

**COASTAL MIGRATORY SHOREBIRD  
MANAGEMENT SYSTEM AND DATA BASE**

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## **MIGRATORY SHOREBIRD MANAGEMENT SYSTEMS**

### **INTRODUCTION**

This document describes the system used by the Maine Department of Inland Fisheries and Wildlife (MDIFW) to make decisions concerning management and habitat protection for migratory shorebirds. Management goals and objectives for migratory shorebirds as a group have been established through the species assessment process with input from public working groups and are documented in the Migratory Shorebird Assessment (MDIFW 2000).

This document will not address management for those species that nest in Maine (upland sandpiper, willet, American woodcock, piping plover, spotted sandpiper, killdeer, common snipe and American oystercatcher). Individual assessments and management systems are needed to better address the nesting requirements for shorebird species that may be limited by restrictive nesting habitat requirements. Individual assessments and management systems exist for the American woodcock (MDIFW 2001, MDIFW 1988) and piping plover (MDIFW 1989, MDIFW 1994) and an individual assessment for the upland sandpiper (MDIFW 2000). Individual assessments and management systems for willet, spotted sandpiper, killdeer, and common snipe, are considered a lower priority since their habitat is relatively secure and their populations considered stable. The American oystercatcher's breeding status in Maine is presently considered rare or occasional. Between 1995 and 1999, 2 pairs are documented as nesting in Maine and were marginally successful (Mawhinney et al. 1999, MDIFW

unpubl. data). Whether these few pairs represent an expanding population or irregular nesting should be established before MDIFW develops an assessment or management system.

Part I of this document describes the process used for selecting management options to achieve the management goals and objectives. Part II discusses techniques used to survey and inventory shorebird populations and describes the databases used for storing habitat information.

Thirty-three species of shorebirds have been reported in Maine; most of which are long-distance migrants stopping to feed and rest between their Canadian Arctic breeding grounds and South American wintering areas (Appendix I). These include turnstones, plovers, sandpipers, dowitchers, curlews, godwits, and phalaropes. Along with the Bay of Fundy, the Maine coast is recognized as a critical staging region for migratory shorebirds in the western Atlantic Flyway. These coastal areas provide many of these migrants with a last opportunity to fuel a non-stop flight across the Atlantic (2000 - 3000 km) to their South American wintering areas (Morrison and Myers 1989).

Shorebird staging habitat consists of discrete coastal areas, which provide both tidal mudflats rich in invertebrates for feeding, and areas, such as gravel bars and sand spits for roosting. Such areas are susceptible to degradation from disturbance, development, and environmental contaminants.

Only one shorebird species, the purple sandpiper, regularly winters in Maine. Information is lacking on population size and distribution wintering on the Atlantic coast, but evidence suggests Maine may host the largest percentage of wintering purple sandpipers in North America. Efforts are currently underway in Maine to identify important habitats and establish survey protocols to implement a monitoring program.

### **MANAGEMENT GOALS AND OBJECTIVES**

The migratory shorebird assessment was revised in 2000 (MDIFW 2000), and goals and objectives for migratory shorebirds were developed by a public working group and approved by the Commissioner and the Commissioner's Advisory Council. This assessment was developed to provide information on shorebird ecology and status in Maine and to assist MDIFW in shorebird management. Goals and objectives established for migrating and wintering populations are:

#### ***Management Goals:***

Goal (Staging and Wintering Populations): Maintain or enhance shorebird staging and wintering habitats in Maine, which are vital for shorebirds.

#### ***Management Objectives:***

Population Objective (Staging and Wintering populations): Develop by 2002, and implement by 2005, an interim, standardized, scientifically-sound system for

inventorying and monitoring shorebird populations in Maine, pending implementation of a national plan.

Habitat Objective (Staging and Wintering populations): Prioritize, by level of threat and species importance, and protect 20% of the highest priority Areas of Shorebird Management Concern within each Shorebird Management Unit (see Appendix 3) by 2017.

Public Outreach Objective 1: By 2005, and in cooperation with partners, develop and implement a public outreach plan containing measurable objectives to increase awareness and promote stewardship of migratory shorebirds and their habitats in Maine.

Public Outreach Objective 2: Develop and implement a landowner assistance and recognition program by 2005.

### **MANAGEMENT ASSUMPTIONS**

1. This document is a habitat-based management system, developed to assist MDIFW in maintaining migratory shorebird staging and wintering habitat in Maine to the year 2017.

