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USA: Rhode Island: North Cape Bird Restoration, Block Island Sound



In 1996, the tank barge North Cape and the tugboat Sandia grounded off the coast of Rhode Island; Credit: NOAA



A focal species, the common loon; Credit: NOAA



Overview

In January of 1996 the tank barge, North Cape, struck ground off the coast of Rhode Island spilling approximately 828,000 gallons of No. 2 heating oil into Block Island Sound. The results of over 30 studies of potential resource injuries caused by the spill were reviewed and a variety of experts in relevant scientific and technical disciplines were consulted. Based on this work, it was believed that the spill caused significant injuries to biota in the offshore and salt pond environments and to a variety of birds. Under the natural resource damage assessment provisions of the Oil Pollution Act, a trustee council, made up of representatives of Rhode Island Department of Environmental Management (RIDEM), U.S. Fish and Wildlife Service (USFWS), and National Oceanic and Atmospheric Administration (NOAA), was established to review, select, and oversee implementation of restoration actions for natural resources injured by the spill. A comprehensive restoration plan was developed and projects were implemented for birds, shellfish, and American lobster. Projects were also implemented to restore alewife runs in the salt pond watersheds as compensation for lost recreational fishing opportunities, and open space lands have been protected to compensate for losses to other marine and salt pond organisms. This particular case study focuses on the bird restoration project which was an effort to restore loons, sea ducks, and piping plover populations.

Over 2,000 birds, including numerous loons and sea ducks, were estimated to have been killed by the North Cape oil spill (Sperduto et al. 2003). The piping plover, a federally listed threatened species, was impacted by reductions to its food base. The goal of the restoration was to fully address the impacts to birds by returning injured natural resources to their pre-spill conditions as well as compensate for interim losses of the bird resources. This was attempted by replacing the quantity of bird-years (direct mortality plus foregone production) lost due to the spill. Aspects of the restoration included enhancing reproductive success of loons, eiders and piping plovers through land purchase to protect nesting sites, nesting bird protection and management activities, and monitoring. These efforts have lead to the permanent protection of nearly 1.5 million acres of Maine forests and lakes that provide nesting habitat for at least 125 loon pairs, permanent protection of Flag Island, a 42 acre island in Casco Bay, Maine that is home to more than 600 pairs of nesting common eiders and an increase in nesting piping plovers from 35 pairs on nine beaches in 2000 to 58 pairs on 11 beaches in 2006. In addition, the results from the monitoring have aided in developing effective methods for restoration and management of these bird populations.

Quick Facts

Project Location:

Block Island Sound, United States, 41.20833890000001, -71.8096941

Geographic Region:

North America

Country or Territory:

United States of America

Biome:

Coastal/Marine

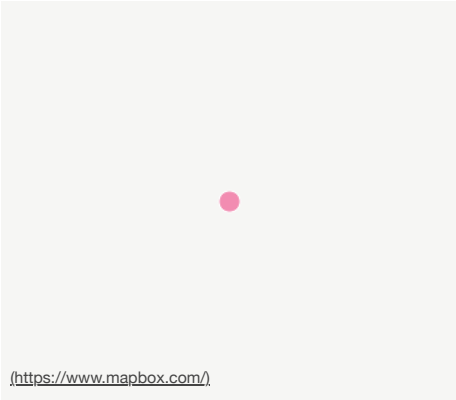
Ecosystem:

Coastal, Dune & Upland

Organization Type:

Governmental Body

Location



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TIMEFRAME

Project Stage:

Completed

Start Date:

2001-01-01

End Date:

2009-01-01

DEFINING THE PROBLEM

Primary Causes of Degradation

Contamination (biological, chemical, physical or radiological)

Degradation Description

On January 19, 1996, during a severe winter storm, the tank barge North Cape, carrying 94,000 barrels (3.9 million gallons) of two blends of No. 2 home heating oil, struck ground off Moonstone Beach in South Kingstown, Rhode Island and began to leak oil into the surrounding water. Winds reaching 50 knots formed large, breaking waves that dispersed the oil throughout the water column and into contact with bottom sediments

resulting in high concentrations of toxic components (i.e. polycyclic aromatic hydrocarbons, PAHs) in the shallow waters near shore (French McCay, 2003). A second winter storm five days later brought the oil, which had been dissipating, back into the sensitive intertidal zone, resulting in substantial mortality of marine organisms (Gibson et al, 1997). In total, an estimated 828,000 gallons of the fuel oil were released into the coastal and offshore environments before the North Cape was refloated and moved to Newport, Rhode Island on Friday, January 26, one week after grounding.

