and improve prospects for success (p. 51). Maintain dense scrub/shrub

		vegetation, retain beaver ponds and manage for stands of emergent or floating vegetation (50-70 percent vegetated: 30-50 percent open water) in managed wetland habitats [for wood ducks](p. 56). Manage wetlands for waterfowl food; Manage stands for old growth mast producing hardwoods to provide habitat for wintering and resident waterfowl and key neotropical migratory birds, including swallow-tailed kites (p. 64). Identify areas where highest priority corridors for migratory birds and large mammals should be added to the current acquisition boundary (p. 67).
	Less frequent waterfowl surveys	Conduct monthly aerial waterfowl surveys (Nov-Feb) for freshwater marsh and forested wetland habitats; Conduct bi-monthly ground waterfowl surveys (Oct-Mar) for all managed wetland complexes on the refuge (p. 51). Conduct aerial surveys annually during fall/winter to determine numbers and specific locations of wood duck roost(s) (p. 55).
	Limited Access	Erect and maintain “Area Closed to Hunting” signs in the general area of the roosts (p. 56).
	Monitoring	“Increasing Wood Duck Productivity-Guidelines for Management and Banding for Refuge Lands (Southeast Region)” updated in 2003 by the Division of Migratory Birds (p. 55). Erect nest boxes in refuge-owned tidal wetlands throughout Units 1, 2, and 3 in line

		with the budgetary and personnel capability to assure annual maintenance, repair, and checking/refurbishing of boxes; Integrate waterbird objectives and strategies for king rail, least bittern, and purple gallinule habitat where feasible with habitat needs for wood duck broods (p. 56).
	Education/outreach	Evaluate establishing swallow-tailed kite tours. If appropriate, add wildlife observation areas to provide visitors with opportunities to see swallow-tailed kites, bald eagles, wading birds, waterfowl, etc (p. 77).

Site Management Plan Rubric #35

<i>Site Name:</i>		Savannah Coastal Complex-4 sites(Pinckney Island; Savannah; Tybee; Wassaw; Harris Neck; Blackbeard Island; and Wolf Island. A separate CCP was prepared for the Wolf Island National Wildlife Refuge.)
<i>Size (ha):</i>		56,000 acres (22,662.40 ha)
<i>Latitude/Longitude:</i>		32-11'43.34" -81-4'20.05"
<i>Primary Management Agency:</i>		USFWS
<i>ACJV Region:</i>		South
<i>Origin of Management Plan:</i>		CCP-Resource managers representing all 6 refuges within complex; biological review team for each refuge; representatives from local and state offices; public meetings.
<i>Date of Plan:</i>		2011
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
	Partners	North American Bird Conservation



		Initiative; ACJV; South Atlantic Migratory Bird Initiative; Audubon Society; DU; The Nature Conservancy;
	Habitat Management	Manage water levels for waterfowl; provide proper nesting and feeding habitat; enhance and protect additional acreage for waterfowl habitat;
	Monitoring	Wood duck boxes; nest success and chick survival data; create surveying and monitoring program for wetland-dependent birds; avian influenza monitoring when duck banding & hunting;
	Impoundment Management	Impoundment overrun with cattails; monitor waterfowl use of all ponds; evaluate water control structures; control invasive species within ponds; monitor water quality; rehabilitate wood duck banding site;
	Less frequent surveys	SAMBI bi-monthly wintering waterfowl survey; 2 surveys per month in winter in ponds;
	Mid-winter waterfowl survey	Conducted on Wassaw NWR;
	Education/Outreach	Improve waterfowl viewing opportunities; bird photography workshops;
	Hunting	Review hunt plan; hunter education course;

Site Management Plan Rubric #36

<i>Site Name:</i>	Cumberland Island National Seashore
<i>Size (ha):</i>	36,415 acres (14,736.63 ha)
<i>Latitude/Longitude:</i>	30-52'2.85" -81-27'17.32"
<i>Primary Management Agency:</i>	NPS
<i>ACJV Region:</i>	South
<i>Origin of Management Plan:</i>	General Management Plan-
<i>Date of Plan:</i>	1984
<i>Individual Waterfowl Management Plan:</i>	No

<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
	Partners	Atlantic Flyway;

