



U.S. Fish & Wildlife Service

Monomoy National Wildlife Refuge

*Draft Comprehensive Conservation Plan
and Environmental Impact Statement*

*Volume 1—Chapters 1 through 6
including Bibliography, Acronyms, and Glossary*

April 2014



Front cover:

Monomoy Lighthouse at sunset
Ravin Thomasson



*This blue goose, designed by
J.N. "Ding" Darling, has become
the symbol of the National Wildlife
Refuge System.*

The U.S. Fish and Wildlife Service (Service) is the principal Federal agency responsible for conserving, protecting, and enhancing fish, wildlife, plants, and their habitats for the continuing benefit of the American people. The Service manages the National Wildlife Refuge System comprised of over 150 million acres including over 560 national wildlife refuges and thousands of waterfowl production areas. The Service also operates 70 national fish hatcheries and over 80 ecological services field stations. The agency enforces Federal wildlife laws, manages migratory bird populations, restores nationally significant fisheries, conserves and restores wildlife habitat such as wetlands, administers the Endangered Species Act, and helps foreign governments with their conservation efforts. It also oversees the Federal Assistance Program which distributes hundreds of millions of dollars in excise taxes on fishing and hunting equipment to state wildlife agencies.

Comprehensive Conservation Plans (CCPs) provide long-term guidance for management decisions on a refuge and set forth goals, objectives, and strategies needed to accomplish refuge purposes. CCPs also identify the Service's best estimate of future needs. These plans detail program levels that are sometimes substantially above current budget allocations and, as such, are primarily for Service strategic planning and program prioritization purposes. CCPs do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.



U.S. Fish & Wildlife Service

Monomoy National Wildlife Refuge

Draft Comprehensive Conservation Plan and Environmental Impact Statement April 2014

Draft Vision Statement

Extending from the elbow of Cape Cod, Monomoy National Wildlife Refuge consists of an assembly of barrier beaches that includes some of New England's last remaining wild seacoast. This dynamic, wilderness system of ocean, intertidal flats, salt and freshwater marshes, dunes and freshwater ponds, provides vital habitat for a vast array of diverse species. Monomoy NWR is world-renowned for its range of seasonal wildlife inhabitants. Seabirds, waterfowl, shorebirds, wading birds, land birds, horseshoe crabs, and seals rely upon the refuge for survival during various times of the year. Given the vital role that these lands and waters play in the survival of so many endangered, threatened, and special species, wildlife conservation and management will always be our first priority at Monomoy NWR.

The unique area that is Cape Cod allows us to reach large numbers of visitors from all over the world. Visitors will learn about the rich history of the refuge, experience unique recreational opportunities, view wildlife in a natural setting, and learn about the positive and negative impacts of human interactions with the refuge. Visitors will understand and appreciate how we manage the refuge, its habitats, and wildlife species. We will ensure that the number of visitors on the refuge is appropriate so as not to detract from a rich wilderness and wildlife experience.

As a regional and national role model, the refuge will provide scientific and technical leadership for wildlife and resource management that is adaptable to changing conditions. Talented, knowledgeable staff will continue to develop and foster partnerships with local, regional, national, and international organizations to assist in the management of Monomoy NWR and inform the conservation community of the work that we do. Monomoy NWR will continue to play a crucial role in the National Wildlife Refuge System by protecting this critical nesting, feeding, and resting area for migratory birds along the Atlantic Coast.



U.S. Fish & Wildlife Service

Monomoy National Wildlife Refuge

Draft Comprehensive Conservation Plan and Environmental Impact Statement April 2014

Summary

Type of Action: Administrative—Development of a Comprehensive Conservation Plan

Lead Agency: U.S. Department of the Interior, Fish and Wildlife Service

Location: Monomoy National Wildlife Refuge
Chatham, Massachusetts

Administrative Headquarters: Eastern Massachusetts National Wildlife Refuge Complex
Sudbury, Massachusetts

Responsible Official: Wendi Weber, Regional Director, Region 5

For Further Information: Carl Melberg, Natural Resource Planner
Eastern Massachusetts National Wildlife Refuge Complex
73 Weir Hill Road
Sudbury, Massachusetts 01776
Phone: 978/443 4661 ext. 32
Email: northeastplanning@fws.gov

This draft comprehensive conservation plan (CCP) and environmental impact statement (EIS) analyzes three alternatives for managing the 8,321-acre Monomoy National Wildlife Refuge (NWR, refuge) over the next 15 years. This document also contains 10 appendixes that provide additional information supporting our analyses. Following is a brief overview of each alternative:

Alternative A: Current Management—Alternative A satisfies the National Environmental Policy Act requirement of a “no-action” alternative, which we define as “continuing current management.” It describes our existing management priorities and activities for Monomoy NWR, and serves as a baseline for comparing and contrasting alternatives B and C.