The trustees reviewed the results of over 30 studies of potential resource injuries caused by the spill and consulted with a variety of experts in relevant scientific and technical disciplines. Based on this work, the trustees believed that the spill caused significant injuries to biota in the offshore and salt pond environments and to a variety of birds. While the effect of the oil spill was extensive, this case study is focused on the bird mortality and subsequent population restoration.

Injury quantification for bird resources began with an estimate of the number of seabird and wintering waterfowl killed as a result of the incident, as well as information describing the size and age of these animals. To arrive at an estimate of total bird mortality, an acute mortality multiplier, based on a qualitative analysis of factors influencing oil spill-related bird mortality (Attachment 2), was applied to the number of water birds known to have died as a result of the oil spill. This multiplier accounts for birds that were never found because they sank, drifted out to sea or were scavenged (Hladik and Burger, 1993). The methods used to derive the value of the acute mortality multiplier used for the North Cape oil spill are described in detail in Sperduto et al (1997).

Once the magnitude of the injury was established, the recovery time for the resource to return to baseline condition was estimated. Recovery time estimates (Attachment 2) were based on life history and population information for each injured bird species, straightforward calculations and best professional judgment (Sperduto et al, 1999). Multiplying the recovery time by the number of individuals affected by the spill provided an estimate of the total direct bird injury. The total direct bird injury for each species group was as follows: marine birds with recovery period greater than one year (4,025 bird-years), marine birds with recovery period equal to one year (606 bird-years), non-water birds (12 bird-years), and pond birds (198 bird-years). The estimate of indirect bird injuries included the lost bird-years associated with the first generation of fledglings that would have been produced by marine birds with recovery periods greater than one year (scoters, mergansers, goldeneye, bufflehead, eider, loons and grebes) and the sum of lost bird-years in the future discounted by an annual rate of three percent (present value estimate of lost bird-years). Based on this approach the estimated total bird loss amounted to 6,275 bird-years. Losses were greatest for loons (2,920 bird-years) and eider (853 bird-years). Details of this calculation are provided in Sperduto et al (2003).

In addition to seabirds and wintering waterfowl, the piping plover, a federally listed threatened species was adversely affected by the North Cape oil spill. To assess injury to piping plovers nesting within the spill impacted area (Moonstone Beach), behavior and productivity of these birds during 1996 was compared to historical and reference area data. This comparison indicated that Moonstone Beach plovers experienced lower productivity than expected and exhibited unusual behavior consistent with reduced food supply and reproductive impairment. A first generation loss was estimated to be approximately five piping plover chicks (Donlan et al. 2003).

PLANNING AND DESIGN

Reference Ecosystem Description

The salt pond and offshore habitats of the Block Island Sound coastal ecosystem provide nesting and foraging habitat for a host of resident and migratory bird species. During the winter months, marine waters support seabird and waterfowl populations including loons and grebes, sea ducks (e.g. eiders and scoters), and diving ducks (e.g. goldeneye, bufflehead, and scaup). Wintering diving ducks and dabbling ducks such as scaup, American black duck and mallard also inhabit the area's salt ponds. Over 200 species of migratory birds use Block Island Sound resources during the spring and autumn months. Several species of birds (e.g. black ducks and loons) are of special importance to wildlife managers because their populations are declining and/or their ranges are retracting.

Common Loon

Breeding common loon (*Gavia immer*) populations in the northeastern U.S. have experienced severe historical declines and range retractions. Common loons rely on the Block Island Sound ecosystem for wintering habitat. Experts believe that loons wintering off the coast of Rhode Island breed in northern New England (Maine) and southern Canada. Although Maine's breeding loon population is currently robust and estimated at 1,400 pairs (Evers, 2007), major stressors continue to pose a threat. These stressors include both the availability of methylmercury (MeHg) in freshwater environments (Evers et al, 1998; Evers, 2000) and oil spills in marine environments. Loons are recognized as a species of management concern by the USFWS, and are highly sensitive to human disturbance and have low nesting and hatching success in habitats encroached upon by human development (Crowley et al, 1996). The state of Vermont has listed common loons as an endangered species; in New Hampshire they are listed as a threatened species; and in Massachusetts, Connecticut and New York they are listed as a species of concern.