Site Management Plan Rubric #37

<i>Site Name:</i>	Okefenokee NWR
<i>Size (ha):</i>	395,080 acres (159,883.20ha)
<i>Latitude/Longitude:</i>	Between 30-33' & 31-05' N and 82-07' & 82-33' W
<i>Primary Management Agency:</i>	USFWS
<i>ACJV Region:</i>	South
<i>Origin of Management Plan:</i>	CCP-planning team: refuge staff, representatives from USFWS office of ecological services, Georgia wildlife federation, GA dept. of natural resources, GA state parks and historic sites, Osceola National Forest, and private natural resource consultants.
<i>Date of Plan:</i>	2006
<i>Individual Waterfowl Management Plan:</i>	No

<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
	Education and Outreach	
	Enforcement	
	Habitat Management	
	Hunting	
	Impoundment Management	
	Limited Access	
	Mid-winter waterfowl count	Eliminate this survey because refuge is not an important contributor;
	Monitoring	Increase annual point counts during migration and breeding periods; eliminate wood duck boxes on east side of refuge-only monitor on west side of refuge for 2 years then evaluate efficacy;

	Partnerships	NAWMP, ACJV,
	Research	
	Weekly waterbird count	
	Less frequent waterbird count	Monthly survey of foraging habits; aerial survey of nesting habits and productivity;

Site Management Plan Rubric #38

<i>Site Name:</i>		Archie Carr NWR (part of Merritt Island Complex)
<i>Size (ha):</i>		Over 258 acres (104 ha)
<i>Latitude/Longitude:</i>		27-54'12.64" -80-28'16.89"
<i>Primary Management Agency:</i>		USFWS
<i>ACJV Region:</i>		South
<i>Origin of Management Plan:</i>		CCP-
<i>Date of Plan:</i>		2008
<i>Individual Waterfowl Management Plan:</i>		no
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
	Education and Outreach	
	Enforcement	
	Habitat Management	
	Hunting	
	Impoundment Management	
	Limited Access	
	Mid-winter waterfowl count	Christmas bird count;
	Monitoring	
	Partnerships	NAWMP, North American Bird Conservation Initiative, ACJV, FL fish and wildlife conservation commission, FL dept. of environmental protection, FL division of forestry, St. Johns River Water Management District
	Research	

	Weekly waterbird count	
	Less frequent waterbird count	

Site Management Plan Rubric #39

<i>Site Name:</i>		Arthur R. Marshall-Loxahatchee NWR
<i>Size (ha):</i>		147,392 acres (59,647.43 ha)
<i>Latitude/Longitude:</i>		26-31'8.84" -80-20'30.33"
<i>Primary Management Agency:</i>		USFWS
<i>ACJV Region:</i>		South
<i>Origin of Management Plan:</i>		CCP-refuge planning team
<i>Date of Plan:</i>		2000
<i>Individual Waterfowl Management Plan:</i>		no
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
	Education and Outreach	
	Enforcement	
	Habitat Management	Manage cypress swamp and marsh to enhance habitat for waterfowl;
	Hunting	Increased access for Waterfowl hunting, update waterfowl hunting plan,
	Impoundment Management	Manage 4 compartments and 13 impoundments for migrating birds and raptors;
	Limited Access	Establish sanctuary areas for waterfowl; restrict hunting days and quotas based on population trends,
	Mid-winter waterfowl count	
	Monitoring	Water quantity, timing, delivery, and quality monitoring; Biological inventory and monitoring plan;
	Partnerships	NAWMP, ACJV, National Wetlands priority conservation plan, develop new partnerships for research and monitoring with DU, Waterfowl USA, FL dept. of environmental

		protection, FL fish and wildlife conservation commission
	Research	
	Weekly waterbird count	
	Less frequent waterbird count	

Site Management Plan Rubric #40

<i>Site Name:</i>		Biscayne National Park
<i>Size (ha):</i>		175,000 acres (70,819.99 ha)
<i>Latitude/Longitude:</i>		25-27°22.66" -80-11°56.17"
<i>Primary Management Agency:</i>		NPS
<i>ACJV Region:</i>		South
<i>Origin of Management Plan:</i>		GMP-being updated
<i>Date of Plan:</i>		1983
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
	Education and Outreach	
	Enforcement	
	Habitat Management	
	Hunting	
	Impoundment Management	
	Limited Access	
	Mid-winter waterfowl count	
	Monitoring	
	Partnerships	
	Research	
	Weekly waterbird count	
	Less frequent waterbird count	