2. Species assessments, including goals and objectives, and management systems for Maine breeding shorebird species will be developed by the year 2009, pending additional funding or staff time to complete these documents. These systems will support long-term habitat and population management for these species.
3. Staging habitat is defined as areas that meet shorebird feeding and roosting requirements during migration.
4. Food resources, consisting of intertidal invertebrates, in close proximity to suitable roosting sites are the two most critical factors influencing successful migration.
5. Feeding areas must provide abundant food resources needed by shorebirds to acquire the large fat reserves necessary to fuel their transoceanic migration to wintering areas. Physical characteristics of feeding areas primarily consist of intertidal mudflats, sandy beaches, salt pannes, and rocky intertidal areas. Functional characteristics of important feeding areas are high densities of invertebrates, low disturbance, and substrates free from degradation such as chemical pollution.
6. Roosting areas provide shorebirds a place to sleep and preen during high tide cycles (non-feeding times). Roosting areas adjacent to feeding areas reduce energetic costs and maintain positive energy flow. Physical characteristics of roosting areas are areas with little or no vegetation that remain above water during high tide. These areas may include sandy beaches, sand and gravel bars, rock ledges, pastures,

barrens, and man-made structures. Functional characteristics of important roosting areas are sites with low disturbance in close proximity to feeding areas.

7. Shorebirds exhibit strong site fidelity to preferred feeding and roosting areas and do not readily use alternative areas.
8. Loss of functional staging and wintering habitat would be detrimental to shorebird populations that depend on those specific areas.
9. Species nesting in arctic or subarctic sites may experience more dramatic population fluctuations than species of more temperate latitudes. Therefore substantial short-term declines are probably normal events.

### ***Management Goal Assumptions***

The primary purpose of this document is to discuss a variety of strategies that may be implemented to achieve the management goals and objectives for staging and wintering shorebird populations identified in the Migratory Shorebird Assessment.

As previously mentioned, protection and enhancement of shorebird populations that nest in Maine (American woodcock, upland sandpiper, American oystercatcher, common snipe, killdeer, spotted sandpiper, upland sandpiper, and willet), and their nesting habitat, are currently, or will be addressed in species-specific assessments and management systems.

## **MANAGEMENT DECISION-MAKING PROCESS**

This document consists of three management systems outlining the decision criteria and management actions needed to achieve established goals and objectives for Shorebird Staging and Wintering Habitat, Staging and Wintering Populations, and Public Outreach identified by the public working group.

## **HABITAT MANAGEMENT SYSTEM FOR STAGING AND WINTERING SHOREBIRD POPULATIONS**

This management system provides the framework for identifying and protecting Maine's migratory shorebird staging and wintering habitat. Habitat protection options include: public ownership, private conservation agency ownership, easements, NRPA Significant Wildlife Habitat and Municipal shoreland zoning and provide the basis for long-term protection. Voluntary initiatives will be pursued first before regulatory options.

## **DECISION CRITERIA**

The following criteria determine the recommended protection a designated shorebird area will receive based on its importance to shorebirds (Figure 1).

### ***Criterion A***

This criterion answers the question: "Is there a record of shorebirds feeding and/or roosting on the designated area since 1981 (base year of the Maine Coastal Inventory)?"

MDIFW, and various other state agencies, as part of Maine's Coastal Management Program, have surveyed feeding and roosting sites along much of the coast (Appendix IV). This information, along with survey data from the International Shorebird Survey and USFWS, is mapped and entered into the MDIFW shorebird database. This database provides the data for criterion A.

### ***Criterion B***

This criterion answers the question "Does the designated area qualify as site of Shorebird Area of Management Concern?"

The site qualifies if either of the following criteria are met:

1. the mean number of shorebird observations since 1981 for the site is 10% or more of the total mean number of shorebirds surveyed in that particular shorebird survey unit (the coastline is divided into seven shorebird survey units from Kittery to Calais (Appendix III));

