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U.S. Shorebird Conservation Plan

Northern Pacific Coast Regional Shorebird Management Plan

by

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EXECUTIVE SUMMARY

Shorebirds (Order Charadriiformes; plovers, oystercatchers, stilts and avocets, sandpipers and allies) represent a group of species which has long been of interest to scientists and the general public. These birds use a variety of habitats during annual spring and fall migrations to and from breeding grounds. Many of the most critical habitats used by shorebirds are associated with wetlands or other limited habitats. Thus, shorebirds may be important indicators of ecosystem status. Because shorebirds aggregate in limited areas in large numbers during critical periods of their life cycles, habitat loss and degradation is a major threat. Addressing these threats and other issues in a coordinated fashion is key to effectively conserving shorebird populations at the national and international scale. To meet this challenge, Manomet Center for Conservation Sciences, under contract with the U. S. Fish and Wildlife Service, is developing the United States Shorebird Conservation Plan. This national Plan includes 11 regional plans reflecting major shorebird flyways and habitats within the United States. The Northern Pacific Regional Working Group was formed under the auspices of the National Plan to formulate shorebird management goals for the Northern Pacific Region (NPR), which represents western Washington and Oregon. The purpose of this management plan is to address shorebird management needs on a regional basis while considering Pacific Flyway and National levels of need.

Within the NPR, the important shorebird habitats are coastal estuaries, beaches, rocky shorelines, pelagic, and freshwater systems (natural and managed wetlands, flooded agricultural areas, and riverine systems). We identified numerous sites across these habitat types within the region that supported at least 1,000 birds in one or more season. Many of the coastal estuaries within the region, such as Grays Harbor, Willapa Bay, and the Columbia River estuary, support large numbers (i.e. >f shorebirds . Other locations, such as the Willamette Valley, contain both wetlands and agricultural lands which overall support a wide diversity of species and large numbers of individuals.

Of the 50 shorebird species recognized by the National Plan as occurring within the United States, 40 occur regularly within the NPR, although several species occur in very low abundance (e.g., rare migrants). All species were given National and Regional prioritization scores based on abundance (i.e., regional importance) and potential threats. Only one species, the Snowy Plover, was considered to be highly imperiled at the national and regional scales. Nineteen species (including species such as Black Oystercatcher, Common Snipe, Dunlin, Greater Yellowlegs, and Sanderling) were identified regionally as species of high concern due to their regional importance, and the remaining species were considered to be of less concern.

Regional goals were established during the development of this plan. The primary goals are to: 1) measurably increase populations, over the next 10 years, of species impacted by current or recent declines at population or flyway levels, and 2) stabilize and maintain current levels of breeding, wintering, and migrating populations of other shorebird species within the region/flyway. In support of these broad population goals, specific goals were also developed for research and monitoring, management, habitat protection, and outreach. Specific strategies to meet each of these goals were developed.

Key features of the monitoring strategy include development and implementation of a Flyway-wide survey to monitor shorebird species across five primary habitat strata (estuarine, beach, rocky shoreline, pelagic, and freshwater). Research and monitoring recommendations cover a broad spectrum and include 1) examination of shorebird response to introduced species (e.g., cordgrass and exotic invertebrates in estuaries, European beachgrass in coastal low dunes, reed canary grass in freshwater areas) and their control, 2) effects on shorebirds of various contaminants, 3) assessment of spatial and temporal aspects of shorebird habitat use, 4) in-depth studies of the life history of species of concern, and 5) evaluation of shorebird response to integrated waterbird management efforts and other enhancement or restoration efforts. Outreach strategies were identified to improve communication among public and private land managers regarding shorebird needs, to facilitate effective plan implementation at the regional scale, and to support public enjoyment of shorebirds.

Of primary concern for shorebird conservation is the loss of wetland habitat. To meet critical habitat goals, we focused on protection, restoration, and enhancement, recognizing the importance of the Pacific Coast Joint Venture (PCJV). The PCJV has identified and facilitated acquisition of many sites known to be important for shorebirds. The Regional Working Group will continue to work with the PCJV to implement our habitat strategies, including identification and protection of additional important sites and implementation of restoration/enhancement activities. Restoration and protection will focus on four of the broad habitat types: estuarine, beach, rocky shoreline, and freshwater. Restoration and protection activities include the protection of nesting areas for Black Oystercatchers on rocky shorelines, restoration of tidal regimes to diked wetlands in estuaries, water level and moist soil management in freshwater environments lost to or degraded by agriculture and development, and removing exotic species and planting native vegetation in both estuarine and freshwater areas. Numerous sites from throughout the region were identified for implementation of these protection and restoration activities.

Finally, a number of sites are recommended for inclusion in the Western Hemisphere Shorebird Reserve Network. Willapa Bay and the Columbia River estuary are recommended as sites of international significance (>100,000 birds or 15% of Flyway total). Port Susan, Skagit Bay, Padilla Bay, North Beach, and Copalis/Ocean Shores Beach are recommended as sites of regional importance (>20,o Additionally, portions of the Willamette Valley support large numbers of shorebirds, and as a complex of seasonally ephemeral sites, this area is of regional importance. New criteria should be developed that recognize the regional or international importance of this and other complexes of sites.

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APPENDIX

I. INTRODUCTION

As a group, the shorebirds (Order Charadriiformes; plovers, oystercatchers, stilts and avocets, sandpipers and allies; American Ornithologists' Union 1998) have long been of great interest to biologists, bird-watchers, and the general public. Their long-distance migrations to and from breeding grounds and a propensity to aggregate have been well documented. It is these two attributes, and a dependence on wetlands, that has placed many members of this group of species at risk.

Most shorebirds, including the most abundant species, are long-distance migrants that typically have vast wintering and breeding ranges. During migration, these species use flyways characterized by a network of estuaries, beaches, rocky shorelines, or wetlands that are typically limited in size and distribution. These areas represent "migratory bottlenecks" (Myers 1983) that the birds must negotiate twice each year. The comparatively limited availability of resources in these bottlenecks present energetic demands on shorebirds that potentially influence migration, reproduction, and even survival (Goss-Custard 1977, Evans et al. 1991, Sutherland and Goss-Custard 1991). Other shorebirds, including residents, overwintering species, and local nesters, are similarly constrained by the availability of suitable habitats.

Shorebird populations and habitats have been impacted by a variety of human activities. Many species were formerly exploited for market hunting and several species suffered substantial population declines and have yet to recover (Paulson 1993, Page and Gill 1994). With the exception of the Common Snipe (scientific names are listed in Appendix 1), shorebirds are no longer hunted in the Northern Pacific Region (NPR) covered by this document. New threats have emerged, however, including habitat degradation and destruction. Over 66% of intertidal wetlands in Washington state have been destroyed in the last century (Boule et al. 1983). Wetland loss in Oregon has been similarly severe where a 50-80% reduction of intertidal marsh has occurred (Boule and Bierly 1987). The loss of wetlands in the Willamette Valley has been estimated at between 40% (Gabriel 1993) and 87% (Titus et al. 1996). Habitat loss leads to increased levels of competition for resources among shorebirds and can eventually result in density dependent mortality (Goss-Custard 1977). Other potential threats to shorebirds in the region include various types of pollution (e.g. oil spills, agricultural and industrial chemicals) and human disturbance (Table 1) (for review, see Buchanan in press).

The northern Pacific coast of the United States is an important part of the Pacific Flyway used by many migrating and wintering shorebirds. Habitats in the region, including coastal estuaries, beaches, rocky shorelines, ocean waters, and interior freshwater areas support large numbers of migrant Western Sandpipers, Short-billed Dowitchers, Greater Yellowlegs, and Sanderlings (Herman and Bulger 1981, Myers et al. 1984, Paulson 1993, Buchanan and Evenson 1997, Evenson and Buchanan 1997, Page et al. 1999), and perhaps the greatest concentration of wintering Dunlins in western North America (Page et al. 1999). The Willamette Valley appears to be the most important wintering area for Killdeers in the Pacific Northwest (Paulson 1993). Given the tremendous importance of this region to these and other shorebird species, the Northern Pacific Regional Working Group was convened under the auspices of the United States National Shorebird Conservation Plan (NSCP) to develop a conservation strategy for shorebirds in the region. In this document, regional goals and management strategies to address shorebird conservation issues in western Washington and western Oregon are presented. This document should be viewed as guidance for the working group and managers in the region, with the understanding that the working group will refine recommendations through time as new information and opportunities arise.

