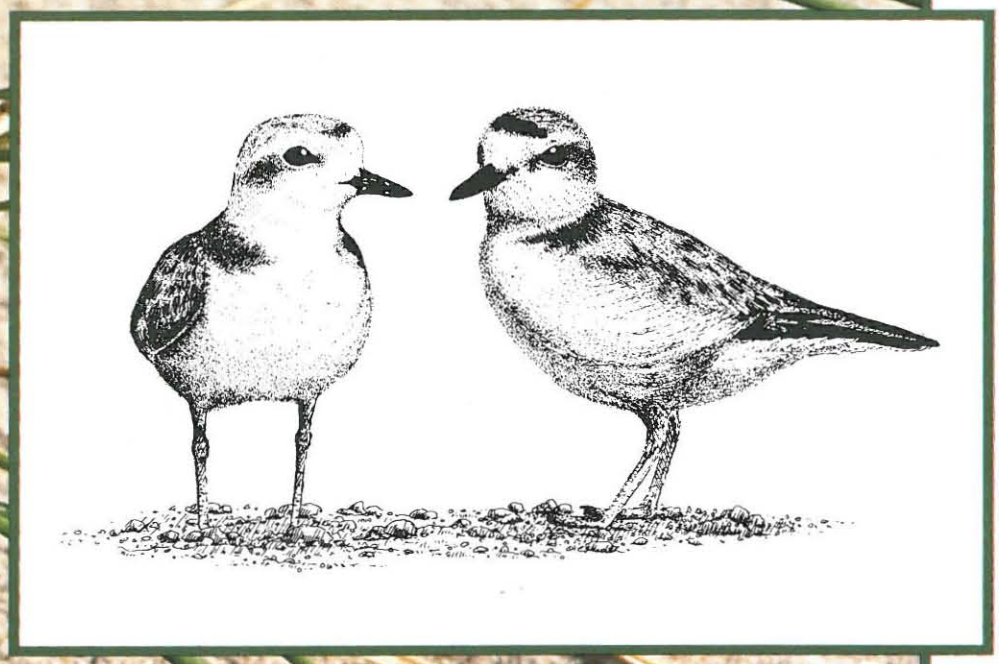
WASHINGTON STATE RECOVERY PLAN FOR THE

February 1995

Snowy Plover



Washington Department of
FISH AND WILDLIFE
Wildlife Management Program

The snowy plover was classified by the Washington Wildlife Commission as an endangered species in 1981 (Washington Administrative Code 232-12-014). In 1990, the Commission adopted procedures for listing and delisting species as endangered, threatened, or sensitive and for writing recovery and management plans for listed species (WAC 232-12-297, Appendix D). The procedures, developed by a group of citizens, interest groups, and state and federal agencies, require preparation of recovery plans for species listed as threatened or endangered.

Recovery, as defined by the U.S. Fish and Wildlife Service, is "the process by which the decline of an endangered or threatened species is arrested or reversed, and threats to its survival are neutralized, so that its long-term survival in nature can be ensured."

This document summarizes the historic and current distribution and abundance of the snowy plover in Washington and describes factors affecting the population and its habitat. It prescribes strategies to recover the species, such as protecting the population, evaluating and managing habitat, and initiating research and education programs. Target population objectives and other criteria for reclassification are identified and an implementation schedule is presented.

The draft state recovery plan was reviewed by snowy plover researchers and State and Federal agencies prior to being made available for a 90-day public review. All comments received were considered in preparation of this final recovery plan. Additional information on the snowy plover is available from:

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Washington State Recovery Plan

for the

Snowy Plover

Washington Department of Fish and Wildlife
Wildlife Management Program
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Date

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ACKNOWLEDGMENTS

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Dozens of observers have contributed to our understanding of snowy plover distribution and abundance in Washington. Reports of individual sightings help our knowledge, but those workers who have expended time and effort throughout a field season in order to quantify breeding activity are especially commended for having contributed a touchstone by which to measure the success of recovery efforts.

Workers in the reference section of the Washington State Library tirelessly copied articles and searched for obscure references. Special thanks are due Shaun Fuller for access to periodical stacks and Kathryn Hamilton Wang for database searches.

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Darrell Pruett helped to draft the Washington location maps.