Piping Plover

Piping plovers (*Charadrius melodus*), a federally listed threatened species, were common along the Atlantic Coast during much of the 19th century, but nearly disappeared due to excessive hunting for the millinery trade. Following passage of the Migratory Bird Treaty Act in 1918, numbers recovered to a 20th Century peak which occurred in the 1940s. The current population decline is attributed to increased development and recreational use of beaches since the end of World War II. The most recent surveys place the Atlantic population at less than 1,800 pairs (USFWS, 2007). The Block Island Sound ecosystem provides particularly valuable habitat for piping plover. These southern beaches contain the largest piping plover nesting area in the state. In the summer of 1996, nine pairs of piping plovers nested on Moonstone Beach near the site of the North Cape grounding, and five pairs nested on Ninigret Beach.

Common Eider

Common eiders (*Somateria mollissima*) have experienced a tremendous population increase during the last 100 years. In the early 1900s, market hunting, egg collecting, and year-round shooting had suppressed numbers so that there were only a few nesting pairs in Maine in 1907 (Gross, 1944; Goudie et al, 2000). Allen (2005) reported a population high of approximately 29,000 nesting pairs on 341 islands, and speculated that the population peaked in late 1980s or early 1990s. Despite their historic comeback, eiders in Maine were believed to be in decline beginning in the 1990s (Krohn et al, 1992). Eiders have low life time reproductive rates which make their population levels sensitive to factors that reduce adult survivorship. Therefore, recent natural mortality events (avian cholera in Quebec, die-offs due to virus and other causes in Massachusetts, and high rates of predation) and demand for sea duck hunting in the northeast has led to concerns about the sustainability of this increased harvest of eiders in New England, Quebec and the Canadian Maritimes.

Project Goals

The overall goal of the restoration was to fully address the impacts to birds by returning injured natural resources to their pre-spill conditions as well as compensate for interim losses of the bird resources. This was attempted by replacing the quantity of bird-years (direct mortality plus foregone production) lost due to the spill through land purchase and management activities that protected existing breeding sites for loons, eiders and piping plovers. By protecting breeding pairs and their associated nesting sites, future productivity was enhanced sufficiently to compensate for the losses caused by the North Cape oil spill.

Monitoring

The project does not have a monitoring plan.

Stakeholders

Under the provisions/authority of the Oil Pollution Act, Rhode Island Department of Environmental Management (RIDEM), the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Department of the Interior (DOI) (represented by the U.S. Fish and Wildlife Service) were designated as natural resource trustees and had the responsibility to restore, rehabilitate, replace, or acquire the equivalent of natural resources injured as a result of the North Cape oil spill.

The trustees, on behalf of the public, determined the natural resource injuries, planned for appropriate restoration projects, prepared the draft and final restoration plans and implemented and oversaw restoration activities. Restoration plans were reviewed by experts from industry, restoration scientists, and interested members of the public. Decisions guiding restoration implementation and monitoring were developed as a part of a settlement agreement between resource managers and responsible parties. Final authority to make determinations regarding injury and restoration rested solely with the trustees.

The trustees have considered and evaluated a full suite of restoration alternatives for compensating bird injuries from the North Cape oil spill. Of all the bird injuries, losses were greatest for loons and eiders. Loon restoration was of particular importance because of scientific concern about the status of their populations in the northeastern United States and strong public interest in and support for this species. Natural mortality events and increased demand for hunting opportunities have impacted the New England eider population and the Rhode Island piping plover population has had difficulty maintaining its size, as evidenced by its listing as a threatened species and state protection efforts. Since these bird species have declined relative to their historic populations due to hunting pressure and habitat loss and degradation, it was reasonably certain that their restoration would result in enhanced ecological services in the area of spill impact. Thus a net ecological benefit to compensate for the oil spill injuries to natural resources was expected.

PROJECT ACTIVITIES

Description of Project Activities:

Common Loon The goal of the loon restoration was to restore the 2,920 loon-years lost as a result of the spill. Since restoration did not begin until 2000, the 2,920 lost loon-years were adjusted for the delay ($2920 \times (1.03)^4$). This resulted in 3,286 loon-years required for restoration. The restoration focused on protecting breeding loon populations by purchasing land and/or development rights to protect existing breeding habitat from future decreases in productivity associated with development. By purchasing enough land to protect an appropriate number of loon pairs and their associated nesting sites, future loon productivity was enhanced sufficiently to compensate for the losses caused by the North Cape spill.