II. DESCRIPTION OF THE REGION

The planning area for the NPR was defined as those areas of Washington and Oregon west of the Cascade Mountain crest. This area, with an exception explained below, coincides with the Pacific Northwest Bird Conservation Region (BCR) proposed by Babcock et al. (1998). For planning purposes, northwestern California was included within the Southern Pacific Region (Coastal California BCR) because coordination of the NPR plan would have been difficult across the larger three-state area.

The NPR is a coastal region dominated by a maritime climate which produces moist, mild conditions throughout much of the year. The region supports vast conifer forests that extend from sea level to the Cascade Mountain crest. Before European settlement, wetland prairie and oak savannah (Franklin and Dyrness 1973) were dominant features of the Willamette Valley and portions of the Puget Trough lowlands. These areas have now been altered substantially through urban development and conversion to agriculture. Important general habitats for shorebirds include coastal estuaries, coastal beaches, rocky marine shorelines, open ocean and other deep water areas, and freshwater systems (natural and managed wetlands, agricultural areas, and riverine systems).

Coastal Estuaries

Within the NPR, the greatest diversity and abundance of shorebirds are found in the coastal estuaries. At these sites, shorebirds rely on intertidal mud flats and salt marshes to meet various life requisites (Buchanan in press). There are 26 estuarine sites that support at least 1000 shorebirds in Puget Sound (Evenson and Buchanan 1997, Buchanan 1988) and 23 such bays or estuaries along the outer coasts of Washington and Oregon (Table 2). Often large numbers of wintering and migrant shorebirds use these estuaries (Herman and Bulger 1981, Buchanan and Evenson 1997, Evenson and Buchanan 1997, Page et al. 1999; see Table 1 for other references). The important estuaries vary in size from less than one km^2 in area to well over 50 km^2; Grays Harbor, Willapa Bay, and the Columbia River estuary are examples of larger sites.

Sand Beaches

Among the dominant features of coastal Washington and Oregon are the sand beaches. The primary sand beaches in Washington (Copalis/Ocean Shores Beach, Grayland Beach, North Beach ["Longbeach"] each support over 1,000 shorebirds) are found between the Copalis River and the mouth of the Columbia River. Other sand beaches on the northern outer coast and Strait of Juan de Fuca (typically small, isolated, and backed by rocky headlands) support comparatively fewer shorebirds. Small sand beaches are also present in the Puget Sound region; however, these also support few shorebirds. Sand beaches are found along much of the coast of Oregon as well, although the beaches are generally smaller south of Cape Blanco. Sand beaches used by shorebirds in either state are typically extensive, wide beach areas with fine-grained sand and relatively gradual slope. At least five beach segments in Oregon support ≥1,000 shorebirds during one or more seasons; the more important beaches are Clatsop Beach, Sunset Beach, Oregon Dunes National Recreation Area, and the beach between Coquille River and Cape Blanco (Table 2). The coastal beaches in the NPR host some of the greatest concentrations of migrant and wintering sanderlings in North America (Myers et al. 1984, Buchanan 1992, Buchanan and Evenson 1997). Beaches are used as roosting habitat by thousands of Dunlins, Western Sandpipers, and Black-bellied Plovers, and lesser numbers of other species, when tides are high in adjacent estuaries (Buchanan 1992). The federally threatened Snowy Plover nests on some of these beaches; nine beach areas in the region are listed as critical habitat by the U.S. Fish and Wildlife Service: Damon Point (Grays Harbor County, WA), Leadbetter Point (Pacific County, WA), Bayocean Spit (Tillamook County, OR), Haceta Head to Sutton Creek (Lane County, OR), Siltcoos River North (Lane County, OR), Siltcoos River to Threemile Creek (Lane and Douglas counties, OR), Umpqua River to Horsfall Beach (Douglas and Coos counties, OR), Horsfall Beach to Coos Bay (Coos County, OR), and Bandon Park to Floras Lake (Coos and Curry counties, OR) (USDI 1999; see Table 2).

Rocky Shoreline

Many sand beaches in the region are separated by rocky shorelines, important habitats for species such as Black Oystercatcher, Wandering Tattler, Rock Sandpiper, Surfbird, Ruddy Turnstone, and Black Turnstone. Rocky shorelines are found along coastal regions in the conservation planning area (Table 2) but there are differences among sites in height, extent, slope, and geological history. For example, portions of the Washington and Oregon coasts are characterized by towering cliffs that drop nearly vertically to the breaker zone. In other areas, such as the mainland shoreline of portions of Puget Sound, the shoreline substrate is glacial in origin, generally unstable, and often less than 50 meters in height. Rocks, reefs, and nearshore islands provide rocky intertidal habitat as well.

Pelagic

Another marine habitat, used almost exclusively by Red-necked Phalaropes and Red Phalaropes, is the pelagic zone. Several marine habitats are recognized within this pelagic habitat category: inland marine waters (e.g., Puget Sound), nearshore waters, shelf and slope waters (i.e., up to 2000 m in depth), and offshore waters (i.e., >2000 m in depth and extending west to the jurisdictional boundary of the United States (Buchanan et al. in press, Johnson and O'Neil in press). Large numbers of phalaropes have been reported off Tillamook Bay, off Cape Arago, off Westport, off Newport Bay, and off Boiler Bay (Nehls 1994, Paulson 1993), but the location of essential areas in the region is not known.

Freshwater Habitats

A diverse group of habitats important to shorebirds is found in freshwater environments. The specific habitats include wetlands, agricultural areas and pasture lands, prairies, and shorelines of ponds, lakes, and riverine systems. Arguably, managed agricultural areas and pasturelands with areas of moist, bare soil and/or very short vegetation, often grazed by livestock, left fallowed, or simply flooded, appear to be important habitats in certain areas of the region. The important areas include sites adjacent to large coastal and Puget Sound estuaries, and the central and southern parts of the Willamette Valley

(Table 2), where areas under grass seed production are important. Coastal pastures adjacent to sites such as Samish Bay and Willapa Bay are used as roosting and foraging habitat by many wintering and migrant species (Buchanan in press) whereas the Willamette Valley supports flocks of Dunlins, as well as substantial numbers of Killdeers and Common Snipes (Paulson 1993, Oregon Department of Fish and Wildlife 1997).

Freshwater wetlands, although an important habitat in the region for shorebirds, waterfowl, and marsh birds, are not extensive in area and currently appear to support comparatively fewer birds than agricultural lands. Where present, however, these nutrient and resource rich sites greatly enhance the value of other habitats and are used by shorebirds when water levels are shallow enough for foraging.

Shorelines and riverine areas are important for species that generally do not occur in large concentrations. Riverine areas are particularly important for Spotted Sandpipers and exposed shorelines of shallow ponds and lakes are valuable habitats for shorebirds such as Solitary Sandpiper and Semipalmated Plover. Shoreline use occurs primarily during fall migration when typically lower water levels create opportunities for foraging.

III. SHOREBIRD SPECIES OCCURRENCE AND REGIONAL SPECIES PRIORITIES

National Priority scores for all species which occur regularly in the NPR were established through a system devised by the National Research and Monitoring Working Group of the NSCP. The scoring was based on a similar system used by Partners in Flight (Carter et al. in press) to prioritize land birds of conservation concern. Regional scores were adjusted to reflect regional concerns and priorities (Table 3). The regional scores differed from those established at the National level because the latter were less sensitive to local or regional information. Consequently, the Regional scores reflect our Working Group's collective opinion about the level of concern for each species within the NPR.

We noted differences between National and Regional prioritization scores (Table 3). Of the 38 species with both National and Regional scores (2 species had no National score), we considered 20 species to be of high concern or highly imperiled (scores of 4 or 5, respectively) at the Regional level compared to 14 species at the National level. Furthermore, in comparison to 18 species considered of moderate concern (score of 3) at the National level we identified only 3 such species at the Regional level. Finally, only 6 species received scores of ≤2 (low concern or no risk) at the National level whereas 17 received these scores at the Regional level. The primary reason for the disparity in scores resulted from different levels of importance of the region for particular species. For example, species for which the NPR constituted a minor portion of the species' flyway or population received lower regional scores. Only one species, the threatened Snowy Plover (USDI 1993), was ranked in the highest priority category at both the National and Regional levels. Conversely, one species classified Nationally as highly imperiled, the Long-billed Curlew, was ranked Regionally as a species of moderate concern because it does not breed in the region and few birds occur in the region during winter or migration.

IV. OVERVIEW OF REGIONAL GOALS

Determining the current population status of shorebirds within the NPR and monitoring these species to determine long-term trends are primary goals for the NSCP. Without this information, management of shorebirds would be difficult and lack direction. This section establishes broad goals for the NPR at both short- and long-term timeframes. Many of the goals stated here should be considered within the context of Pacific Flyway and/or national goals. Details about specific strategies needed to meet Regional goals follow in the corresponding sections of this document.