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EXECUTIVE SUMMARY

Washington harbors a small population of the snowy plover (*Charadrius alexandrinus*), an inhabitant of sandy shores and barren flats. Since at least 1899, small numbers of this cryptic shorebird have nested on the shifting sand spits and peninsulas of the Washington coast, which constitutes the northern limit of the species' range. Historically, at least five areas in the state supported nesting snowy plovers, but the species now is restricted to two sites: Damon Point and Oyhut Wildlife Area at Ocean Shores, Grays Harbor County; and Leadbetter Point in Willapa National Wildlife Refuge, Pacific County. Monitoring by the U.S. Fish and Wildlife Service and the Washington Department of Fish and Wildlife indicates the state population has declined within the past decade, with a current population of about seven breeding pairs.

The snowy plover was listed by the Washington Wildlife Commission as a State Endangered species in 1981. The Pacific coast population of the western snowy plover was listed as Threatened under the federal Endangered Species Act in April 1993.

Snowy plovers lay their three eggs in depressions scraped in the sand of beaches, dunes, or salt flats. Parents share the incubation duties until hatching, which occurs after four weeks. The young birds are precocial and walk within a few hours. They fend for themselves to eat, but are brooded for a few weeks, usually by the male parent. Females often move within a week to a new territory to mate with another male. Juveniles are able to fly a month after hatching.

Factors such as predation and adverse weather are natural pressures on the plover population, but during the past several decades coastal development has posed additional threats to the species' ability to raise young. Shoreline modification and dune stabilization programs for recreational, urban, and industrial development have created deleterious conditions for snowy plovers. Recreational activities ranging from beachcombing to off-road vehicle traffic have elevated the number of human intrusions into plover nesting habitat, which reduces nesting success.

For recovery of the snowy plover population to a level where it may be delisted, pedestrian and vehicular incursions into snowy plover habitat should be eliminated and development in the vicinity of current or potential plover habitat should be discouraged. An aggressive vegetation control program should be initiated to improve current nesting areas and to provide for expansion of the population into historic breeding sites.

The snowy plover will be considered for downlisting to threatened when the state supports a 4-year average of at least 25 breeding pairs, fledging at least one young per pair per year, at two or more nesting areas with secure habitat. Delisting will be considered when the average population reaches 40 breeding pairs at three or more secure nesting areas.

PART ONE

BACKGROUND

TAXONOMY

The snowy plover (*Charadrius alexandrinus*) is a member of the order Charadriiformes and the family Charadriidae. The genus *Charadrius* comprises about 31 species; the six races of *C. alexandrinus* probably constitute a superspecies with *C. marginatus* and *C. ruficapillus* (Cramp and Simmons 1983). *C. alexandrinus* is known as the snowy plover in the Americas and the Kentish plover or sandplover elsewhere. Two subspecies are found in the United States: *C. a. tenuirostris* of the Gulf coast and *C. a. nivosus* of western regions. The subspecific status of plovers which breed at interior regions east of the Rocky Mountains is uncertain. The species was first described by Linnaeus in 1758 (Am. Ornithol. Union 1983). The subspecies *C. a. nivosus* was described by Cassin in 1858 (Cramp and Simmons 1983).

DESCRIPTION

Western snowy plovers are pale gray-brown above and white below, with a white hindneck collar and dark lateral breast patches, forehead bar, and eye stripe. Dark areas are black on males and brownish-black or brown on females. Legs and bill are dark. Individuals range in length from 150-175 mm (about 6.5 in) and weigh approximately 40 g (1.4 oz) (Hayman et al. 1986). A detailed description is provided in Hayman et al. (1986).

GEOGRAPHICAL DISTRIBUTION

C. alexandrinus has one of the most cosmopolitan ranges of any shorebird (Johnsgard 1981). The species is found in Europe, Asia, North Africa, Java, the west coast of South America, the Caribbean, and the United States (Hayman et al. 1986). *C. a. nivosus*, the western snowy plover, breeds in western North America along the Pacific coast from southern Washington to southern Baja California, and locally at interior areas in states west of the Rocky Mountains except Washington and Idaho (Fig. 1 and 2) (Am. Ornithol. Union 1983). The Washington breeding population is restricted to two sites: Leadbetter Point in Willapa National Wildlife Refuge, Pacific County (Fig. 3); and Damon Point (also known as Catala Spit or Protection Island) and Oyhut Wildlife Area at Ocean Shores, Grays Harbor County (Fig. 4). Most western snowy plovers winter coastally from Washington to Baja California and western Mexico.