Alternative B: Enhanced Management of Habitat and Public Uses (Service-preferred Alternative)—Alternative B represents an extension and progression of all areas of refuge management. Under alternative B, new biological program activities would be initiated. Special emphasis would be placed on obtaining baseline data of wildlife populations and habitat conditions, or filling in information gaps as needed. The new information would be used to develop the detailed step-down plans proposed under this CCP. Wildlife population and habitat monitoring surveys and inventories would be continued on an on-going basis to provide the data needed to evaluate the effectiveness of refuge programs and practices, and to adapt management as warranted to achieve long-range refuge goals and objectives.

Under alternative B, new compatible wildlife-dependent recreational opportunities would be provided consistent with wilderness designation. Special emphasis would be placed on providing enhanced, but sustainable, opportunities for all six priority wildlife-dependent recreational uses defined in the Administration Act. Staffing would be modestly increased to accommodate new programs and activities, and proposed new visitor contact facilities would provide better access to information and support quality educational and interpretive programs.

Alternative C: Natural Processes—Alternative C proposes less intensive management on all refuge lands. It would be guided by a philosophy of allowing natural processes and succession of habitats to progress, consistent with preserving wilderness character, and to the extent that it does not compromise refuge purposes and goals. Generally, wildlife and habitat management, and inventories and monitoring efforts, would be reduced from those planned under alternative A. We would manage the refuge visitor services program with an emphasis on providing opportunities for wildlife-dependent recreation that uses primitive tools and non-motorized equipment, provides solitude, and increases emphasis on non-motorized access to the Monomoy Wilderness Area.

Chapters

Chapter 1 The Purpose of, and Need for, Action

Introduction	1-1
The Purpose of, and Need for, Action	1-7
The Service and the Refuge System: Policies and Mandates Guiding Planning	1-8
Conservation Plans and Initiatives Guiding Our Planning	1-17
Refuge Establishment Purposes and its Land Acquisition History	1-27
Refuge Administration	1-28
Refuge Operational Plans (“Step-down” Plans)	1-29
Complex and Refuge Vision Statements	1-29
Refuge Goals	1-30
The Comprehensive Conservation Planning Process	1-31
Wilderness Review	1-33
Issues, Concerns, and Other Opportunities	1-34

Chapter 2 Affected Environment

Introduction	2-1
Physical Environment	2-1
Biological Environment	2-29
Refuge Visitor Services Program	2-70
Refuge Archaeological, Historical, and Cultural Resources	2-89
Regional Socioeconomic Setting	2-94
Refuge Administration	2-100

Chapter 3 Alternatives Considered, Including the Service-preferred Alternative

Introduction	3-1
Actions Common to All Alternatives	3-2
Actions Common to Alternatives B and C Only	3-24
Alternatives or Actions Considered but Eliminated From Further Study	3-25
Alternative A. Current Management (No Action Alternative)	3-27
Alternative B. Enhanced Management of Habitat and Public Uses (Service-preferred Alternative)	3-73
Alternative C. Natural Processes	3-133

Chapter 4 Environmental Consequences

Introduction	4-1
Effects on Air Quality	4-2
Effects on Climate Change	4-12
Effects on Water Quality	4-18
Effects on Soils	4-22
Effects on Federal Threatened and Endangered Species	4-28
Effects on Vegetation and Habitats	4-39
Effects on Birds	4-47
Effects on Other Native Wildlife	4-55
Effects on Wilderness Recommendations and Designation	4-62
Effects on Public Uses and Access	4-68
Effects on Socioeconomic Resources	4-76

Chapters (cont.)

Chapter 4 Environmental Consequences (cont.)