Approximately 25 loon pairs and their associated nesting sites needed protection to restore the lost bird-years. Since Rhode Island is only a wintering destination for loons, appropriate in-state restoration options were not available. Consequently, the trustees looked for restoration options in other New England states where loon breeding habitat is present. Working with an array of partners (including New England Forestry Foundation, Downeast Lakes Land Trust, Forest Society of Maine, and The Nature Conservancy), the trustees assisted with the permanent protection of nearly 1.5 million acres of Maine forests and lakes that provide nesting habitat for nearly 150 loon pairs. A loon protection/monitoring/education program was implemented to ensure that the restoration project was meeting established objectives. Field biologists were hired to protect and monitor the loons during the breeding season and implement educational efforts for 10 years. Specific tasks included: ensuring that there was no physical disturbance to the loon habitat, monitoring loon biological activity, protecting nest sites from human disturbance, organizing and implementing educational activities for residents and recreational users of protected lakes. Results from the monitoring efforts indicated that loon productivity varies by region and season. This variability has important implications for future loon restoration scaling efforts. While the average productivity was much lower than expected for the North Cape restoration scaling effort (0.20 compared to 0.5), the opportunity to leverage settlement funds and protect many more nests than anticipated, resulted in a successful restoration effort. For more detailed information about the monitoring methods and results contact the USFWS New England Field Office.

Piping Plover The goal of the piping plover restoration was to improve the productivity of local piping plover populations by enhancing their reproductive success, thereby replacing productivity lost due to the North Cape oil spill (five piping plover chicks). This was attempted by reducing disturbance and predation at new and

existing piping plover nesting sites. The trustees worked with biologists from the Rhode Island National Wildlife Refuge (RINWR) and The Nature Conservancy (TNC) to implement monitoring and management activities that effectively addressed recovery tasks identified in the Atlantic Coast Piping Plover Revised Recovery Plan (USFWS, 1995) and met established objectives of the restoration plan. The activities included exclosing nests to protect against predation, installing symbolic fencing to limit pedestrian access to nesting areas, predator removal, posting interpretive signage and presenting educational programs to the public. With the help of volunteers, biologists educated beachgoers about dog leash laws and minimizing disturbance to nesting piping plovers. Numerous partnerships were also developed with local landowners to cooperatively manage beaches for piping plover protection. As a result of these efforts, piping plover nesting pairs have increased from 35 pairs on nine beaches in 2000 to 58 pairs on 11 beaches in 2006 (Edwards et al, 2006). In addition to the increased numbers of nesting pairs, plover productivity appears to have stabilized to approximately one chick per pair based upon monitoring data collected from 1998-2008 (Hartlaub et al, 2009). However, this productivity is below the 1.24 estimate needed to maintain a stable piping plover population. Use of exclosures was discontinued in some locations due to adult mortality associated with these structures and changes in climatic conditions appear to effect hatching success as well as chick mortality. For more detailed information regarding monitoring methods and results contact the Rhode Island National Wildlife Refuge Complex or the Rhode Island Chapter of The Nature Conservancy.