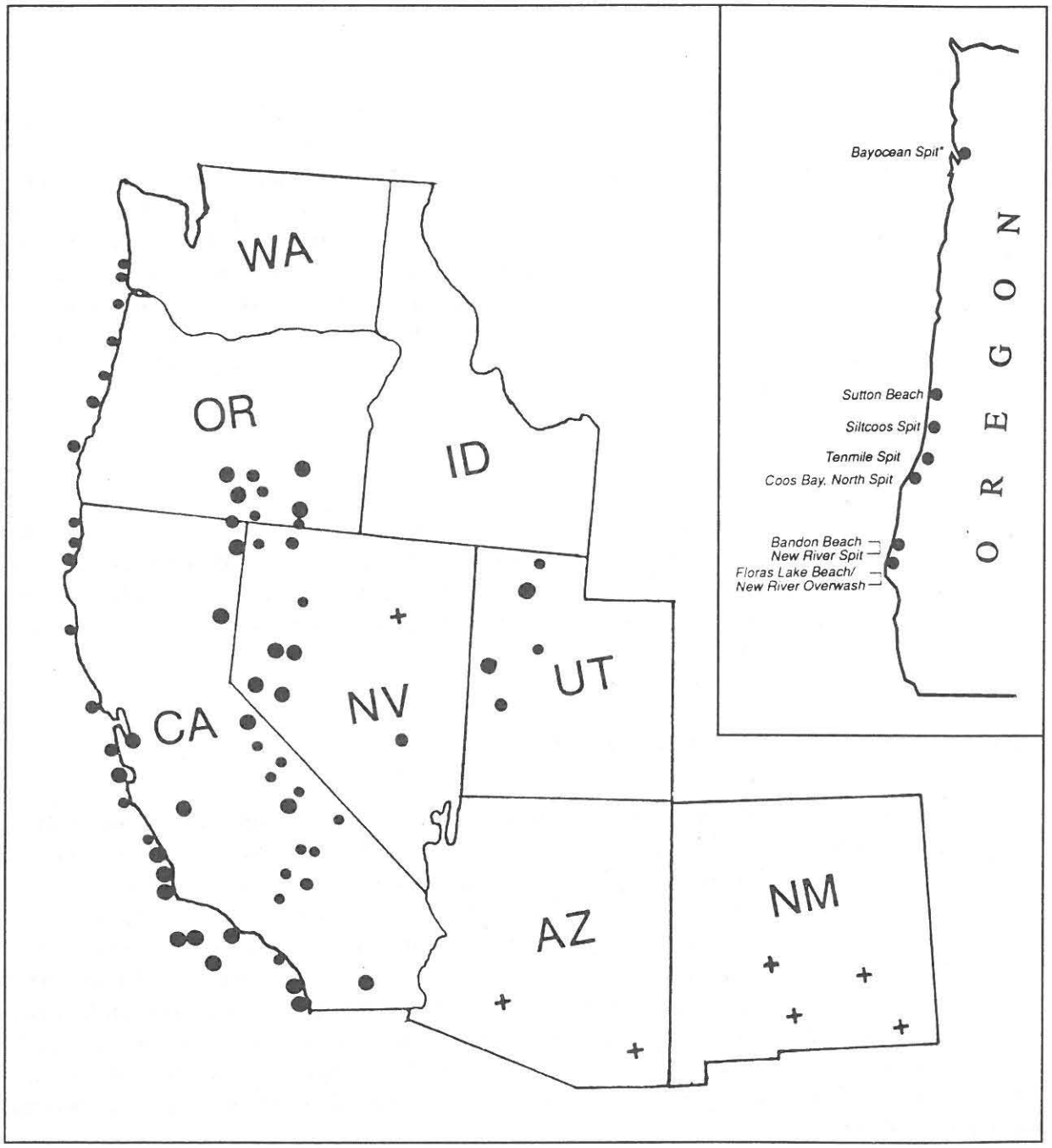

Figure 1. Documented snowy plover breeding locations in the western United States (from Page et al. 1991). Largest numbers recorded for each region are shown by three sizes of circles following Page et al. (1986):. small = 1-27 plovers, medium = 28-81, large = 82 or more. Plus signs represent known breeding sites which had not been surveyed. (Figure reproduced with permission from the *Journal of Field Ornithology*.) Inset shows, more accurately, coastal Oregon sites recently used for nesting (from Oreg. Dept. Fish and Wildl. 1994).