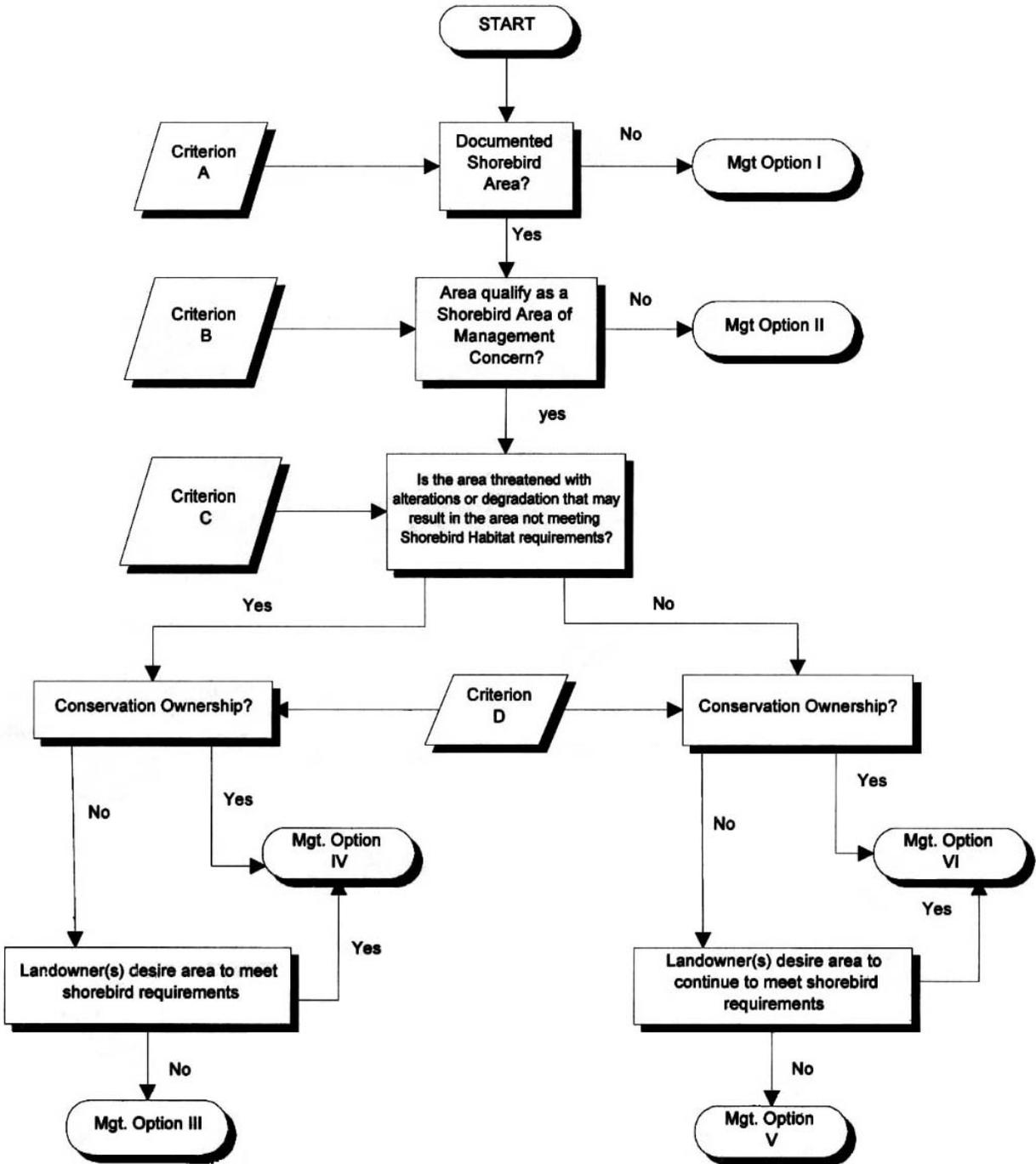


Figure 1. Flow diagram depicting decision criteria for Habitat Management System.

2. the mean number for a single species since 1981 at the site is 10% or more of the overall or total mean number observed of that species in the encompassing shorebird survey unit.

Roosting and feeding areas are analyzed separately using the above criteria, so numbers of shorebirds observed at roosting areas are not compared to numbers of shorebirds at feeding areas. Generally, the number of shorebirds at a roost is less than at a feeding area because typically roosts are smaller areas and thus more spatially limiting than feeding flats.

### ***Criterion C***

This criterion answers the question “Is the Shorebird Area of Management Concern threatened with alterations or degradation that will diminish its shorebird carrying capacity?”

The area is considered threatened if one or more of the following apply:

### **Disturbance**

To satisfy shorebird requirements, roosts must remain above the mean high-tide mark and have relatively little disturbance compared to other shorelines. Research indicates activities such as jogging, beach combing, exercising pets, and off-road vehicle traffic within 100 meters of roosting shorebirds will cause the birds to repeatedly flush and re-

land, and/or force them to permanently leave the roost (Burger 1981, Burger and Gochfeld 1991). A roost with chronic disturbance as described would not meet shorebird requirements.

Types of disturbance on feeding flats are similar to those mentioned above for roosting areas, but may also include boat traffic associated with docks, marinas, or aquaculture, within 100 meters of feeding shorebirds.

### **Development**

Increased residential development appears to result in increased numbers of people on the beach, therefore development within 100 meters of shorebird areas are likely to cause disturbance from human activities associated with residential development (Rodgers and Smith 1997, Burger and Gochfeld 1991).

### **Contaminants**

Environmental contaminants are known to be present in most if not all estuarine systems. Migratory shorebirds feed in these systems throughout the western hemisphere, and may be particularly exposed to contaminants that bioaccumulate. Toxic contaminants affecting Maine's marine environment include heavy metals and organic compounds. The Maine Department of Environmental Protection has information on toxic contamination from over 120 locations along the coast. Sediments from about 25 areas contain levels of one or more contaminants that would impair populations of invertebrates (Maine Environmental Priorities Council (MEPC) 1999).

Feeding areas must have high densities of invertebrates and substrates free from chemical contaminants. Ideally, feeding areas should have a minimal invertebrate abundance of 100 individuals per square meter (Eldridge 1992). Chemical contamination that lowers invertebrate densities or diversity below the minimum would compromise the feeding area for shorebirds.

Oil pollution may be the most widespread threat to Maine's coastal waters. Currently approximately 110 million barrels of refined and unrefined oil are being transported in Maine's waters (MEPC 1999). A large spill could be devastating. Significant numbers of shorebirds were killed after an oil spill in an England estuary in 1966, presumably from direct toxic effects of oil, compounding these direct effects, damage to the habitats resulted in decreases of 20 – 100% of the invertebrate populations (Connors et al. 1979).