Effects on Cultural, Historical, and Archaeological Resources 4-80
 Cumulative Impacts 4-82
 Relationship Between Short-term Uses of the Human Environment and Enhancement of
 Long-term Productivity 4-89
 Unavoidable Adverse Effects 4-90
 Potential Irreversible and Irretrievable Commitments of Resources 4-90
 Environmental Justice 4-90

Chapter 5 Consultation and Coordination

Introduction 5-1
 Planning to Protect Land and Resources 5-1
 Contact Information 5-3

Chapter 6 List of Preparers

Members of the Core Planning Team 6-1
 Other Service Program Involvement 6-1
 List of Preparers 6-2

Bibliography

Bibliography Bibl-1

Acronyms and Glossary

Acronyms Glos-1
 Glossary Glos-5

List of Figures

Figure 1.1 Steps in the Comprehensive Conservation Planning Process. 1-31
Figure 2.1 Landform Changes in Monomoy NWR and the Eastern Coastline of
 Cape Cod 2-12
Figure 2.2 Champlain’s Map of “Port Fortune” (Stage Harbor) in Chatham,
 Massachusetts, circa 1605 2-19
Figure 2.3 Annual Averages of the Global Mean Sea Level in Millimeters 2-25
Figure 2.4 Mean Sea Level Trend at Nantucket Island, MA. 2-25
Figure 2.5 Seasonal Variation in Mean (+ or – 1SE) Shorebird-use-days for all
 Shorebirds Based on Semi-monthly Time Intervals
 at Monomoy NWR 2-46
Figure 2.6 Seasonal Variation in Mean (+ or – 1SE) Shorebird-use-days for
 Nine Shorebird Species Based on Semi-monthly Time Intervals at
 Monomoy NWR. 2-47
Figure 2.7 Nesting Common Terns on Monomoy NWR (1996 to 2012) 2-49
Figure 2.8 Black Skimmers Nesting at Monomoy NWR Compared to Other Sites
 in Massachusetts (1996 to 2012). 2-54
Figure 2.9 Number of Nesting Laughing Gulls Counted on South Monomoy
 (A-Census) 2-55

List of Figures (cont.)

Figure 2.10	Nesting Black-crowned Night-herons on Monomoy NWR (1996 to 2012)	2-57
Figure 2.11	Snowy Egrets on Monomoy NWR (1996 to 2012)	2-58
Figure 2.12	Monomoy Branting Club of Boston buildings, storm-battered just prior to demolition in 1953, built near Shooter's Island and Inward Point after the club was established in 1862.	2-76
Figure 2.13	Monomoy Branting Club's Annual Brant Harvest	2-77
Figure 2.14	Powder Hole, Circa 1910.	2-93
Figure 2.15	Chatham Fish Pier Landings 2002 to 2012.	2-95
Figure 4.1	Class 1 Airsheds of the Northeastern U.S	4-5
Figure 4.2	Leatherback Sea Turtle Lobster Gear Entanglements by New England State for 2002 to 2010	4-34
Figure 4.3	Southern Massachusetts Confirmed Sea Turtle Entanglements June 2007 to May 2010; adapted from Burke and Sharp 2010	4-36

List of Tables

Table 2.1	Monomoy NWR Soil Types	2-30
Table 2.2	Piping Plover Nesting and Productivity at Monomoy NWR (1996 to 2012).	2-34
Table 2.3	Roseate Tern Nesting and Productivity at Monomoy NWR (1996 to 2012).	2-38
Table 2.4	Northeastern Beach Tiger Beetle Translocated and Marked at Monomoy NWR (2000 to 2012)	2-41
Table 2.5	Midwinter Waterfowl Surveys (January) for Waters Surrounding Monomoy NWR and Coastwide (in parentheses) (2005 to 2012).	2-43
Table 2.6	Conservation Priority and Abundance of all Shorebird Species Observed in Survey Plots at Monomoy NWR in 2006 and 2007	2-45
Table 2.7	American Oystercatcher Nesting and Productivity at Monomoy NWR (1996 to 2012)	2-48
Table 2.8	Common Tern Productivity (1996 to 2012).	2-50
Table 2.9	Least Terns Nesting on Monomoy NWR (1996 to 2012)	2-52
Table 2.10	Great Black-backed Gull and Herring Gull Nests Counted in Areas A and B During May Gull Censuses in 1996 to 2007 on South Monomoy	2-56
Table 2.11	Hawk Watch Total Hours Observed and Species Counted by Year.	2-58
Table 2.12	Most Common Species Captured at MRBS 2011 to 2012 (includes recaptures).	2-61
Table 2.13	Essential Fish Habitat at Monomoy NWR.	2-66
Table 2.14	Macrofauna Abundance in Sediment Cores.	2-67
Table 2.15	Total Number of Horseshoe Crabs Tagged on Monomoy NWR (2001 to 2012).	2-68
Table 2.16	Number of Visitors by Activity in 2012	2-73
Table 2.17	Massachusetts Commercial Fin Fish Harvest (live pounds) in Nantucket Sound (SRA 10)	2-83
Table 2.18	Massachusetts Commercial Lobster Landings for SRA 10	2-85

List of Tables (cont.)