Common Eider The goal of the common eider project was to restore the 2,933 marine bird-years (adjusted to the year 2000) lost as a result of the North Cape oil spill. This was attempted by protecting nesting habitat. Habitat protection offered a practical effective means of preventing future losses of eider productivity associated with development. It was important to protect/acquire an entire island, as previous restoration projects that allowed development on portions of an island that was not directly utilized by an eider colony had generally been unsuccessful at restoring targeted populations (Attachment 1). In addition, the existence of development pressure was an important project condition, as purchases of non-threatened sites would have little benefit for eider productivity rates. By purchasing enough land to protect an appropriate number of nest sites, future productivity was expected to be enhanced sufficiently to compensate for the loss due to the North Cape spill. To restore the lost marine bird-years, the Trustees estimated that approximately 315 nest sites should be protected. Assuming typical eider densities, a minimum of 24 island acres were required to protect this number of nest sites (Sperduto et al, 1999). In partnership with the Maine Coast Heritage Trust, the State of Maine, the Nature Conservancy and the Casco Bay Estuary Project, the trustees provided funds to permanently protect Flag Island, a 42-acre island in Casco Bay, Maine. The island is considered one of the most important nesting islands for eiders in Casco Bay and was reported to have over 600 pairs of nesting eiders as recently as 1999 (Allen et al, 2009). A marine bird protection/monitoring program was implemented to ensure that the restoration project was meeting established objectives. Field biologists were hired to protect and monitor seaducks during the breeding season and perform the following tasks: ensure that there was no physical disturbance to the seaduck habitat, monitor seaduck biological activity, and protect nest sites from human disturbance. The final report produced from these monitoring activities (Allen et al, 2009) indicated that the long term estimate of nesting pairs on the island is 500-600. The observed nesting success was high with an average of 79% from 2005 through 2007. The estimated survival for Flag Island female eiders was 87% between the years of 2003-2008. Monitoring also determined that Flag Island is not utilized as a brood-rearing area for eider ducklings; cr ches left the island for the mainland within hours after reaching the water. Duckling predation rates adjacent to Flag Island and on brood rearing habitats were not as high as those observed at other locations in previous studies along the Maine coast. Overall productivity, ducklings per breeding female, averaged 0.316 from 2006 to 2007. Based on the number of nesting pairs protected and the overall productivity, the restoration effort successfully restored the estimated marine-bird years lost. For more detailed information regarding monitoring methods and results contact the USFWS New England Field Office.

PROJECT OUTCOMES

Ecological Outcomes Achieved

Eliminate existing threats to the ecosystem:

An average of 500-600 common eider and approximately 150 common loon nesting sites have been protected through the purchase of land and development rights. The number of piping plover nesting pairs has increased sufficiently such that the 5 lost chicks have been replaced.

Factors limiting recovery of the ecosystem:

Common Loon The number of territorial loon pairs has increased during the restoration. Productivity varied by both season and region with the overall productivity in the restoration area below the amount needed to maintain a self-sustaining population. Egg predation, water level fluctuations, elevated methylmercury availability, and heavy rain have caused nest failure and low hatching rates leading to declines in overall productivity. Efforts to address these impacts will need to be implemented to stabilize the loon population in this portion of its breeding area.

Piping Plover The number of nesting pairs of piping plovers and the beaches being utilized for production has increased during the restoration. However, plover productivity is below the amount needed to maintain a stable population. Development, human disturbance and predation are factors that negatively affect productivity. Efforts to educate the public about vehicular traffic, dog leash laws and the plight of the piping plover will need to continue in order to minimize these impacts. In recent years, climatic conditions have had a negative effect on productivity. Extremely high tides during the nesting season have increased egg mortality due to nest overwash and young chick mortality has increased as a result of high temperatures and heavy rainfall shortly after hatch.

Common Eider Predation by herring gulls and great black-backed gulls is the major cause of mortality for common eider eggs and ducklings (Mawhinney, 1997). Great black-back gulls (GBBG) are capable of virtually eliminating the reproductive output of some eider colonies during some years. It is likely that current GBBG numbers greatly exceed historic levels due to the presence of open dumps and landfills, abundance of fish processing waste, and subsidized feeding from commercial fishing vessels. Managers are concerned that elevated numbers of GBBG will further reduce the naturally low recruitment rates for eiders and decrease their ability to sustain current population levels. Predation of hen eiders by a burgeoning bald eagle population, river otters (a relatively new predator to off shore islands) and mink is also cause for concern (Attachment 1).

Socio-Economic & Community Outcomes Achieved

Economic vitality and local livelihoods:

Birds are appreciated and enjoyed by millions of people throughout the United States. Sixty four million people pursue bird-related recreation, such as bird watching, bird feeding, bird hunting, and photography. Revenue of these activities contributes nearly \$40 billion to local economies.

KEY LESSONS LEARNED

Key Lessons Learned

The importance and value of monitoring was demonstrated in this restoration. Monitoring data were analyzed and the strategies employed were adjusted to keep the restoration heading along the desired ecological trajectory. Use of exclosures was discontinued at some piping plover nesting locations due to adult mortality associated with these structures and field methods were adjusted to minimize human disturbance to nesting birds while collecting monitoring data. Data analysis also furthered the knowledge of habitat requirements and environmental conditions that may impact these bird species. Elevated levels of methylmercury negatively affected productivity of loons and fluctuations in water level have led to egg and chick mortality and delayed nesting. Monitoring has aided in developing effective methods for restoration and management of these species so that they continue to provide ecological services to Block Island Sound. Monitoring also provided a means for evaluating the effectiveness of the overall restoration and provided important data for common loons that will help refine future restoration scaling efforts in the northeast.