### **Physical Alterations**

Activities that physically alter a roost or feeding area such that the roost is no longer available, or the feeding area is no longer able to support a large number of invertebrates, would render the area unusable to shorebirds. Some examples include rockweed harvesting, intertidal dragging or dredging, construction of docks, and activities associated with aquaculture pens and/or lobster pounds.

### ***Criterion D***

This criterion answers the question "Is the title to the site held by a public agency or a private conservation organization, or are there conservation easements, agreements,

etc., in place that provide long-term shorebird habitat protection?" This question can be answered by WRAS-MDIFW records or by consulting town offices.

## **MANAGEMENT SYSTEM OUTPUTS**

Shorebird habitat management in Maine primarily consists of three components: 1) to preserve and protect natural foraging and roosting habitats, 2) to reduce disturbance, and 3) to enhance foraging and roosting sites through habitat manipulation.

## **MANAGEMENT OPTIONS**

### ***Management Option I***

1. If this area appears to have suitable feeding or roosting habitat, then survey it incidentally to other inventory activities.

### ***Management Option II***

1. Schedule periodic surveys (at 3 year intervals) of shorebird use of the area using appropriate inventory techniques (Appendix IV). Areas that have not been surveyed in the last 10 years, or where data indicate that shorebird numbers are close to meeting Criterion B, should be given priority.
2. Delineate the shorebird feeding and roosting area, and encourage protection through cooperative agreements with landowners. Some development or other

human activities may be appropriate on, or adjacent to, the shorebird area as determined by the appropriate MDIFW regional biologist.

3. Maintain current levels of management and habitat protection as warranted.
4. Add new data to the MDIFW Shorebird database and *Habitat Consultation Area(HCAMP)* maps.

### ***Management Option III***

1. Determine by level of threat or species importance, if the area should be included in the 20% of the highest priority areas of Shorebird Areas of Management Concern for protection.
2. Negotiate conservation easements or landowner agreements.
3. Pursue and support programs to acquire shorebird area.
4. Protect area from environmental degradation through a range of resource protection measures that may include non-regulatory approaches as appropriate to each specific case. If non-regulatory efforts fail regulatory efforts may be required. Work with municipalities to develop resource protection zones.
5. Identify area as a candidate site for *Significant Wildlife Habitat* and recommend candidate sites be included in a package of *Significant Wildlife Habitat* for DEP rule-making under NRPA.
6. Submit area to Habitat Group for oil spill contingency plan and HCAMP. Areas that qualify as Areas of Shorebird Management Concern under Criterion B will be included in HCAMP and will highlight grid cells indicating the site qualifies for NRPA protection. MDIFW may be required to comment regarding land alteration permit

reviews and to share knowledge of these special habitats with landowners for their information, appreciation and planning.

7. Continue to survey and document shorebird use. Add new data to the MDIFW shorebird database and HCAMP. Provide new information to appropriate MDIFW regions through HCAMP.

#### ***Management Option IV***

1. Roosting and feeding areas should be posted and buffer zones 100 meters from mean high tide should be established.

Restrict use or access between July 1 and October 31 on designated roosting or feeding area if necessary to minimize disturbance from recreational use.

Shorebirds on intertidal feeding areas are highly vulnerable to disturbance two hours after high tide, or just as the flats begin to appear when the shorebirds are limited to narrow stretches of habitat (Helmert 1992). Ideally placement of docks and moorings should be located away from areas where feeding shorebirds concentrate. Shorebirds feeding on expansive intertidal flats during low tide are usually subject to few disturbances. Little recreational use is made of these habitats except by those collecting shellfish or digging worms for bait. It is generally believed such slow, methodical activities rarely disturb foraging shorebirds (Burger 1981). If MDIFW determines that a specific use or activity adversely affects feeding shorebirds, then site specific recommendations will be developed cooperatively with landowners and resource users.

Shorebirds on roosting areas are highly vulnerable to disturbance two hours either side of high tide.

2. Inform public conservation groups, landowners, recreationalists, and anglers of shorebird life history, requirements, and viewing protocols. Increase the number of people watching shorebirds without adverse impact, by establishing viewing platforms with signs describing viewing protocols.
3. Provide access to sites not frequented by shorebirds. For example, placement of stairs or ramps to access areas of beach not utilized by shorebirds.
5. Utilize physical barriers to limit recreational use within 100 meters of roosting shorebirds.
6. Schedule periodic surveys. This may include assistance from landowners or “birders” (Appendix IV).
7. Submit area to Habitat Group for oil spill contingency plan and HCAMP. Updated information will be entered into the MDIFW shorebird database and provided to the appropriate MDIFW region through HCAMP. Areas that qualify as Areas of Shorebird Management Concern under Criterion B will be included in HCAMP and will highlight grid cells indicating the site qualifies for NRPA protection. MDIFW may be required to comment regarding land alteration permit reviews and to share knowledge of these special habitats with landowners for their information, appreciation, and planning.