Population Goals (see Section V)

- Over the next ten years, measurably increase populations of species which have experienced (or are believed to have experienced) population declines. This will require development of reliable baseline information and appropriate monitoring techniques. After the 10-year period, this goal should be re-evaluated on a species-by-species basis to assess its appropriateness and determine whether new approaches are needed to facilitate achievement of the desired population response.
- Stabilize and/or maintain current levels of breeding, wintering, and migrating populations of the more common shorebirds within the Region/Flyway.

Monitoring and Research Goals (see Section VI)

In many ways, monitoring goals are closely related to research goals. It is anticipated that many of the monitoring and research activities in the region, particularly those related to habitat restoration, will involve adaptive management, an approach that uses

experimentation and monitoring to both evaluate alternatives and modify future management practices (Holling 1978, Walters 1986, Walters and Holling 1990). For this reason, monitoring and research goals are identified together in the section below.

Population Status

- Monitor breeding, wintering, and migratory populations of shorebirds within the Region to determine short-term and long-term trends in distribution and abundance within the context of flyway and overall populations.

Habitat Status (Availability and Use)

- Monitor the condition, distribution, availability and use of shorebird habitat.
- Determine and evaluate habitat use by shorebirds in created and restored wetlands and in integrated wetland management areas. Integrated wetland management areas are here defined as those areas where water-level and vegetation management are designed to address the ecological needs of a variety of species associated with wetlands.
- Determine and assess potential threats/benefits to shorebirds and/or shorebird habitat, including, but not limited to: a) disturbance, b) development, c) wetland restoration, d) agricultural practices, e) general management activities, and f) exotic species.

Contaminants

- Identify and monitor specific sites or areas where contaminants have a reasonable likelihood of impacting shorebirds. Examples include sites near shipping lanes or oil refineries for concerns about oil spills, agricultural areas in the Willamette Valley and around larger estuaries for concerns about agricultural chemicals, industrial ports for concerns about introduction of plastic particles into the marine environment.
- Determine the potential impacts of environmental contaminants on the health of shorebird populations.

General Ecology

- Address ecological questions that identify or improve the spectrum of management practices beneficial to shorebirds.

Habitat Goal (see Section VII)

- Protect, restore, and enhance the amount and quality of shorebird nesting, roosting, and foraging habitats necessary to support Regional population goals.

Management Effectiveness and Coordination (see Section VIII)

Planning

- Develop comprehensive management plans that address shorebirds and other wetland species in the Region/Flyway.
- Develop and refine strategies to reduce threats to shorebirds from contaminants, disturbance, introduced species, hazardous structures, human and predator caused mortality, and habitat loss/degradation.
- Develop and implement integrated conservation strategies that involve multiple agencies and organizations at regional and Flyway scales.

Enhancement and Restoration

- Use a variety of existing or new management techniques and practices to restore and enhance shorebird habitat.

Protection

- Use a variety of strategies to identify and protect shorebird habitat and otherwise reduce the likelihood of impacts to shorebirds or their habitats.

Management Effectiveness

- Maintain continuity in conservation and management effort in the NPR.

Interagency Communication

- Improve communication among and within resource management agencies about shorebird needs and management techniques.

Outreach and Education (see Section IX)

- Develop strategies to provide information on shorebird conservation and management issues

to land managers and private landowners, the general public, and policy makers.

Funding (see Section X)

- Substantial levels of funding are required to support two management biologists, research and monitoring efforts, on-the-ground habitat management, and acquisition.

V. POPULATION GOALS

A number of shorebird species in North America have undergone population declines in eastern North America in the past two or more decades (e.g. Ruddy Turnstone, Red Knot, Short-billed Dowitcher; Howe et al. 1989, Morrison et al. 1994). Populations of some shorebird species appear to be declining in the Pacific Northwest as well (e.g., Snowy Plover, Killdeer, Black Turnstone; see Buchanan [in press] for summary). Additional species perhaps have yet to recover from population declines dating back to the era of unregulated market hunting (e.g., Marbled Godwit; Page and Gill 1994, Paulson 1993). Although reversing these declines (measurably increasing populations) is an important objective, scientifically-based population targets, based on reliable estimates of prior abundance, are lacking for most shorebird species.

Factors such as market hunting were responsible for some of the population declines noted above (Page and Gill 1994) and more recent influences (e.g., habitat loss or degradation), in many cases unrelated to the original declines, may now interfere with population recovery of some species (Paulson 1993). For these reasons, it will be important to first identify limiting factors and understand the current population status of shorebirds within the NPR. Only then will it be possible to establish realistic population targets and recovery periods for focal species in the region. Consequently, establishment of population goals, beyond the general goal of measurable improvement, will require careful monitoring and assessment as well as achievement of objectives outlined below that address monitoring and research, habitat, management, and outreach.

While waiting for development of this important information, however, it is possible to begin using the best available information to estimate population targets and make preliminary assessments of conservation priorities. Population targets have been developed at the National level (S. Brown, personal communication; modified from Haig et al. 1999). The targets are preliminary and will eventually be refined. Future refinement will be particularly important to improve flyway-level conservation and management efforts. Haig et al. (1999) also prioritized species recovery needs based on factors, evaluated by an expert panel, such as relative abundance, population status, the size and location of the breeding range, status of breeding habitat, and threats. After establishing eight criteria important to recovery, they prioritized species according to their recovery needs. Of the species considered to be of high concern in the region (a score of 4 or higher in Table 3), three had a high need for recovery: Snowy Plover, Black Oystercatcher, and Marbled Godwit; two were vulnerable species requiring recovery: Wandering Tattler and Whimbrel; eight were species of concern: Killdeer, Surfbird, Red Knot, Short-billed Dowitcher, Dunlin, Common Snipe, Red-necked Phalarope, and Red Phalarope; and three were species to watch: Black Turnstone, Western Sandpiper, and Rock Sandpiper. These scores will eventually require revision to more accurately reflect regionally-specific population status and recovery needs.

It is proposed that concerted attempts be made over the next ten years to measurably increase populations of species which have experienced population declines in this region. Again, this will require development of reliable baseline information and appropriate monitoring techniques. After the 10-year period, this goal should be re-evaluated on a species-by-species basis to determine its appropriateness and determine whether new approaches are needed to facilitate achievement of the desired population response.

VI. MONITORING AND RESEARCH GOALS

For the purposes of this document, monitoring and research were combined. Shorebird monitoring and research will often require cooperation and coordination among agencies, organizations, and individuals at regional, national, and international levels within and among flyways. Consequently, the recommended strategy is to develop and implement a coordinated monitoring and research program at these spatial scales. Partnerships should be developed and used to address issues of importance across the region or along the Pacific Flyway. The strategy should involve use of a stratified effort of five main species/habitat groups: pelagic, rocky shoreline, estuarine, beach, and freshwater. It may be possible to facilitate coordination through the working group, or perhaps through a monitoring research group within that or another organization. Adaptive management (Holling 1978, Walters 1986, Walters and Holling 1990) should be used where possible.

The working group established research goals for four general topics: 1) population status, 2) habitat status

(availability and use), 3) contaminants, and 4) general shorebird ecology. For each goal, objectives will be presented first followed by specific strategies recommended by the working group to meet the objectives. Specific research and monitoring activities important to achieve recovery of the Snowy Plover can be derived from other sources (e.g. Richardson 1995, USDI 2000) and are not repeated here.

Population Status

There will be two general approaches to population monitoring. The first is a population-level assessment that will require coordination of monitoring efforts both within and among flyways. As such, this effort will essentially be contained within the National monitoring strategy to facilitate development of national or global population estimates. Monitoring procedures are currently being developed for all species and subspecies covered by the National plan.

The second approach to population monitoring is more regional in scope. Site-specific and regional monitoring efforts will be required to evaluate shorebird responses to habitat changes and to further refine our understanding of the location of important sites for shorebirds in the region.

Habitat Use

A number of monitoring and research activities were identified that should be useful to future management by helping to determine and evaluate potential benefits and threats to habitat used by shorebirds. The proposed projects all involve investigating habitat use or habitat selection in both managed and non-managed systems. We anticipate that new project ideas will emerge in the coming decade as our knowledge increases and new threats to shorebirds and their habitats are identified. The list of projects will be evaluated and updated annually by the working group.