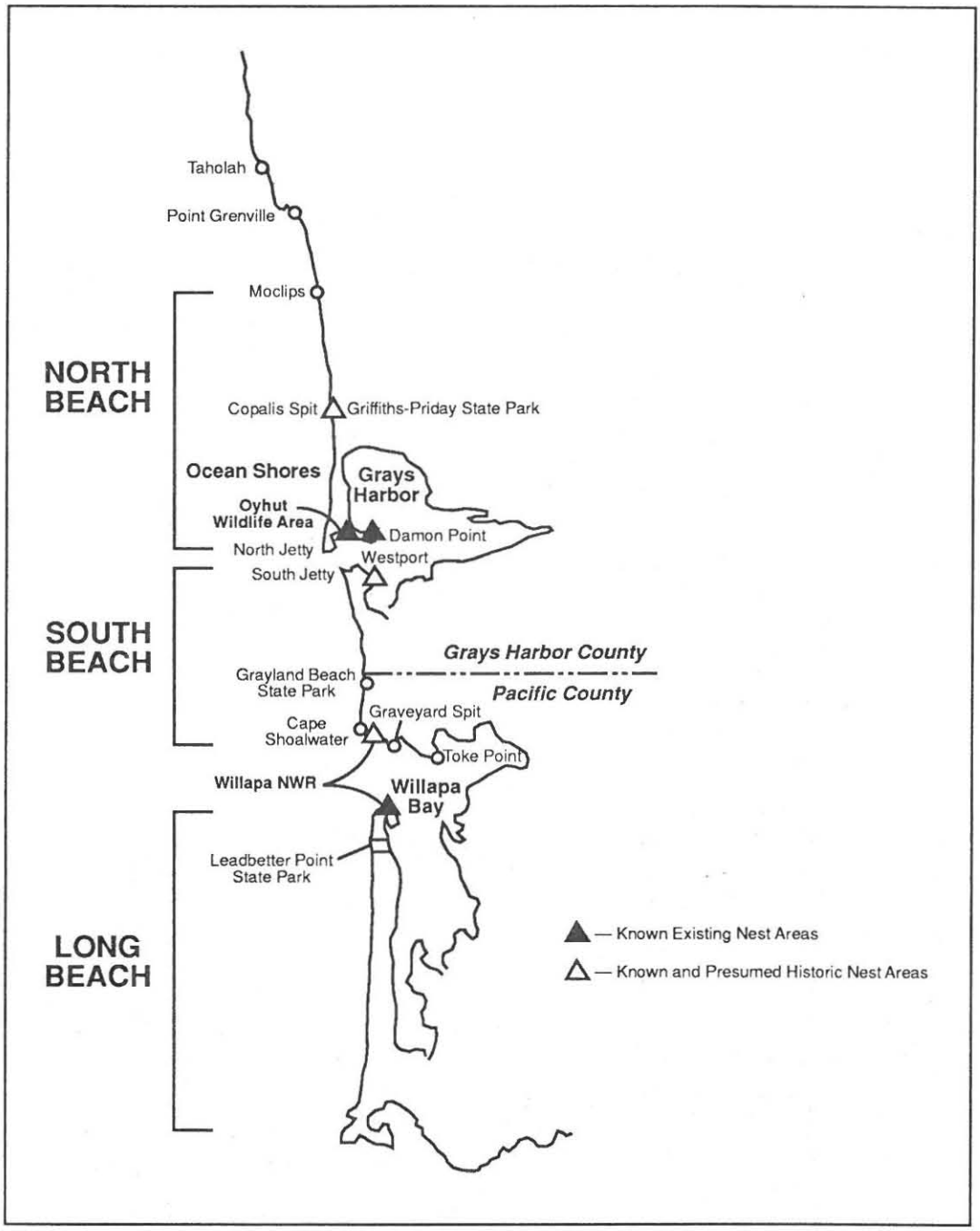

Figure 2. Washington south coast locations important to snowy plover management.