***Management Option V***

1. Determine by level of threat or species importance, if the area should be included in the 20% of the highest priority areas of Shorebird Areas of Management Concern for protection.
2. Continue monitoring. Add new data to MDIFW shorebird database and HCAMP. Provide new information to appropriate MDIFW regions.
3. Negotiate conservation easements or landowner agreements opportunistically.
4. Pursue and support programs to acquire shorebird area.
5. Designate area as a candidate site for *Significant Wildlife Habitat*. Recommend candidate sites for inclusion in a package of *Significant Wildlife Habitat* DEP rule-making under NRPA.
6. Protect area from environmental degradation using non-regulatory approaches as appropriate to each specific case. If non-regulatory efforts fail then regulatory efforts may be needed. Work with municipalities to develop resource protection zones.
7. Submit Area to the Habitat Group for Oil Spill Contingency Plan and HCAMP. Areas that qualify as Areas of Shorebird Management Concern under Criterion B will highlight HCAMP grid cells indicating the site qualifies for NRPA protection. MDIFW may be required to comment regarding land alteration permit reviews and to share knowledge of these special habitats with landowners for their information, appreciation and planning.

***Management Option VI***

1. Continue monitoring. This may include assistance from landowner(s)/user volunteers (Appendix IV). Add new data to MDIFW shorebird database and HCAMP. Provide new information to the appropriate MDIFW regions.
2. Maintain current levels of management and habitat protection.
3. Inform public groups, landowners, recreationalists, and anglers of shorebird life history requirements and viewing protocols. Increase the number of people watching shorebirds without adverse impact, by establishing viewing platforms with signs describing viewing protocols.
4. Provide access to sites not frequented by shorebirds. For example, placement of stairs or ramps to access areas of beach not utilized by shorebirds.
5. Utilize physical barriers to limit recreational use within 100 meters of roosting shorebirds. Placement of docks and moorings should be away from areas where shorebirds concentrate for roosting or feeding.
6. Schedule periodic surveys. This may include assistance from landowners or “birders” (Appendix IV).
7. Submit area to Habitat Group for Oil Spill Contingency Plan and HCAMP. Areas that qualify as Areas of Shorebird Management Concern under Criterion B will highlight HCAMP grid cells indicating the site qualifies for NRPA protection. MDIFW may be required to comment regarding land alteration permit reviews and to share knowledge of these special habitats with landowners for their information, appreciation and planning.

Updated information will be entered into the MDIFW shorebird database and provided to the appropriate MDIFW regions through HCAMP.

8. Secure conservation easements or landowner agreements.
9. Pursue and support programs to acquire shorebird area.

## **POPULATION MANAGEMENT SYSTEM FOR STAGING AND WINTERING SHOREBIRD POPULATIONS IN MAINE**

The population management system provides the framework for identification of priority migratory shorebird species and identification of areas to inventory and monitor populations to determine population trends for priority species. Continual monitoring is required to document changes in use of Maine staging and wintering habitats and identify factors that may be limiting.

### **DECISION CRITERIA**

The following criteria prioritizes shorebird species to monitor and selects shorebird areas to survey to determine population trends for priority species (Figure 2).

#### ***Criterion A***

This criterion answers the question: “Is the selected shorebird species a management priority in Maine? “