- In estuarine environments, evaluate the response of shorebirds to introduced species (both exotic vegetation and invertebrates), control programs for introduced species, and aquacultural practices that may influence habitat quality.
- In freshwater environments, evaluate the response of shorebirds to the spatial arrangement or quality of habitat in natural and managed wetlands.
- In freshwater environments, evaluate the response of shorebirds to grazing practices, farming practices, and crop changes in agricultural fields.
- Develop predictive models or other analytical tools that can be used to better understand shorebird use of freshwater habitats to facilitate wetland management, restoration, and creation efforts.
- Assemble available information on shorebird ecology and habitat use in the region. A comprehensive, species-specific assessment of habitat attributes and conditions important to shorebirds in various habitat associations throughout Oregon and Washington will soon be available (Johnson and O'Neil in press).

Contaminants

Determine the effects of contaminants on the health of shorebird populations (see Buchanan in press, Calambokidis et al. 1991).

- Evaluate impacts of contaminants on shorebirds including: lead, agricultural chemicals, industrial chemicals, oil, and plastic particle pollution in marine waters.

Shorebird Ecology

Address information gaps in knowledge of shorebird ecology to improve management practices that benefit shorebirds.

- Develop and implement studies on individual shorebird species of concern in the region (e.g., black oystercatcher and common snipe).
- Conduct research to examine shorebird response to integrated wetland management.
- Evaluate and develop methods to increase prey abundance and availability in created, restored, or managed habitats.
- Examine effects of human disturbance on shorebird behavior and physiology.
- Describe characteristics of roost sites.

This list of research and monitoring needs is not complete. An important task for the next year will be to develop a comprehensive document outlining data gaps and specific research projects needed in the region. The resulting document will be reviewed annually by the working group and revised as necessary.

VII. HABITAT OBJECTIVES AND MANAGEMENT NEEDS

Critical Habitats

We placed the critical habitats into four general categories that reflect the diversity of geophysical conditions present in the planning area. The habitats and representative species associated within each are listed in Table 4.

Conservation Status

The loss of habitat important to shorebirds has been particularly dramatic in the last 100 years (Page and Gill 1994, Dahl 1990). For example, over one-half of the intertidal wetlands in Washington and Oregon were destroyed by conversion and development (Boule and Bierly 1987, Boule et al. 1983). Similarly, prairie and wetland habitats in the Willamette Valley and Puget Trough have been converted to agricultural croplands, pastures, and general development; perhaps 90-99% of this habitat has been lost in Oregon (Altman and Janes, in press; see Gabriel 1993, Titus et al. 1996). Conversion of land for agricultural purposes, in some cases, may impact shorebirds less than other wildlife species, which depend on more pristine habitat conditions. In fact, it appears that shorebirds may benefit from certain agricultural management practices (Colwell and Dodd 1995, 1997). Other agricultural practices, however, such as tiling and chemical use, degrade or likely degrade habitats. Although other habitats, such as open water, sand beach, and rocky shoreline, have not been reduced in size, human activities (e.g. oil spills or other forms of pollution, exotic vegetation, disturbance from human recreation) have degraded conditions in many areas.

Although some of the most important sites or areas (e.g. Skagit Bay, portions of Grays Harbor, portions of Willapa Bay, Oregon Dunes National Recreation Area) in the planning region are on state or federal lands and are protected from industrial and urban development, many other sites are on unprotected lands or on lands not specifically managed to address shorebird habitat needs. Some of these sites have been identified as priorities for acquisition or other conservation measures (see below). A very high proportion of potentially important estuarine/beach and freshwater sites in Washington and Oregon are either wholly or partly owned by private entities (Table 2). As a group, these latter sites support large numbers of shorebirds and their acquisition and/or protection should be a high priority. Although work is in progress (Buchanan and Evenson, in preparation), we currently lack estimates of the actual geographic size of most of the important areas in the planning region.

Habitat Goals

The habitat goal for the planning region is to protect, restore, and enhance habitat conditions necessary to achieve population goals. Achieving this goal will likely provide important habitats for other wildlife species as well. Although it is impossible to manage for all species in all places, comprehensive planning at various spatial and temporal scales is important and should be used to ensure the presence of well-distributed habitats and associated populations of all species in the region. Shorebird conservation will be most effective when scale factors are considered in the planning process (Haig et al. 1998, Buchanan in press).

Four main objectives were identified to meet habitat goals: 1) identification of sites, 2) protection of important sites, 3) restoration and/or enhancement of sites, and 4) identification of current and potential threats to the quality of sites.

Identification of Important Sites

- Achieving the habitat goal will require, among other things, identification of important sites, in all basic habitat types, for protection, acquisition, restoration, or creation activities designed to improve habitats important to shorebirds. Important sites in the planning region have been identified and are presented in Table 2. It is anticipated that other sites may be added to the list as more surveys are conducted, or after shorebirds respond to restoration or creation activities.

Protection of Known Important Sites

- Important sites should be protected through various means including acquisition, conservation easement, and development of voluntary conservation plans.
- Important nesting, roosting and foraging sites should be protected from human disturbance.

Restoration and Enhancement Activities

- Specific desired or ongoing restoration and enhancement activities were identified. These came from members of the NPR working group and a questionnaire distributed to land managers throughout the Region. Questions were designed to elicit responses regarding on-going shorebird management activities in the Region. Results from the questionnaire will be presented

elsewhere, but restoration and enhancement projects are summarized below. For further discussion of restoration and enhancement activities, see Buchanan (in press).

Pelagic

- There were no priority restoration or enhancement activities identified for this general habitat type.

Rocky Shoreline

- Increase the number and quality of black oystercatcher nesting areas by reducing human disturbance.

Estuarine

- Remove and control *Spartina* (cordgrass) and other exotic vegetation in tidal areas (e.g., Willapa Bay, Padilla Bay).
- Remove dikes to restore natural tidal influence of estuarine marsh.
- Reduce potentially deleterious silt accumulation in marsh and mud flats (e.g., Bowerman Basin in Grays Harbor).
- Plant or otherwise encourage growth of native vegetation in restored marsh areas.
- Restore important roosting areas (e.g., Tillamook Bay).

Beach

- Remove and control European beach grass in dune areas (nearly all coastal beaches).

Freshwater

- Restore wetland habitat where it has been lost to agriculture and other development.
- Remove and/or control exotic vegetation such as reed canary grass, scotch broom (e.g., in southern Puget Trough), and purple loosestrife.
- Plant or manage for native vegetation, conducive to shorebird use, in restored freshwater habitats.
- Manage water levels and vegetation to create conditions suitable for use by wintering or migrating shorebirds.
- Mow and disc vegetation in areas to be flooded during fall migration and winter.
- In agricultural areas, use crop management practices that are compatible with shorebird use at a landscape scale and refrain from tiling and other practices that actually or potentially degrade habitats.

Acquisition, Conservation Easements, Development of Conservation Plans

- An effective protection program will require identification of important unprotected shorebird habitats and sites that can be restored to shorebird habitat. A strategy to achieve this objective will be to consult local experts and identify potentially important sites. Information generated from the shorebird management questionnaire and discussions with experts within the working group were used to identify the important sites presented below. Additional sites identified in Table 2 (and any other sites of importance) may prove to also be appropriate for protection.
- Through outreach and education programs, work with landowners and other groups to develop voluntary and/or incentive-based approaches, such as conservation easements, to protect or restore important habitats.

Pelagic

- There were no priority acquisitions identified for this general habitat type. It is anticipated that various marine protected areas (see Buchanan et al. in press) in the pelagic zone will be identified in the future.
- Conservation strategies should be developed within the shipping industry to reduce marine pollution (Buchanan in press).

Rocky Shoreline

- Acquisition or protection of Long Island (in the San Juan Islands).

Estuarine

- Acquire diked former tidal wetlands (vicinity of National Wildlife Refuges such as Bandon Marsh, Siletz Bay, Nestucca, and Nisqually).
- Acquire or develop conservation easements for various intertidal areas (Port Susan Bay in Puget Sound, Dungeness River estuary, unprotected areas in Grays Harbor and Willapa Bay, Tillamook Bay, Coos Bay, unprotected areas on Padilla Bay, Totten Inlet, Skokomish estuary, Salmon River estuary, Skokomish estuary).
- Any other areas listed in Table 1.

Beach

- Acquire or protect non-federal portions of the New River spit.

Freshwater

- Acquire or protect agricultural and pasture lands (areas adjacent to Ankeny, Baskett Slough, W.L. Finley, Wapato Lake, and Tualatin River National Wildlife Refuges and additional lands in the central and southern Willamette Valley; Sauvie Island; areas adjacent to Jackson Bottom Wetland Preserve; areas adjacent to Willapa Bay; vicinity of Puget Sound sites such as Port Susan and Drayton Harbor; Chehalis River floodplain in southwestern Washington; area adjacent to Ridgefield NWR; vicinity of Sand Lake Recreation Area; complex of sites near confluence of Columbia and Willamette Rivers [Bybee Lake, Smith Lake, Vancouver Lake]).