Site Management Plan Rubric #41

<i>Site Name:</i>		Everglades National Park
<i>Size (ha):</i>		1,400,533 acres (566,775.60 ha)
<i>Latitude/Longitude:</i>		25-25'33.28" -80-52'5.06"
<i>Primary Management Agency:</i>		NPS
<i>ACJV Region:</i>		South
<i>Origin of Management Plan:</i>		GMP-
<i>Date of Plan:</i>		1979
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
	Education and Outreach	
	Enforcement	
	Habitat Management	
	Hunting	
	Impoundment Management	
	Limited Access	
	Mid-winter waterfowl count	
	Monitoring	
	Partnerships	
	Research	
	Weekly waterbird count	
	Less frequent waterbird count	

Site Management Plan Rubric #42

<i>Site Name:</i>		Ocala National Forest
<i>Size (ha):</i>		383,000 acres (154,994.60 ha)
<i>Latitude/Longitude:</i>		29-20'3.47 -81-46'39.54"
<i>Primary Management Agency:</i>		FS
<i>ACJV Region:</i>		South
<i>Origin of Management Plan:</i>		Land and Resource Management Plan
<i>Date of Plan:</i>		1999
<i>Individual Waterfowl Management Plan:</i>		No

<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
	Education and Outreach	
	Enforcement	
	Habitat Management	
	Hunting	
	Impoundment Management	
	Limited Access	
	Mid-winter waterfowl count	
	Monitoring	Wood duck boxes
	Partnerships	
	Research	
	Weekly waterbird count	
	Less frequent waterbird count	

Site Management Plan Rubric #43

<i>Site Name:</i>		Crocodile Lake NWR
<i>Size (ha):</i>		6,700 acres (2,711.39 ha)
<i>Latitude/Longitude:</i>		25-15'4.38" -80-20'17.76"
<i>Primary Management Agency:</i>		USFWS
<i>ACJV Region:</i>		South
<i>Origin of Management Plan:</i>		CCP-planning team
<i>Date of Plan:</i>		2006
<i>Individual Waterfowl Management Plan:</i>		No
<b>Waterfowl Management Goals</b>	<b>Waterfowl Management Strategies</b>	<b>Waterfowl Management Actions</b>
Provide high-quality habitat, including nesting, resting, foraging, and nursery areas, for the long-term survival of threatened and endangered species, migratory birds, and other	Education and Outreach	

wildlife (p.23).		
	Enforcement	
	Habitat Management	
	Hunting	
	Impoundment Management	
	Limited Access	
	Mid-winter waterfowl count	
	Monitoring	
	Partnerships	
	Research	
	Weekly waterbird count	
	Less frequent waterbird count	



## APPENDIX D: SURVEY INSTRUMENT

### Waterfowl Management Survey

This survey serves as a tool for the dissertation research of April Evans, PhD candidate at East Carolina University. The dissertation research aims to identify waterfowl management strategies used by coastal Atlantic Coast Joint Venture (ACJV) sites. This survey is directed to managers and staff of coastal ACJV sites who are involved in the management of waterfowl and seeks their perception of waterfowl management strategy effectiveness. This research aims to help managers allocate funds and staff to the most effective management efforts for waterfowl conservation.

Your answers to this survey will be kept confidential and will only be used for the purpose of this study. This study has been approved by and is under the guidance and supervision of East Carolina University. Please contact April Evans with any questions regarding this study at [evansa00@students.ecu.edu](mailto:evansa00@students.ecu.edu).

If you have additional staff members who were not sent this questionnaire, and who implement waterfowl management at your site, please forward this survey to those individuals or send April Evans their contact information, so that they may be sent a link to the survey.

#### **Part I: Background Information**

1. What is your sex?
  - Male
  - Female
  
2. What race or ethnicity do you consider yourself?
  - Anglo or White
  - African American or Black
  - Hispanic American
  - Native American
  - Asian American
  - Other
  
3. What is your age? \_\_\_\_\_
  
4. What is the highest level of education you have completed?
  - <6<sup>th</sup> grade
  - Grades 6-12
  - High school graduate
  - Some college
  - College degree
  - Graduate or professional degree
  
5. If you marked “college degree or graduate/professional degree” list the degree and major you received.



Fisheries management	_____	_____
Predator management	_____	_____
Endangered species management	_____	_____
Law enforcement	_____	_____
Visitor use	_____	_____
Volunteer management	_____	_____
Public outreach/education	_____	_____
Administrative	_____	_____
Other	_____	_____

15. Does your site have a Biologist position?

- Yes
- No

16. Has your site ever had a Biologist position?

- Yes
- No

17. How many staff members are currently involved in any aspect of waterfowl management?

\_\_\_\_\_

18. How many staff members were involved with waterfowl management ten years ago?

\_\_\_\_\_

19. Has the number of staff members involved in waterfowl management affected waterfowl management at your site? If so, then please explain.