Restoration managers also found that partnering with other agencies and organizations facilitated land purchases that protected far more nesting sites than the funds from the restoration alone would have accomplished. Monitoring efforts were also done in partnership with organizations that already had programs in place. In this way, the funds from the restoration were used to continue long term monitoring and the restoration benefited from information gathered through previous year's efforts.

LONG-TERM MANAGEMENT

Long-Term Management

All three of the bird species (common eider, common loon and piping plover) that were the focus of this restoration are birds of management concern for the USFWS Migratory Bird Program and consequently are given priority emphasis. The mission of the Migratory Bird Program is to conserve migratory bird populations and their habitats for future generations, through careful monitoring, effective management, and by supporting national and international partnerships that conserve habitat for migratory birds. For details regarding these monitoring and management activities see the USFWS "A Blueprint for the Future of Migratory Birds" Migratory Bird Program Strategic Plan 2004-2014 at <http://www.fws.gov/migratorybirds/AboutUS/mbstratplan/finalmbstratplan.pdf>.

The transport of oil and other hazardous substances along the East coast carries with it the risk of future spills or releases into the Block Island Sound ecosystem. Despite the United States' best efforts to prevent spills, almost 14,000 oil spills are reported each year. The National Oil and Hazardous Substance Pollution Contingency Plan (NCP) provides the organizational structure and procedures to prepare for and respond to discharges of oil and releases of hazardous substances, pollutants, and contaminants. The United States Coast Guard, the Environmental Protection Agency and other organizations have specially trained emergency response personnel ready to deploy advanced response mechanisms available for controlling oil spills and minimizing their impacts on human health and the environment. Since most spill response equipment and materials are greatly affected by factors such as conditions at sea, water currents, and wind; the key to effectively combating spills is careful selection and proper use of the equipment and materials best suited to the type of oil and the conditions at the spill site. Rapid response to spills and proper use of containment and recovery equipment can reduce the damage to shorelines and other threatened areas.

FUNDING

Sources and Amounts of Funding

3.5 million USD In August 2000, the trustees reached a settlement agreement with the insurer of the companies responsible for the North Cape oil spill. As part of the agreement, \$3.5 million was paid to the trustees to restore loons, sea ducks, and piping plovers.

\$3 million to purchase and protect loon nesting habitat

\$400,000 to purchase and protect eider nesting habitat

\$140,000 to manage and protect piping plover nesting habitat

LEARN MORE

Other Resources

Literature Cited:

Allen, R.B. 2005. Survival and Recruitment of Common Eiders (*Somateria mollissima Dresseri*) in the Gulf of Maine. Maine Department of Inland Fisheries and Wildlife. Unpublished data.

Allen, R.B., McAuley, D.G., Tur, A. 2009. Survival, Nest Success and Productivity of Female Common Eiders (*Somateria millissima dresseri*) on Flag Island, Harpswell, Casco Bay, Maine. Final Report 2003-2008. 29 pp.