The Pacific Coast Joint Venture (PCJV), in a program established under the North American Waterfowl Management Plan, has identified many of these sites for potential acquisition. Coordination among the PCJV and the shorebird conservation initiatives is essential for meeting acquisition goals that will benefit multiple species (see Section VIII, Management Effectiveness and Coordination). Efforts should also be made to coordinate with other acquisition programs within the region (e.g., West Eugene Wetlands [BLM], The Nature Conservancy, The Wetland Conservancy).

Identification of Threats

Many of the actual or potential threats to shorebirds or their habitats have been identified here or in Buchanan (in press). The working group will seek to develop better information on new threats as they are identified.

Current Shorebird Management Activities

A wide range of management activities have recently been implemented in the NPR to protect shorebirds and their habitats. The activities include control and/or removal of exotic vegetation, active restoration and enhancement, water level management, and a variety of outreach strategies to limit human disturbance and increase public awareness. The primary means to address human disturbance have been a combination of area closures and dissemination of information to the public via outreach activities and the use of site-specific signs describing management and conservation issues. A detailed description of shorebird conservation and management activities will be presented elsewhere.

VIII. MANAGEMENT EFFECTIVENESS AND COORDINATION

The NPR working group recognized the need for better involvement and coordination among stakeholders with interests and/or responsibilities relating to shorebird conservation and management. These parties include government agencies (federal, state, and local), non-governmental organizations, private landowners, and the public. Involvement and coordination within resource management agencies is minimal or lacking in many instances and must be improved if shorebird management needs are to be adequately addressed. Consequently, the goal is to improve communication among agencies and organizations about shorebirds. Two main objectives were formulated to accomplish this goal:

1) Provide and share information about shorebird life history requirements, habitat needs, and population status among and within agencies, non-governmental organizations, landowners, and the public.

2) Increase awareness and knowledge of integrated management for waterbirds.

Recommended strategies to meet these objectives are as follows:

- Coordinate with the PCJV and other programs/organizations (e.g., U.S. Army Corps of Engineers-Flood Initiative, National Resource Conservation Service programs, Partners-in-Flight, The Nature Conservancy, Audubon Society, The Wetland Conservancy) concerned with habitat acquisition and habitat enhancement/restoration.
- Develop comprehensive regional management plans that address the needs of all species affected similarly by wetland loss, water level management, and other management practices. Develop site-specific plans within the context of these regional recommendations.
- Provide data and resource access to county and municipal planning agencies to enhance management efforts for shorebirds.
- Develop and share among agencies and organizations maps of known shorebird use sites and concentration areas. Such maps may be species- and/or season-specific.
- Establish a program to facilitate regular meetings for shorebird biologists, wildlife area managers,

refuge managers, and other managers to discuss shorebird issues. Ideally, members of the working group would participate in these meetings.

- Facilitate communication on the state, regional, and Flyway levels to address the tasks described in this document.
- To facilitate commitments of agencies and other organizations to participate in shorebird conservation and management activities, encourage stakeholders to sign a memorandum of understanding to formalize the stated commitment. This may result in greater recognition of the NPR working group.
- To ensure proper management and monitoring among states and regions within the Pacific Flyway, the two state wildlife agencies should develop and fill shorebird biologist positions.• Due to substantial information gaps, the conservation plan should be evaluated and revised, as needed, at five-year intervals.
- The NPR working group should evaluate specific tasks and priorities on an annual basis.

Although the actual functioning of the working group has yet to be determined, a number of meaningful activities can be surmised. The group will likely consist of biologists and managers representing a broad range of interest groups. The group will meet at least annually (and more frequently as the program develops) to discuss management issues and to seek opportunities to update and implement components of the conservation plan. The working group may elect to identify a representative to attend meetings of other organizations such as the PCJV. The group will also identify information needs and will attempt to secure funds to address these and other conservation issues in the region.

IX. OUTREACH AND EDUCATION

The NPR working group believes outreach should concentrate on three groups of people: 1) land managers and private landowners, 2) the general public, and 3) public policy makers.

Land Managers and Private Landowners

- Develop materials needed for programs, described below, that would meet with various interest groups to share information regarding shorebird conservation and management issues.
- Establish a program in the region that would meet with the agricultural community, the aquaculture community, hunting clubs, sewage treatment facilities, and Watershed Councils, to share information regarding shorebird needs and how management practices can be implemented to enhance conditions for shorebirds. Efforts should focus on maintenance and/or enhancement of shorebird habitat and responsible use of chemical fertilizers, pesticides, and herbicides.
- Improve hunter education information (enhanced illustrations and text regarding shorebirds) to reduce incidental take of shorebirds during waterfowl and other gamebird hunting seasons.

General Public

- Incorporate the NPR into the Shorebird Sister School Program. This international program is designed to allow students to track shorebird migration by communicating, via an e-mail list server and a World Wide Web site, with other students and scientists during shorebird migration periods.
- Establish a program that would access existing materials/programs and develop new brochures, websites, and other educational materials about shorebirds. The focus of this program would be on Grades K-12.
- Build observation platforms to facilitate public viewing of shorebirds at areas such as high tide roosts near estuaries and inland wetlands. Use signs at these areas to inform the public about shorebird needs. An emphasis of the public signs should be on reduction of disturbance by humans and pets.
- Develop a program to work with various information media to increase dissemination about shorebird issues and activities.
- Develop and foster shorebird festivals during migration to promote awareness and appreciation.
- Support and contribute to efforts like "All Bird TV" that can promote, via television, avian conservation issues at a regional/national scale.
- Involve the public (i.e., as volunteers), to the extent possible, in organized efforts to collect information about the distribution and abundance of shorebirds.
- Involve the public (i.e., as volunteers), to the extent possible, in efforts to enhance shorebird habitat in areas with good viewing opportunities.

Policy Makers

- Meet with legislators and other public policy makers to inform them about shorebird issues. The focus would be on habitat protection, habitat restoration, and control of introduced species such as *Spartina* and European beachgrass.
- Develop and promote funding packages at agency and legislative levels for shorebird monitoring, research, and management activities.
- Continue to demonstrate the economic value of shorebird viewing to the tourism industry. Develop partnerships with tourism agencies and organizations and local community organizations.

X. FUNDING

Four general areas of funding needs were identified by the working group: 1) management biologists, 2) monitoring and research activities, 3) habitat management, and 4) protection and acquisition. It is recommended that two biologist positions be filled, one for each state. The annual cost to support these positions would be approximately $200,000 to $250,000. Monitoring and research needs identified by the working group would be about $320,000 per year for projects (e.g., monitor shorebird populations, evaluate responses to habitat restoration efforts, evaluate responses to human disturbance). Habitat management activities (e.g., active management of shorebird habitat) would require approximately $1,400,000 per year. Finally, acquisition costs would be substantial, running to about $8,000,000 per year. An important point should be made regarding these figures. The costs reflect only those issues identified in the questionnaire or raised by members of the working group. A more exhaustive assessment of needs would have resulted in higher estimates for acquisitions, habitat management activities, and monitoring and research.

XI. NOMINATION OF SITES FOR INCLUSION IN THE WESTERN HEMISPHERE SHOREBIRD RESERVE NETWORK

It is recommended that seven sites be added to the Western Hemisphere Shorebird Reserve Network (WHSRN) at the International Level (>100,000 birds or 15% of the Flyway total) or the Regional Level (>20,000 birds or 5% of the Flyway total). Grays Harbor and Coos Bay have been identified as WHSRN sites (Harrington and Perry 1995) and are not discussed below. A seventh site, Tillamook Bay, supported approximately 100,000 birds in August 1979 (Nehls 1994). This site, however, no longer supports such numbers of birds, possibly due to destruction of roost sites (Jeff Gilligan, personal communication). For this reason, we believe the site has the potential to be very important and that the site's status should be reevaluated after attempts are made to restore roosting and other habitats that were destroyed in the past two decades.

The Puget Sound is a large complex of estuaries which collectively support large numbers of shorebirds during most seasons. Puget Sound contains at least three sites of regional importance (Port Susan Bay, Skagit Bay, Padilla Bay) and a multitude of other sites that collectively support >25,000 shorebirds in some winters (Evenson and Buchanan 1997). Shorebirds appear to make regular movements among some of the larger sites within Puget Sound and the nearby Fraser River delta, a site of international significance just across the border in British Columbia, Canada (Butler 1994). Although our recommendation follows the traditional WHSRN guidelines, it appears appropriate that Puget Sound sites and the Fraser River delta be recognized as a complex of sites that collectively are of international significance.