Table 2.19	Massachusetts Commercial Fin Fish Harvest Proportion by Gear Type in Nantucket Sound (SRA 10)	2-85
Table 2.20	Refuge Revenue Sharing Payments for Monomoy NWR	2-100
Table 2.21	Fiscal Year Funding for Monomoy and Eastern Massachusetts NWR Complex	2-106
Table 2.22	Sample of Special Use Permits for Monomoy NWR Since 2000.	2-109
Table 3.1	Gut Samples From Shorebirds at Monomoy NWR Examined During Migration	3-49
Table 3.2	Summary Comparison of Management Actions by Alternative	3-173
Table 4.1	Monomoy NWR and Barnstable County Emissions	4-5
Table 4.2	Maximum Biomass Consumption Estimates From Prescribed Burning for a 10-Year Period, by Alternative.	4-9
Table 4.3	Maximum Emissions From Prescribed Burning for a 10-Year Period for Air Pollutants of Interest by Alternative	4-10
Table 4.4	Estimated Air Emission Reductions.	4-13
Table 4.5	Sea Turtle Entanglements by Fishery or Gear Type During 2007 to 2010	4-35
Table 4.6	Total Economic Impacts of Refuge Visitation Expenditures to Monomoy NWR in 2012.	4-77
Table 4.7	Total Economic Impacts Associated with Visitation to Monomoy NWR under Alternative B.	4-78
Table 4.8	Matrix of Environmental Consequences by Alternative	4-92

List of Maps

Map 1.1	Monomoy National Wildlife Refuge	1-2
Map 1.2	Monomoy National Wildlife Refuge Headquarters Area.	1-3
Map 1.3	Monomoy National Wildlife Refuge Wilderness Boundary	1-4
Map 1.4	Eastern Massachusetts National Wildlife Refuge Complex	1-5
Map 2.1	Service and Partner Conservation Regions	2-6
Map 2.2	Habitat Cover Types – JW Sewall Co. – 2011	2-32
Map 2.3	Monomoy National Wildlife Refuge Piping Plover Nest Locations 2005–2012.	2-35
Map 2.4	Northeastern Beach Tiger Beetle Distribution	2-40
Map 2.5	Sea Turtle Entanglements from Fixed Fishing Gear	2-64
Map 2.6	Non-native Phragmites Locations	2-71
Map 2.7	Public Use – North and South Monomoy Islands	2-74
Map 2.8	Public Use – North Monomoy Island.	2-75
Map 2.9	Monomoy NWR Shellfish Resources	2-81
Map 3.1	Proposed Waterfowl Hunting Area	3-117

Appendixes (Contained in Volume 2, a separate book)

Appendix A Animal Species Known or Suspected on Monomoy National Wildlife Refuge

Table A.1. Fish Species Known or Suspected at Monomoy National Wildlife Refuge	A-1
Table A.2. Reptile Species Known or Suspected on Monomoy NWR.	A-8
Table A.3. Amphibian Species Known or Suspected on Monomoy NWR.	A-8
Table A.4. Bird Species Known or Suspected on Monomoy NWR.	A-9
Table A.5. Mammal Species Known or Suspected on Monomoy NWR.	A-27
Table A.6. Butterfly and Moth Species Known or Suspected on Monomoy NWR.	A-30
Table A.7. Dragonfly and Damselfly Species Known or Suspected on Monomoy NWR.	A-31
Table A.8. Tiger Beetle Species Known or Suspected on Monomoy NWR.	A-32
Table A.9. Crustacean Species Known or Suspected on Monomoy NWR.	A-33
Table A.10. Bivalve Species Known or Suspected on Monomoy NWR.	A-34
Table A.11. Miscellaneous Marine Invertebrate Species at Monomoy NWR.	A-35
Table A.12. Miscellaneous Terrestrial Invertebrates Known to be Present on Monomoy NWR.	A-37
Table A.13. Marine Worms Known or Suspected at Monomoy NWR.	A-37
Literature Cited	A-40

Appendix B Plant Species Known or Suspected on Monomoy National Wildlife Refuge

Table B.1. Plant Species Known or Suspected on Monomoy National Wildlife Refuge (NWR).	B-1
Literature Cited	B-10

Appendix C Vegetation Alliances and Associations of Monomoy National Wildlife Refuge

I. Forest	C-7
II. Woodland	C-7
III. Shrubland	C-9
IV. Dwarf-shrubland	C-11
V. Herbaceous Vegetation	C-14
VII. Sparse Vegetation	C-42
Dune Blowout	C-44