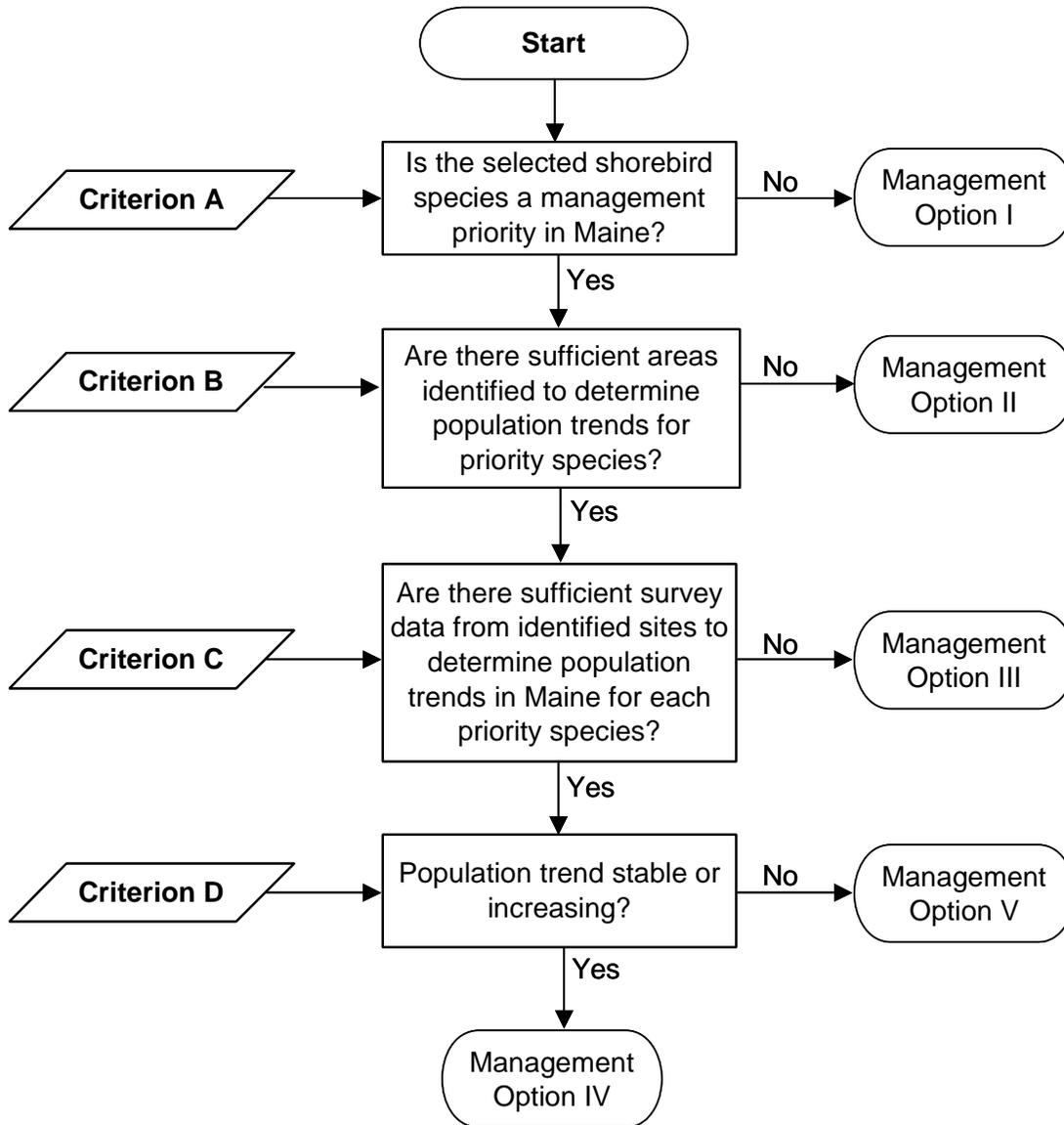


Figure 2. Flow diagram depicting decision criteria for Population Management System.

With limited funding and personnel, there is a need to prioritize conservation activities. This question can be answered by consulting MDIFW. Using input from the U.S. Shorebird Conservation Plan, International Shorebird Survey, and the Atlantic Coast High Priority Shorebird Network, MDIFW has prioritized shorebird species according to their relative conservation status and risks and the relative importance of Maine habitats for each species (Appendix 1). Rule of thumb used to determine management priority is: if a species is rated 5 (highly imperiled) or 4 (Species of high concern) it should be considered a management priority.

***Criterion B***

This criterion identifies areas in Maine where a large percentage of one or more priority species are found staging or wintering and would therefore be suitable to survey and monitor for population trend analysis. The feeding or roosting site qualifies if the following criterion is met:

The mean number of a priority species observed at the site is 10% or more of the total mean numbered observed for that particular species in the encompassing shorebird survey unit (Appendix III).

***Criterion C***

This criterion answers the question: “ Are there sufficient survey data from identified sites to determine population trends in Maine for each priority species?”

Based on methods used by the ISS for trend analysis, data from identified sites for each priority species can be used for trend analysis if shorebird populations were surveyed

intensively within year coverage and consistent between year coverage during the latest 10-year period.

***Criterion D***

This input attempts to address the question “Is the population trend stable or increasing?”

A shorebird species population will be considered stable if trends calculated from annual population indices combining data from all sites monitored for that species show no significant population change. A shorebird species population is considered increasing if annual indices show an increase of 5% or greater over a 10 year period.

**MANAGEMENT SYSTEM OUTPUTS**

***Management Option I***

1. If recent data suggests a species is not a priority, continue to survey and monitor incidentally to other inventory activities.
2. If recent data suggests a species should be a priority, the MDIFW priority shorebird list should be amended to include the shorebird species to the MDIFW shorebird species priority list.

***Management Option II***

1. Schedule annual surveys at sites where there is documented use by priority shorebird species using appropriate inventory techniques (Appendix IV). Areas that have not been surveyed in the last 10 years, or where data indicate that priority species numbers are close to meeting Criterion B, should be surveyed first.
2. Locate new sites that may qualify under criterion B.

***Management Option III***

1. To obtain more survey data needed to determine population trend for priority species, annually survey using ISS survey protocols, concentrating on sites used by priority species that qualify under Criterion B (Appendix IV).

***Management Option IV***

1. Protect and maintain feeding and roosting habitats used by priority species (see Habitat Management System)
2. Continue to survey and monitor priority species population.

***Management Option V***

1. Determine population limiting factors. If population limiting factors are related to Maine shorebird habitats, refer to Habitat Management System.

2. If population limiting factors occur outside of Maine, support International efforts by sharing knowledge and data collected in Maine on local shorebird populations and habitats.

## **PUBLIC OUTREACH MANAGEMENT SYSTEM FOR MIGRATORY SHOREBIRDS IN MAINE**

The Public Outreach Management system provides the framework for development and implementation of Public Outreach initiatives that will increase awareness and promote stewardship of migratory shorebirds and their habitats in Maine.