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

20. What is the status of your site management plan?

- a. In use
- b. In revision
- c. In planning phase
- d. Do not have one

**Part 2: Opinion Survey**

21. Which of the following management strategies is your site currently **NOT** using for the management of waterfowl? Please choose the primary reason for not implementing the strategy. Check all that apply.

	Not perceived as effective	Too expensive	No expertise	Too labor and time intensive	No administrative support	Statutorily prohibited
Education/ Outreach						
Enforcement						
Habitat Management						
Hunting						
Impoundment Management						
Less Frequent Waterfowl Count						
Limited Access						
Mid-winter Waterfowl Count						
Monitoring						
Partnerships						
Research						
Weekly Waterbird count						

22. Which of the following are threats to waterfowl at your site? Check all that apply.

- Habitat loss
- Habitat degradation
- Invasive species
- Lack of food source
- Pollution
- Predators
- Illegal hunting practices (over bag limit, rallying birds, poaching)

23. For each of the following questions please check the box that indicates your professional opinion as “strongly agree”, “agree”, “neither”, “disagree”, “strongly disagree”. (These statements are taken or derived from the NAWMP and the ACJV Strategic Plan)

- Waterfowl are valuable/important as a natural resource.
- Conserving waterfowl for future generations is our ethical duty.
- Waterfowl populations should be sustained at objective levels across their natural ranges to provide ecological and socioeconomic benefits.
- Protection of waterfowl requires long-term planning at regional and/or continental scales.
- Sustainable waterfowl harvests are desirable and consistent with waterfowl conservation goals.
- Partnerships at all levels of government and with interest groups are necessary for successful waterfowl conservation and management.
- Adaptive management regimes are effective for waterfowl management.
- Habitat loss, fragmentation, and degradation are major threats to waterfowl populations on the Atlantic coast.
- Habitat conservation on public and private land is essential to waterfowl protection.
- A scientific base for management decisions is critical for successful waterfowl management.
- Education and outreach are important components for successful waterfowl management.

24. Rank the effectiveness (1 being not effective, 5 being very effective) of waterfowl in assisting your site to:

Attract visitors	1 2 3 4 5
Attract public involvement/volunteers	1 2 3 4 5
Attract funding/partnerships	1 2 3 4 5
Preserving other natural resources	1 2 3 4 5

25. Rank the following criteria according to their importance to waterfowl management strategy selection at your site (1 being not important, 5 being very important)

Location of the site (remoteness, climate)	1 2 3 4 5
Type of management plan (CCP, Habitat Management Plan)	1 2 3 4 5
Visitor Use (hiking, fishing, boating)	1 2 3 4 5
Hunting on site	1 2 3 4 5
Wetlands on site	1 2 3 4 5
Managers' professional background	1 2 3 4 5
Managers' years of experience	1 2 3 4 5

26. Rank the importance of the following groups in the formation of your waterfowl management strategies (1 being not important, 5 being very important)

Atlantic Coast Joint Venture	1 2 3 4 5
Partnerships	1 2 3 4 5
Headquarters/Regional Manager	1 2 3 4 5
Site Manager	1 2 3 4 5
Site Staff	1 2 3 4 5
Local Communities	1 2 3 4 5

27. Indicate your perception of waterfowl population trends overall (1 being declining, 3 being stable, 5 being thriving).

At your site	1 2 3 4 5
The Atlantic Flyway	1 2 3 4 5

28. Rank how effective you perceive the following waterfowl management strategies overall (1 being not effective, 5 being very effective)

Education and Outreach	1 2 3 4 5
Enforcement	1 2 3 4 5
Habitat Management (vegetation cover, food source)	1 2 3 4 5
Hunting	1 2 3 4 5
Impoundment Management	1 2 3 4 5
Less frequent waterfowl count	
Limited Access	1 2 3 4 5
Mid-winter waterfowl count	1 2 3 4 5
Monitoring (nest boxes, banding, wing counts)	1 2 3 4 5
Partnerships	1 2 3 4 5
Research	1 2 3 4 5
Weekly waterbird count	1 2 3 4 5

29. Please write any additional comments you may have.

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