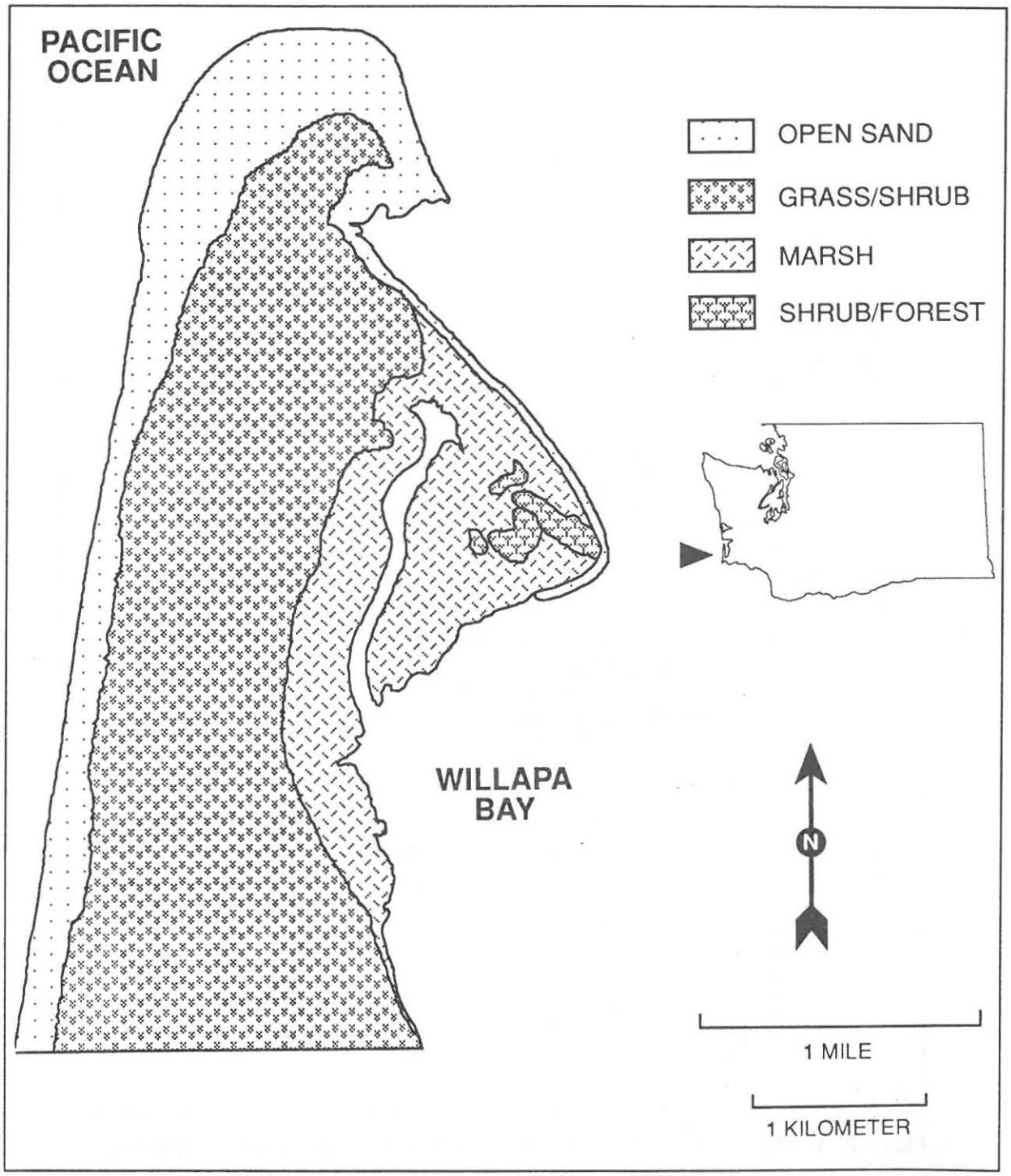

Figure 3. Leadbetter Point, in the Willapa National Wildlife Refuge, Pacific County, based on 1992 aerial photographs.