Similarly, large flocks of shorebirds from Grays Harbor and Willapa Bay make daily flights of about three km to roosting areas along the outer beaches (Copalis/Ocean Shores, Grayland, and North [Longbeach] beaches) adjacent to these large estuaries. This suggests that the beaches, two of which qualify individually as Regionally important sites (see below), could appropriately be associated with Grays Harbor and Willapa Bay as Internationally important sites.

The Willamette Valley in Oregon (portions of Polk, Marion, Benton, Linn, and Lane counties) is an important area for at least three species including Common Snipe, which may be declining, Killdeer, which may number 10,000 or more in some winters (Paulson 1993, Oregon Department of Fish and Wildlife 1997), and Dunlin (over 15,000 have been documented in winter and migration; see Johnson 1994). Due to the rather ephemeral nature of shorebird habitat over much of this largely agricultural area, shorebirds are forced to move around in search of habitat. Consequently, the Willamette Valley is best recognized as a complex of related sites including National Wildlife Refuges, State Wildlife Areas, private conservation lands, and private agricultural and pasture lands. Although none of the individual sites have yet supported enough birds to meet regional significance criteria, the central and southern valley areas, taken as a whole, are clearly important for Common Snipe, Killdeer, and Dunlin. It is therefore recommended that the central and southern portions of the Willamette Valley be recognized as a regionally important site (using anticipated future criteria that evaluate groups of sites).

Sites of International Significance

Willapa Bay, Washington. This large embayment on the southern Washington coast contains numerous river deltas, two of which are individually of regional significance (Buchanan and Evenson 1997). Counts over the entire bay have exceeded 100,000 birds during spring migration (Buchanan and Evenson 1997).

Columbia River Estuary (Oregon and Washington). The intertidal areas of the Columbia River estuary, two of which qualify individually as regionally significant sites (Long Island, Quinn Island; see Table 2), collectively qualify as a site of international significance (Oregon Department of Fish and Wildlife 1992, 1993, 1994a, 1994b,). This site was recognized as Regionally important by Harrington and Perry (1995), but should be upgraded to International status.

Sites of Regional Significance

Port Susan, Washington. High counts of shorebirds at this site have exceeded 30,000 in winter and 50,000 in both spring and autumn (Evenson and Buchanan 1997).

Skagit Bay, Washington. High counts of shorebirds at this site have exceeded 29,000 in winter and 20,000 in spring (Evenson and Buchanan 1997). .

Padilla Bay, Washington. High counts of shorebirds at this site have exceeded 30,000 during spring migration (Evenson and Buchanan 1997).

Copalis/Ocean Shores Beach, Washington. This beach has supported over 20,000 shorebirds, primarily Sanderlings and roosting Dunlins, during winter (Buchanan 1992). The beach also supports large numbers of migrating Sanderlings (Myers et al. 1984).

North Beach, Washington. High counts at this beach include over 30,000 Dunlins (Buchanan 1992), regular counts exceeding 2,000 Sanderlings (Myers et al. 1984, Buchanan 1992), and a high of over 3,800 Black-bellied Plovers (Buchanan and Evenson 1997).

Clatsop/Sunset Beach, Oregon. This beach supports large numbers of Sanderlings, particularly during migration (Myers et al. 1984).

Oregon Dunes National Recreation Area, Oregon. Efforts are also underway to nominate the Oregon Dunes National Recreation Area as a WHSRN site (Jim Heaney, personal communication; Carrie Phillips, personal communication). The limited information available indicated the presence of over 18,000 Sanderlings in the area during autumn migration in 1993 (Platt and Goggans 1993).

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Table 1. Issues of management concern for shorebirds in western Washington and western Oregon, according to major habitat type. See Buchanan (in press) for a review of these management issues.

	Major Habitat Types				
Issue	**Pelagic**	**Estuarine**	**Beach**	**Rocky Shoreline**	**Fresh-water**
Habitat Loss:					
Habitat loss		•			•
Habitat Degradation:					
Draining of wetlands		•			•
Dike creation		•			•
Water level manipulation					•
Utility lines		•			•
Climate change (including oceanic warming)	•	•	•	•	•
Introduction of exotic vegetation and invertebrates	?	•	•	?	•
Pollution:					
Agricultural		•			•
Industrial		•			•
Oil	•	•	•	•	•
Heavy metal		•			•
Plastic particle	•				
Human Disturbance:					
Pedestrian		•	•	•	•
Motorized vehicles		•	•		•
Water craft		•			•
Pets		•	•	•	•
Hunting		•			•

Table 2. Ownership and protection status of important shorebird sites in western Washington and western Oregon. The list includes ownership information for estuarine and freshwater sites that support at least 1000 shorebirds during winter, spring, or autumn; critical habitat areas of the Snowy Plover (indicated in columns by 'SP'), and potentially important rocky beach areas (numerical data were lacking and therefore were not used for the latter). Ownerships at estuaries, sand beaches, and freshwater sites that support at least 1000 foraging or roosting shorebirds are indicated with a solid symbol (•) and sites with ownerships used by fewer birds are indicated with a hollow symbol (❍). Important rocky shoreline sites are indicated with solid symbols; sites that likely support few birds are indicated with a hollow symbol. Sites which supported at least 4000 birds are indicated with an asterisk (*) in the left column and sites which qualify for WHSRN regional or international status are identified in *italics*. Pelagic sites were not included although large numbers of the pelagic Red Phalarope have been recorded at sea off Boiler Bay, Cape Arago, the south jetty of the Columbia River, Neah Bay, Newport, Westport, and Yaquina (Paulson 1993, Nehls 1994, Wahl pers. comm.).

Region and Site[a]	Ownership or Protection Status[b]						
	Refuge	Park	State[c]	Military	Environ-mental	Private	Tribal
Estuarine - Washington							
Ala Spit	-	-	•	-	-	•	-
Annas Bay	❍	-	-	-	-	-	•
Baker Bay	-	-	-	-	-	•	-
Bellingham Bay *	-	-	❍	-	-	❍	•
Birch Bay	-	❍	•	-	-	•	-
Boz Lake	-	-	-	-	-	•	-
Chuckanut Bay *	-	-	❍	-	-	•	-
Crockett Lake	-	•	-	-	-	•	-
Cultus Bay	-	-	•	-	-	•	-
Deer Lagoon	-	-	•	-	-	•	-
Drayton Harbor *	-	-	•	-	-	•	-
Dungeness Bay *	•	❍	•	-	-	•	•
Eld Inlet	-	-	•	-	-	•	-
Fidalgo Bay *	-	-	-	-	-	•	-
Grays Harbor[d]	•	•	•	-	•	•	-
Kilisut Harbor	-	❍	❍	❍	-	❍	-
Lummi Bay *	-	-	-	-	-	-	•
Nisqually R. delta	•	•	❍	-	❍	•	❍
Oak Bay	-	-	❍	❍	-	❍	-
Padilla Bay[e]	•	❍	-	-	-	•	-
Port Angeles Harbor	-	❍	•	❍	-	❍	-
Port Susan	-	❍	-	-	-	•	-
Samish Bay	-	-	•	-	-	•	-

Region and Site[a]	Ownership or Protection Status[b]						
	Refuge	Park	State[c]	Military	Environ-mental	Private	Tribal
Sequim Bay *	-	-	•	-	-	•	-
Sinclair Inlet	-	-	❍	-	-	•	-
Skagit Bay	•	-	•	-	-	•	-
Snohomish Bay *	-	-	-	-	-	•	❍
Totten Inlet *	-	-	•	-	-	•	-
Willapa Bay[d]	•	•	•	-	-	•	•
Estuarine - Oregon							
Alsea Bay	-	-	•?	-	-	•	-
Bandon Marsh/Coquille River Estuary	•	❍?	•?	-	-	❍?	-
Coos Bay *	•	•	•?	-	-	•	-
Green Island (CRE)[f]	•	-	-	-	-	-	-
Lois Island (CRE)*	•	-	-	-	-	-	-
Long Island (CRE)	-	-	•?	-	-	•?	-
Miller Island Spit (CRE)*	•	-	-	-	-	-	-
Nehalem Bay	-	•	•?	-	-	•	-
New River Estuary	-	•	•?	-	-	•	-
Netarts Bay *	-	•	-	-	-	•	-
Piller Rock (CRE)*	•	-	-	-	-	-	-
Quinn Island (CRE)	•	-	-	-	-	-	-
Russian Island (CRE)*	•	-	-	-	-	-	-
Siletz Bay	•?	-	❍?	-	-	•	-
Siuslaw River Estuary	-	-	•?	-	-	•	-
Snag Island (CRE)	•	-	-	-	-	-	-
Tillamook Bay *	-	•	•	•	-	•	-
Trestle Bay - Clatsop Spit (CRE)	-	•	?	-	-	-	-
Yaquina Bay	-	•	•?	-	-	•	-
Sand Beaches - Washington							
Damon Point	-	❍ SP	❍ SP	-	-	-	-
Grayland Beach *	-	•	•	-	-	-	-
North Beach [Longbeach]	• SP	•	•	-	-	-	-