- Bolduc, F., Guillemette, M., and Titman R.D. 2005. Nesting Success of Common Eiders *Somateria millissima* as Influenced by Nest-Site and Female Characteristics in the Gulf of the St. Lawrence. *Wildlife Biology* 11(4):273-279.
- Bourget, A.A. 1973. Relation of Eiders and Gulls Nesting in Mixed Colonies in Penobscot Bay, Maine. *Auk* 90(4): 809-820.
- Crowley, S., Welsh, C., Cavanagh, P and Griffin, C. 1996. Weighing-birds: Habitat Assessment Procedures for Wetland-dependent Birds in New England. Department of Forestry and Wildlife Management, University of Massachusetts, Amherst, MS, USA.
- Donlan, M., M. Sperduto, and C. Hebert. 2003. Compensatory mitigation for injury to a threatened or endangered species: scaling piping plover restoration. *Mar Ecol Prog Ser* 264: 213-219.
- Edwards, W., Laquinto, K., Heinz, C., Shoppell, S., Maier, S., Paton, S. and Tompkins, A. 2006. Rhode Island Piping Plover Restoration Project: 2006. Annual Report. Rhode Island National Wildlife Refuge Complex, 50 Bend Road, Charlestown, RI 02813. 16 pp.
- Evers, D.C., Kaplan, J.D., Meyer, M.W., Reaman, P.S., Braselton, W.E., Major, A., Burgess, N., and Scheuhammer, A.M. 1998. Geographic Trend in Mercury Measured in Common Loon Feathers and Blood. *Environ. Tox. And Chem.* 17:173-183.
- Evers, D.C. 2000. An Update of North America's Common Loon Breeding Population. Pp. 91-94 in J.W. McIntyre and D.C. Evers (eds). *Loons: Old History and New Findings*. Proc. of a Symposium from the 1997 Meeting, American Ornithologists' Union. North American Loon Fund, Holderness, N.H.
- Evers, D.C. 2007. Status Assessment and Conservation Plan for the Common Loon in North America. U.S. Fish and Wildlife Service Tech. Report Series.
- Evers, D.C., Savoy, L.J., DeSorbo, C.R., Yates, D.E., Hanson, W., Taylor, K.M., Siegel, L.S., Cooley Jr, J.H., Bank, M.S., Major, A., Munney, K., Mower, B.F., Vogel, H.S. Schoch, N., Pokras, M., Goodale, M.W. and Fair, J. 2008a. Adverse Effects from Environmental Mercury Loads on Breeding Common Loons. *Ecotoxicology* 17:69-81.
- Evers, D.C., Taylor, K., MacKenzie, J., and Attie, L. 2008b. Effects of Water Levels on the Reproductive Success of Common Loons (*Gavia immer*) within the Grand Lake Stream Project, Maine. Report BRI 2008-24 submitted to OA System Corporation, Amarillo, Texas. BioDiversity Research Institute, Gorham, Maine.
- Fontes, D. 1996. Preserve Management Report for Goosewing and Briggs Beaches, Little Compton, Rhode Island. Unpublished Report. The Nature Conservancy, Providence, Rhode Island. 55 pp.
- French McCay, D.P. 2003. Development and Application of Damage Assessment Modeling: Example Assessment for the North Cape Oil Spill. *Marine Pollution Bulletin* 47:341-359.
- Gerrard, P.M., and Louis, V.L. 2001. The Effects of Experimental Reservoir Creation on the Bioaccumulation of Methylmercury and Reproductive Success of Tree Swallows (*Tachycineta bicolor*). *Environ. Sci. Technol.* 35:1329-38
- Gibson, M.R., Angell, T.E., Lazar, N.B., 1997. Estimation of Lobster Strandings Following the North Cape Oil Spill in Block Island Sound. Research Reference Document 97/1, Division of Fish and Wildlife, Rhode Island Dept of Environmental Management, Wickford (part of case administrative record, available at www.darp.noaa.gov/neregion/ncape.htm)
- Good, T.P. 1998. Great Black-backed Gull (*Larus marinus*). In *The Birds of North America*, No. 330 (A. Poole and F. Gill, eds). The Birds of North America, Inc., Philadelphia, PA.
- Goudie, R.I., Robertson, G.J. and Reed, A. 2000. Common Eider (*Somateria millissima*). In *The Birds of North America*, No. 546 (A. Poole and F. Gill, eds). The Birds of North America, Inc., Philadelphia, PA
- Gross, A.O. 1944. The Present Status of the American Eider on the Maine Coast. *Wilson Bulletin* 56:15-26.
- Hartlaub, H., Hobbs, N., Turner, P. and Wiitala, C. 2009. Management of the Piping Plover (*Charadrius melodus*) and the Least Tern (*Sterna antillarum*) 2008 Report. Annual Report. The Nature Conservancy, Rhode Island Chapter, 159 Waterman Street, Providence, RI 02906. 91 pp.
- Hlady, D.A. and Burger, A.E. 1993. Drift-block Experiments to Analyze the Mortality of Oiled Seabirds Off Vancouver Island, British Columbia. *Marine Pollution Bulletin*. 26(9): 495-501.
- Kirby, R.E. 1988. American Black Duck Breeding Habitat Enhancement in the Northeastern United States: A Review and Synthesis. June.
- Krohn, W.B., Corr, P.O. and Hutchinson, A.E., 1992. Status of American Eider Ducks with Special Reference to Northern New England. U.S. Fish and Wildlife Service. Fish and Wildlife Research 12. 12pp.
- Laurila, T. 1989. Nest Site Selection in the Common Eider *Somateria mollissima*: Differences Between the Archipelago Zones. *Ornis Fennica* 66:100-111.
- Mawhinney, K. 1997. The Importance of Gull Predation and the Survival of Common Eiders (*Somateria mollissima*) Ducklings. Atlantic Cooperative Wildlife Ecology Research Network, University of New Brunswick. Unpublished Progress Report.