### **DECISION CRITERIA**

The following criteria will identify steps needed to establish a Public Outreach Plan (Figure 3).

#### ***Criterion A***

This criterion answers the question: “Has a public outreach plan been developed that creates awareness of migratory shorebird needs and values in Maine; and recognizes and assists landowners that practice good stewardship of shorebird habitats.

#### ***Criterion B***

This criterion answers the question: “Has the Public Outreach Plan been implemented?”

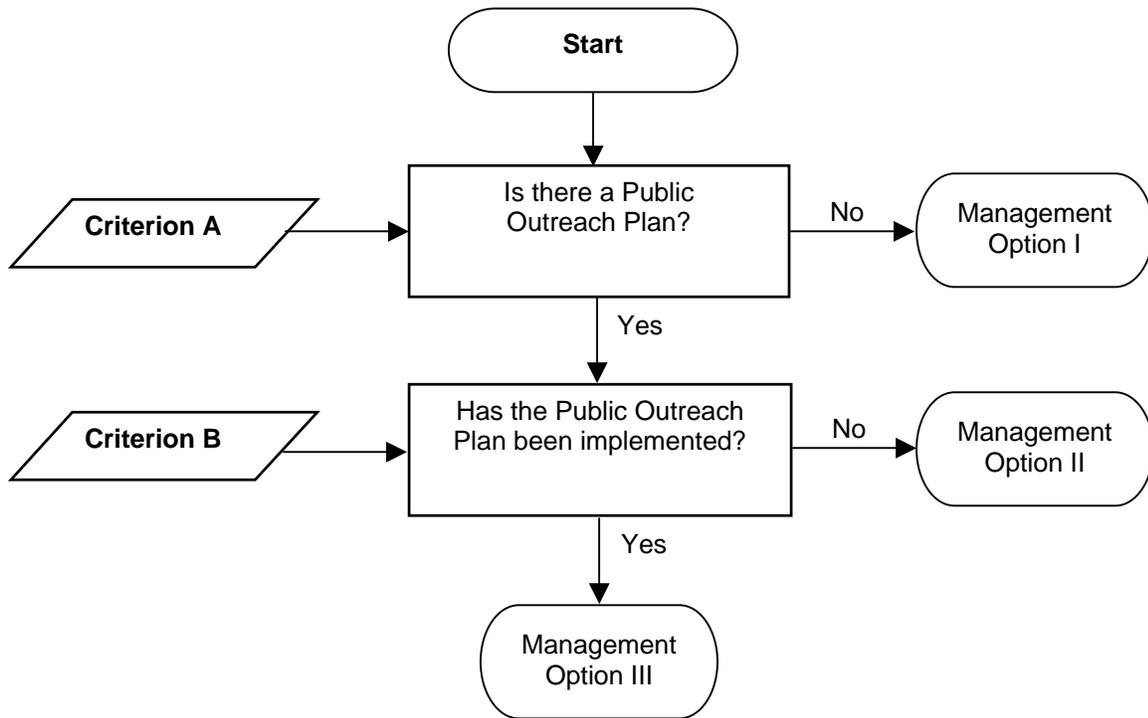


Figure 3. Flow diagram depicting decision criteria for Public Outreach Management System.

## **MANAGEMENT SYSTEM OUTPUTS**

### ***Management Option I***

1. Secure adequate funding and qualified personnel to work with partners to develop Public Outreach Plan. The Migratory Shorebird Outreach Plan should include strategies for informing public groups, landowners, and recreationalists, of shorebird life history requirements and viewing protocols. Landowner assistance and recognition of good stewardship of shorebird habitats should also be addressed.

### ***Management Option II***

1. Secure adequate funding and personnel to implement Public Outreach Plan.
2. Continue to work with partners to implement Public Outreach Plan.

### ***Management Option III***

1. Monitor effectiveness of Public Outreach Plan and modify where appropriate.
2. Continue to work with partners to monitor and modify the Public Outreach Plan.

## **Part II MIGRATORY SHOREBIRD MANAGEMENT DATABASE**

MDIFW has surveyed shorebird feeding and roosting sites along much of the coast as part of Maine's Coastal Management Program. Regional inventories started in 1981 with the Casco Bay Coastal Resources Inventory and continued until the coastal inventory was completed in 1990. A combination of aerial and ground surveys were used to identify shorebird feeding and roosting habitat.

To update and fill in gaps where information was lacking, regional surveys were initiated again in 1993. Beginning with coastal areas from Kittery to Phippsburg, MDIFW performed intensive ground surveys of shorebird areas mapped during the 1981 surveys, as well as additional areas previously not surveyed. In 1994, MDIFW surveyed Sheepscot, Muscongus, and Penobscot Bay; Hancock County and Washington County were surveyed in 1995, 1996, and 1997.

Areas were surveyed 3 to 6 times between July 1 and September 31 at various tidal stages. Data collected included shorebird species, number observed, activity (feeding and or roosting), site name, site number, location, date and time of survey, observer, and tidal stage. The observer also recorded habitat characteristics for each site and any disturbance observed. MDIFW entered this information into the WRAS shorebird database.