Region and Site[a]	Ownership or Protection Status[b]						
	Refuge	Park	State[c]	Military	Environ-mental	Private	Tribal
OceanShores/ Copalis Beach *	-	•	•	-	-	-	-
Sand Beaches - Oregon							
Bayocean Spit	-	❍ SP	-	-	-	❍	-
Clatsop Beach *	-	•	•	-	-	-	-
Coquille R. to Cape Blanco	-	• SP	• SP	-	-	❍ SP	-
Haceta Head to Siuslaw R.	-	•	•	-	-	?	-
Horsfall Beach to Coos Bay	-	? SP	? SP	-	-	-	-
Oregon Dunes NRA*	-	• SP	•	-	-	-	-
Sunset Beach *	-	•	•	•	-	•	-
Yachats to Seal Rock	-	❍	❍	-	-	?	-
Rocky Shorelines - Washington[c]							
San Juan Islands NWR	•	•	•	-	-	•	-
Strait of Juan de Fuca	•	❍	•	-	-	❍	•
Washington Maritime NWR	•	-	-	-	-	-	•
Rocky Shorelines - Oregon[c]							
Columbia R. to Siletz Bay	•	•	•	-	-	•	-
Coos Bay to California border	•	•	•	-	-	•	-
Siletz Bay to Coos Bay	•	•	•	-	-	❍	-
Freshwater Sites - Washington							
Chehalis River Valley	-	-	❍?	-	-	•	❍
Near Drayton Harbor	-	-	-	-	-	•	-
Near Grays Harbor	-	-	-	-	-	•	-
Near Nisqually R. Delta	-	-	-	-	-	•	-
Near Padilla Bay	-	-	-	-	-	•	-
Near Port Susan	-	-	-	-	-	•	-
Near Samish Bay	-	-	❍	-	-	•	-
Near Skagit Bay	•	-	-	-	-	•	-
Near Snohomish R. Delta	-	-	-	-	-	•	-
Vancouver Lake	-	-	-	-	-	❍	-

Region and Site[a]	Ownership or Protection Status[b]						
	Refuge	Park	State[c]	Military	Environ-mental	Private	Tribal
Near Willapa Bay	-	•	-	-	-	•	❍
Wynoochee River Valley	-	-	-	-	-	❍	-
Freshwater Sites - Oregon							
Ankeney NWR (CSWV)[h]	•	-	-	-	-	-	-
Baskett Slough NWR (CSWV)	•	-	-	-	-	-	-
Brownsville ricefields (CSWV)	-	-	-	-	-	•	-
Bybee Lake	-	-	?	-	-	?	-
Cape Blanco	-	-	-	-	-	•	-
Fern Ridge Reservoir (CSWV)	-	•?	-	•	-	-	-
William L. Finley NWR (CSWV)	❍	-	-	-	-	-	-
Lake Labish (CSWV)	-	-	-	-	-	•	-
Medford	-	-	-	-	-	•	-
Roseburg-Sutherlin	-	❍	-	-	-	•	-
Sauvie Island	•	-	•	-	-	•	-
Smith Lake	-	-	?	-	-	?	-
unnamed ephemeral agri-cultural areas (CSWV)[e]	-	-	-	-	-	•	-
West Eugene wetlands (CSWV)	-	•?	-	-	-	-	-
E.E. Wilson WMA (CSWV)	❍	-	-	-	-	-	-
Number and Proportion of (•) Sites According to Ownership Category							
Total Estuaries - Washing-ton	6 (21%)	4 (14%)	14 (48%)	0 (0%)	1 (3%)	23 (79%)	5 (17%)
Total Estuaries - Oregon	11 (58%)	7 (37%)	9 (47%)	1 (5%)	0 (0%)	10 (52%)	0 (0%)
Total Estuaries - both states	17 (35%)	11 (23%)	23 (48%)	1 (2%)	1 (2%)	33 (69%)	5 (10%)
Total Beaches - Washington	1 (33%)	3 (100%)	3 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total Beaches - Oregon	0 (0%)	5 (83%)	5 (83%)	1 (17%)	0 (0%)	1 (17%)	0 (0%)
Total Beaches - both states	1 (11%)	8 (89%)	8 (89%)	1 (11%)	0 (0%)	1 (11%)	0 (0%)
Total Rocky Shoreline - both states	6 (100%)	4 (66%)	5 (83%)	0 (0%)	0 (0%)	3 (50%)	2 (33%)

Region and Site[a]	Ownership or Protection Status[b]						
	Refuge	Park	State[c]	Military	Environ-mental	Private	Tribal
Total Freshwater - Wash-ington	1 (8%)	1 (8%)	0 (0%)	0 (0%)	0 (0%)	10 (83%)	0 (0%)
Total Freshwater - Oregon	3 (20%)	2 (13%)	1 (7%)	1 (7%)	0 (0%)	7 (47%)	0 (0%)
Total Freshwater - both states	4 (15%)	3 (11%)	1 (4%)	1 (4%)	0 (0%)	17 (63%)	0 (0%)
Total of all sites - both states	27 (29%)	26 (28%)	37 (41%)	3 (3%)	1 (1%)	54 (58%)	7 (8%)

[a] Sources used to categorize sites for **Washington beaches and estuaries:** Herman and Bulger (1981), Brennan et al. (1985), Buchanan (1988), Buchanan (1992), Paulson (1993), Oregon Department of Fish and Wildlife (1992, 1993, 1994a, 1994b), Buchanan and Evenson (1997), Evenson and Buchanan (1997), Wahl (1995); **Oregon beaches and estuaries:** Nehls (1994), Paulson (1993), Platt and Goggans (1993), Oregon Department of Fish and Wildlife (1994c, 1994d), Page et al. (1999), USDI (1999); **Washington rocky shorelines:** Paulson (1993), Wahl (1996); **Oregon rocky shorelines:** Nehls (1994); **Washington freshwater sites:** Paulson (1993); and **Oregon freshwater sites:** Nehls (1994), Paulson (1993), Oregon Department of Fish and Wildlife (1997).

[b] Categories of ownership are defined as **Refuge** (federal, state, county, or other government-owned refuge or park with emphasis on protection of wildlife [with the exception of hunting]), **Park** (federal, state, county, or other government-owned park with emphasis on recreation or multiple-use [with the exception of hunting]), **State** (any other state-owned areas not included above, including public-use beaches and beaches which are leased to private parties), **Military** (any lands owned and managed by the military), **Environmental** (any lands owned and managed as reserves by environmental groups or other private entities), **Private** (any unprotected lands owned by private entities), **Tribal** (any lands owned by Native American Tribes). Abbreviations used include NRA (National Recreation Area), NWR (National Wildlife Refuge), and WMA (Wildlife Management Area).

[c] State-owned tidelands in Washington, where present, are variable in width and may encompass as much as the area between mean high tide and extreme low tide. The state of Washington also owns much of the sub-tidal zone.

[d] Most state-owned tidelands in Grays Harbor and Willapa Bay are bounded on the waterward side by private oyster beds.

[e] As a National Estuarine Research Reserve, most of Padilla Bay is reserved for research and education about estuaries. Some areas of Padilla Bay are designated as wildlife refuge by Washington Department of Fish and Wildlife.

[f] CRE = Columbia River Estuary. Most of the listed CRE sites are within the Lewis and Clark National Wildlife Refuge.

[g] Large jetties associated with major river estuaries and embayments are important shorebird sites in both states.

[h] CSWV = Central and southern portions of the Willamette Valley.

Table 3. Conservation priority of regularly-occurring shorebird species[a] in the Northern Pacific Region (western Washington and western Oregon). Regional priority scores reflect several factors, including population status, population trend, and comparative importance of the region. Specific factors and rationale related to the Regional priority scores, particularly when they differ from the National scores, are explained in the comments column. Species are sorted by Regional priority, followed by National priority, and then arranged alphabetically.