Appendix D Findings of Appropriateness and Compatibility Determinations

Finding of Appropriateness —Beach Use (Sports, Kite Flying, Grilling, and Shade Tents)	D-3
Finding of Appropriateness —Bicycling.	D-5
Finding of Appropriateness —Boat Moorings	D-7
Finding of Appropriateness —Camping	D-11
Finding of Appropriateness —Fires.	D-13
Finding of Appropriateness —Fireworks	D-15
Finding of Appropriateness —Fisheries Harvest Using Bottom Disturbing Gear and Techniques on Submerged Lands	D-17
Finding of Appropriateness —Horseshoe Crab Harvesting	D-21
Finding of Appropriateness —Jet Skiing (Personal Watercraft)	D-25
Finding of Appropriateness —Kiteboarding	D-27

Appendixes (cont.)—Contained in Volume 2, a separate book

Appendix D Findings of Appropriateness and Compatibility Determinations (cont.)

Finding of Appropriateness—Mussel Harvesting D-31

Finding of Appropriateness—Recreational Over-sand Vehicle Use D-35

Finding of Appropriateness—Pets D-39

Finding of Appropriateness—Organized Picnicking. D-43

Finding of Appropriateness—Stage Island Parking and Dinghy Storage D-45

Finding of Appropriateness—Beachcombing. D-47

Compatibility Determination—Beachcombing D-49

**Finding of Appropriateness—Commercial Tours, Ferry Service, Guided Trips, and
Outfitting D-57**

**Compatibility Determination—Commercial Tours, Ferry Service, Guided Trips, and
Outfitting D-59**

**Finding of Appropriateness—Commercial Wildlife and Landscape Filming and
Photography D-71**

**Compatibility Determination—Commercial Wildlife and Landscape Filming and
Photography. D-73**

Compatibility Determination—Environmental Education and Interpretation. D-83

Compatibility Determination—Fin Fishing D-93

Finding of Appropriateness—Hiking, Walking, and Jogging D-101

Compatibility Determination—Hiking, Walking, and Jogging D-103

Finding of Appropriateness—Mosquito Monitoring and Control D-111

Compatibility Determination—Mosquito Monitoring and Control. D-113

Finding of Appropriateness—Motorized and Nonmotorized Boating D-129

Compatibility Determination—Motorized and Nonmotorized Boating. D-131

**Compatibility Determination—Nonmechanized harvesting of subterranean
shellfish (softshell clams, razor clams, and quahogs)
without the aid of artificial extraction methods. D-139**

Finding of Appropriateness—Virtual Geocaching and Letterboxing D-159

Compatibility Determination—Virtual Geocaching and Letterboxing D-161

Finding of Appropriateness—Outdoor Events and Ceremonies D-169

Compatibility Determination—Outdoor Events and Ceremonies D-171

Finding of Appropriateness—Research Conducted by Non-Service Personnel D-179

Compatibility Determination—Research Conducted by Non-Service Personnel D-183

Finding of Appropriateness—Sunbathing and Swimming. D-193

Compatibility Determination—Sunbathing and Swimming D-195

Compatibility Determination—Waterfowl Hunting D-203

Compatibility Determination—Wildlife Observation and Photography D-209

Appendixes (cont.)—Contained in Volume 2, a separate book

Appendix E	Wilderness Review of Monomoy National Wildlife Refuge	
	E.1 Wilderness Review of Monomoy National Wildlife Refuge	E-1
	E.2 Wilderness Stewardship Plan Outline	E-11
	E.3 Minimum Requirements Analyses Alternatives Matrix	E-13
	E.4 Minimum Requirements Decision Guide	E-14
Appendix F	Fire Management Program Guidance Introduction	
	Introduction	F-1
	The Role of Fire	F-1
	Wildland Fire and Management Policy and Guidance	F-2
	Fire Management Planning	F-2
	Fire Management Program at Monomoy National Wildlife Refuge	F-3
Appendix G	Refuge Staffing Charts	
	Refuge Staffing Charts	G-1
Appendix H	Refuge Operations Needs System (RONS) and Service Asset Maintenance Management System (SAMMS)	
	Refuge Operations Needs System (RONS) and Service Asset Maintenance Management System (SAMMS)	H-1
Appendix I	A Geomorphological Analysis of the Monomoy Barrier System	
	A Geomorphological Analysis of the Monomoy Barrier System	I-1
Appendix J	Predator and Competitor Management Plan for Monomoy National Wildlife Refuge	
	Background and Introduction	J-1
	Species-specific Predator and Competitor Management	J-2
	Non-lethal Methods Common to Many Predators	J-24