McCourtney, E. 1996. Rhode Island Piping Plover Restoration Project 1996. Submitted by Ninigret National Wildlife Refuge, Box 307, Charlestown, Rhode Island.

Niven, C.D., Yates, D., Taylor, K., Evers, D.C., and Goodale, W. 2007. Monitoring of Breeding Common Loons: West Branch of the Penobscot River Area-2006. Report BRI 2007-11. BioDiversity Research Institute, Gorham, ME. 30 pp.

Office of Migratory Bird Management, Washington. 1995. Migratory Non-Game Birds of Management Concern in the U.S.: The 1995 List. September 1995. 15 p.

Olsen, S., and Lee, V. 1985. Rhode Island's Salt Pond Region: A Special Area Management Plan. Prepared for the Rhode Island Coastal Resources Management Council. Adopted November 27, 1984.

Sperduto, M., Herbert, C., Myers, J. and Haas, G. 1997. Estimate of Total Acute Mortality to Birds Resulting from the North Cape Oil Spill, South Kingstown, Rhode Island, January 19, 1996. June 23.

Sperduto, M., Herbert, C., Donlan, M., and Thompson, S. 1999. Injury Quantification and Restoration Scaling for Marine Birds Killed as a Result of the North Cape Oil Spill. March 15.

Sperduto, M., Powers, S., and M. Donlan. 2003. Scaling restoration to achieve quantitative enhancement of loon, seaduck, and other seabird populations. Mar Ecol Prog Ser 264: 221-232.

Taylor, K.D., Yates, D., Evers, D.C., Berry, M., Tompkins, J., MacKenzie, J., and Goodale, W. 2009. Monitoring of Breeding Common Loons: Downeast Lakes Land Trust 2008. Report BRI 2009-02. BioDiversity Research Institute, Gorham, ME. 54 pp.

U.S. Department of Commerce. U.S. DOC. 1992. Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days, 1961-1990. January 1992. National Oceanic and Atmospheric Administration, National Climatic Data Center.

U.S. Fish and Wildlife Service. 1995. Piping Plover Atlantic Coast Population Revised Recovery Plan. Atlantic Coast Piping Plover Recovery Team. Hadley, MA 238 pp.

U. S. Fish and Wildlife Service. 2007. You Can Help Protect the Piping Plover. USFWS Northeast Region, January 1994 (original). Updated 2007.

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Trustee Links:

Rhode Island Department of Environmental Management
<http://www.dem.ri.gov/>

National Oceanic and Atmospheric Association Northeast Region
<http://www.darrp.noaa.gov/northeast/index.html>

US Fish and Wildlife Service, Northeast Region, Environmental Contaminants
<http://www.fws.gov/contaminants/restorationplans/NorthCape/NorthCape.cfm>

US Fish and Wildlife Service, New England Field Office
<http://www.fws.gov/newengland/>

Other Links:

NOAA Press Release: North Cape Oil Spill Presents Opportunity to Forge New Approach to Natural Resources Restoration
<http://www.publicaffairs.noaa.gov/pr97/jan97/noaa97-r901.html>

Fact sheet of restoration activities associated with North Cape oil spill
http://www.darrp.noaa.gov/northeast/north_cape/restore.html

Case documents associated with the North Cape oil spill http://www.darrp.noaa.gov/northeast/north_cape/admin.html

Final restoration plan and environmental assessment of North Cape oil spill <http://www.dem.ri.gov/pubs/damage/rptchooz.htm>

1999 News release regarding settlement of North Cape oil spill case <http://www.dem.ri.gov/news/1999/pr/1222991.htm>

Overview of North Cape restoration <http://seagrant.gso.uri.edu/coasts/symposium/presentations2/tammi.pdf>

The Rhode Island Chapter of The Nature Conservancy
<http://www.nature.org/wherewework/northamerica/states/rhodeisland/misc/art28309.html>

The Office of Migratory Bird Management
<http://www.fws.gov/migratorybirds/AboutUS/mbstratplan/finalmbstratplan.pdf>

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