Species	Species Occurrence[b]	Regional Score[c]	National Score[c]	Comments
Snowy Plover	M, ***W, B***	5	5	Management critical; federally listed threatened species (considered endangered by Washington Wildlife Commission; see Richardson 1995)
Black Oystercatcher	M, ***W, B***	4	4	Area of high importance; large numbers of migrants and winter residents.
Black Turnstone	M, ***W***	4	4	Area of high importance.
Marbled Godwit	M, w	4	4	Alaskan breeding population may migrate exclusively through region.
Red Knot	***M***	4	4	Area of high importance to western (?) subspecies.
Ruddy Turnstone	M, w	4	4	Area of high importance.
Sanderling	***M, W***	4	4	Large concentrations in winter and migration; major flyway for species.
Surfbird	M, ***W***	4	4	Area of high importance
Whimbrel	***M***, w	4	4	
Black-bellied Plover	***M,*** W	4	3	Area of high importance; large numbers of migrants and winter residents.
Common Snipe	m, ***W***, b	4	3	Large wintering concentrations; population may be declining in the Willamette Valley, Oregon.
Dunlin	***M, W***	4	3	Large concentrations in winter and migration; major flyway for species.
Greater Yellowlegs	***M***, W	4	3	Area of high importance; large numbers of migrants and winter residents.
Killdeer	***M, W***	4	3	Breeding Bird Survey data indicate regional population declines; important wintering concentrations in Willamette Valley.
Red Phalarope	***M***, w	4	3	Offshore portion of region supports large numbers of birds and is important part of migratory route.
Red-necked Phalarope	***M***	4	3	Offshore portion of region supports large numbers of birds and is important part of migratory route.

Species	Species Occurrence[b]	Regional Score[c]	National Score[c]	Comments
Rock Sandpiper	m, w	4	3	Large-scale range contraction from coastal Washington and Oregon portions of wintering range.
Short-billed Dowitcher	***M***	4	3	Large concentrations in migration.
Wandering Tattler	M	4	3	Entire population appears to migrate along/off Washington and Oregon coasts.
Western Sandpiper	***M***, w	4	3	Large concentrations in migration; major flyway for species.
Least Sandpiper	M, w	3	3	
Spotted Sandpiper	m, w, b	3	3	
Long-billed Dowitcher	***M***, w	3	2	
Semipalmated Plover	***M***, w	3	2	Fairly high concentrations.
Long-billed Curlew	m, w	2	5	Small number of local wintering and migratory birds in region.
American Golden-Plover	m	2	4	Small numbers present; not a primary flyway for species.
Solitary Sandpiper	m	2	4	Little apparent risk to habitat; no areas of concentrated use.
Wilson's Phalarope	m, b	2	4	Small numbers present; not a primary flyway for species.
Pacific Golden-Plover	m	2	3	Small numbers present; not a primary flyway for species.
Willet	m, w	2	3	Small local wintering populations.
Lesser Yellowlegs	M	2	2	
Pectoral Sandpiper	m	2	2	
Buff-breasted Sandpiper	m	1	4	Small numbers present; not a primary flyway for species.
American Avocet	m	1	3	Rare in North Pacific Region.
Semipalmated Sandpiper	m	1	3	Small numbers present; not a primary flyway for species.
Stilt Sandpiper	m	1	3	Small numbers present; not a primary flyway for species.
Baird's Sandpiper	m	1	2	Small numbers present; not a primary flyway for species.

Species	Species Occurrence[b]	Regional Score[c]	National Score[c]	Comments
Black-necked Stilt	m	1	2	Rare in North Pacific Region.
Ruff	m	1	-	Small numbers present; not a primary flyway for species.
Sharp-tailed Sandpiper	m	1	-	Small numbers present; not a primary flyway for species.

[a] Species not occurring regularly in the Northern Pacific Region: Mountain Plover (*Charadrius montanus*), Eskimo Curlew (*Numenius borealis*), Bristle-thighed Curlew (*Numenius tahitiensis*), Hudsonian Godwit (*Limosa haemastica*), Bar-tailed Godwit (*Limosa lapponica*), Upland Sandpiper (*Bartramia longicauda*), White-rumped Sandpiper (*Calidris fuscicollis*), Grey-tailed Tattler (*Heteroscelus brevipes*), Rufous-necked Stint (*Calidris ruficollis*), and Curlew Sandpiper (*Calidris ferruginea*).

[b] Species use codes: M = migration, W = wintering, B = breeding; Capitalized, Bold, Italics - species occurs regularly in the region, and management in region is relatively more important than other regions where it occurs; Capitalized - species occurs regularly, and in large enough numbers to warrant management; Lower Case - species occurs rarely to regularly, but not in large enough numbers to warrant management (exclusive of Threatened & Endangered Species).

[c] Category codes: 5 = Highly imperiled, including species listed as threatened or endangered; 4 = High concern; 3 = Moderate concern; 2 = Low concern; 1 = No risk.

Table 4. Summary of "natural" and human-created habitat types in the North Pacific Coast region, and some of the shorebird species known to use them.

Habitat Types	Representative Species
I. Pelagic:	
Open ocean (shelf and offshore waters)	Red-necked Phalarope, Red Phalarope
Nearshore and inland marine waters	Red-necked Phalarope, Red Phalarope
II. Rocky Shoreline:	
Rocky islands, reefs, rocky shores, and headlands	Black Oystercatcher, Surfbird, Black Turnstone
Jetties and bulkheads (coastal and estuarine)	Black Oystercatcher, Surfbird, Black Turnstone
III. Beach and Estuarine:	
Sand beach	Sanderling, Snowy Plover, roosting sandpipers, Whimbrel, Black-bellied Plover
Unstable foredunes	Snowy Plover
Estuarine sandflats	Sanderling, sandpipers
Estuarine silt/sand flats	Black-bellied Plover, Semipalmated Plover, Red Knot
Estuarine silt (mud) flats	Dunlin, Western Sandpiper
Estuarine pebble/cobble shoreline	Spotted Sandpiper, turnstones
Oyster beds	turnstones, Greater Yellowlegs
Tidally-influenced ponds	sandpipers, dowitchers
Salt marsh	Pectoral Sandpiper; roosting habitat for many other species
IV. Freshwater:	
Shallow-water wetlands	sandpipers, dowitchers, yellowlegs, Common Snipe, Dunlin, Spotted Sandpiper
Deep-water wetlands	Red-necked Phalarope
Agricultural lands	Killdeer, Common Snipe, Dunlin
Short pasture	Black-bellied Plover; roosting habitat for many species
Grasslands	Whimbrel
River and stream shorelines	Spotted Sandpiper
Lake and pond shorelines	Killdeer, Solitary Sandpiper
Gravel/pebble	Killdeer
Sewage treatment ponds	many species
Dredge-spoil islands	many species

Appendix 1. Common and standard names of species mentioned in the document. Information on subspecies is from Paulson (1993) and AOU (1998).

Common Name	Standard Name
Black-bellied Plover	Pluvialis squatarola
American Golden-Plover	Pluvialis dominica
Pacific Golden-Plover	Pluvialis fulva
Snowy Plover	Charadrius alexandrinus nivosus
Semipalmated Plover	Charadrius semipalmatus
Killdeer	Charadrius vociferus
Black Oystercatcher	Haematopus bachmani
Black-necked Stilt	Himantopus mexicanus mexicanus
American Avocet	Recurvirostra americana
Greater Yellowlegs	Tringa melanoleuca
Lesser Yellowlegs	Tringa flavipes
Solitary Sandpiper	Tringa solitaria solitaria and cinnamonomea
Willet	Catoptrophorus semipalmatus inornatus
Wandering Tattler	Heteroscelus incanus
Spotted Sandpiper	Actitis macularia
Whimbrel	Numenius phaeopus
Long-billed Curlew	Numenius americanus parvus
Marbled Godwit	Limosa fedoa beringiae (and perhaps L. f. fedoa)
Ruddy Turnstone	Arenaria interpres interpres
Black Turnstone	Arenaria melanocephala
Surfbird	Aphriza virgata
Red Knot	Calidris canutus (subspecies not determined)
Sanderling	Calidris alba
Semipalmated Sandpiper	Calidris pusilla
Western Sandpiper	Calidris mauri
Least Sandpiper	Calidris minutilla
Baird's Sandpiper	Calidris bairdii
Pectoral Sandpiper	Calidris melanotos
Sharp-tailed Sandpiper	Calidris acuminata
Rock Sandpiper	Calidris ptilocnemis (possibly both tschuktschorum and couesi)
Dunlin	Calidris alpina pacifica
Stilt Sandpiper	Calidris himantopus
Buff-breasted Sandpiper	Tryngites subruficollis
Ruff	Philomachus pugnax
Short-billed Dowitcher	Limnodromus griseus caurinus
Long-billed Dowitcher	Limnodromus scolopaceus
Common Snipe	Gallinago gallinago
Wilson's Phalarope	Phalaropus tricolor
Red-necked Phalarope	Phalaropus lobatus
Red Phalarope	Phalaropus fulicaria