Data are lacking on purple sandpiper wintering population size and distribution. Efforts are currently underway to identify critical habitats and establish survey protocols to implement a monitoring program.

## **WRAS SHOREBIRD DATABASE**

### ***Computer Files***

The purpose of this MS Access file is to facilitate data computations for use in defining Shorebird Areas of Management Concern, which can be submitted as candidate shorebird feeding and staging areas for Significant Wildlife Habitat designation under NRPA. This dataset resides on the GIS server maintained by the Habitat Group. WRAS and Regional biologists are able to browse the data via connections to the GIS server. This file is accessible for incorporating into a geo-database as well.

### ***Regional Files***

MDIFW prepared manual reports for each region surveyed describing the characteristics of individual sites surveyed. Sites are organized by township and include dates visited, and shorebird numbers by species observed. Basic habitat information such as habitat type (mud flat, salt panne, sand spit, gravel bar, etc.), as well as type and level of disturbance observed, were described. Access to each area and observation points with the best vantage are included to assist in future surveys.

### ***Map Files***

MDIFW mapped shorebird areas on USGS topographic 15' quadrangle maps. Areas are designated by shaded polygons with roosting areas highlighted. Areas are labeled by site number. All maps are housed in the WRAS files in Bangor. The Habitat Group has mapped and entered all areas in a GIS database.

### ***Species Files***

Separate, manual files exist for each species of shorebird that stage or nest in Maine. These files consist of information on life history, population status, and species management. These files are maintained by the Bird Group at the WRAS in Bangor.

## **USE OF THESE DATA AND INFORMATION**

These data are used by the WRAS staff for development of species assessments, management systems, and chemical spill contingency plans. The WRAS staff, namely the Bird Group, Habitat Group, and the Endangered and Threatened Species Group, provide current site data along with management guidelines, policy recommendations, training, and other technical assistance as requested by regional biologists.

MDIFW includes these data in reports sent to others interested in shorebird management, such as state, federal, and private conservation agencies; colleges and universities; and individuals.

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**APPENDIX I. National, North Atlantic Region, and Maine shorebird prioritization scores.**

<b>Migratory Shorebirds in Maine</b>	<b>National Priority</b>	<b>N. Atlantic Priority</b>	<b>Maine Priority</b>
Piping Plover ( <i>Charadrius melodus</i> )	5	5	5
Upland Sandpiper ( <i>Bartramia longicauda</i> )	2	4	5
American Oystercatcher ( <i>Haematopus palliatus</i> )	4	5	5
Whimbrel ( <i>Numenius phaeopus</i> )	4	5	5
Red Knot ( <i>Calidris canutus</i> )	4	5	5
Red-necked Phalarope ( <i>Phalaropus lobatus</i> )	3	3	5
Purple Sandpiper ( <i>Calidris maritima</i> )	2	3	4
Semipalmated Sandpiper ( <i>Calidris pusilla</i> )	3	4	4
Ruddy Turnstone ( <i>Arenaria interpres</i> )	4	4	4
Sanderling ( <i>Calidris alba</i> )	4	4	4
Willet ( <i>Catoptrophorus semipalmatus</i> )	3	4	4
Greater Yellowlegs ( <i>Tringa melanoleuca</i> )	3	4	4
Hudsonian Godwit ( <i>Limosa haemastica</i> )	4	4	3
American Golden Plover ( <i>Pluvialis dominicus</i> )	4	4	3
Black-bellied Plover ( <i>Pluvialis squatarola</i> )	3	3	3
Least Sandpiper ( <i>Calidris minutilla</i> )	3	3	3
Dunlin ( <i>Calidris alpina</i> )	3	3	3
Short-billed Dowitcher ( <i>Limnodromus griseus</i> )	3	3	3
White-rumped Sandpiper ( <i>Calidris fuscicollis</i> )	2	3	3
Stilt Sandpiper ( <i>Calidris himantopus</i> )	3	3	3
Northern Phalarope ( <i>Phalaropus fulicaria</i> )	3	3	3
Buff-breasted Sandpiper ( <i>Tryngites subruficollis</i> )	4	4	3
Solitary Sandpiper ( <i>Tringa solitaria</i> )	3	3	2
Killdeer ( <i>Charadrius vociferus</i> )	3	2	2
Western Sandpiper ( <i>Calidris mauri</i> )	3	2	2
Semipalmated Plover ( <i>Charadrius semipalmatus</i> )	2	2	2
Lesser Yellowlegs ( <i>Tringa flavipes</i> )	3	2	2
Pectoral Sandpiper ( <i>Calidris melanotos</i> )	2	2	2
Long-billed Dowitcher ( <i>Limnodromus scolopaceus</i> )	2	2	2
Baird's Sandpiper ( <i>Calidris bairdii</i> )	2	2	2

**Priority Definitions:**

- 5 = Highly Imperiled
- 4 = Species of High Concern
- 3 = Species of Moderate Concern
- 2 = Species of Low Concern
- 1 = Species not at risk