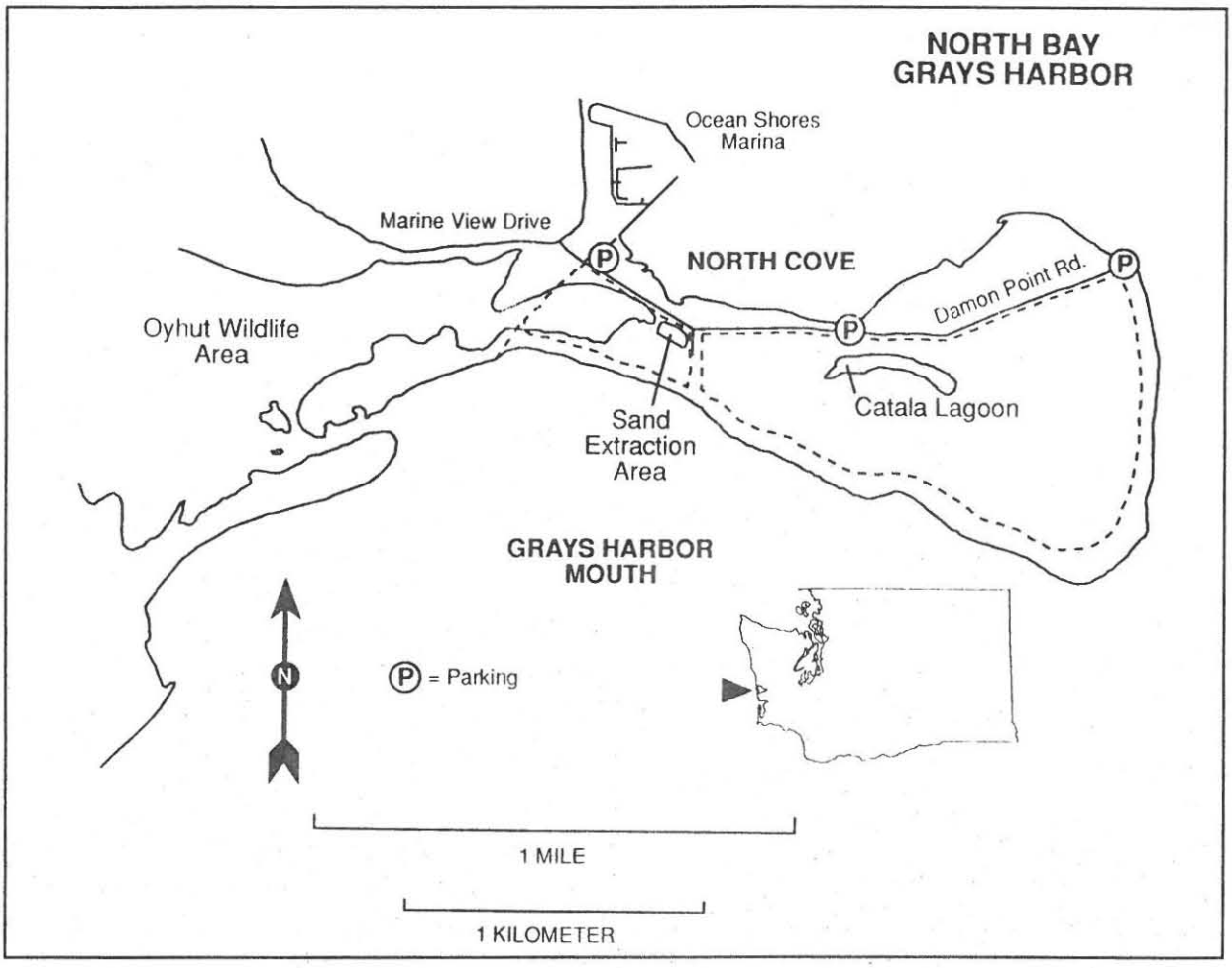

Figure 4. Damon Point and Oyhut Wildlife Area vicinity, Ocean Shores, Grays Harbor County, based on 1990 aerial photographs. The snowy plover protection area boundary (identified in the Damon Point Agreement) is shown by a dashed line.

NATURAL HISTORY

Reproduction

Chronology. Most knowledge of snowy plover breeding behavior comes from research done elsewhere in the species' range, but a generalized breeding chronology for Washington can be derived from years of seasonal reports from Leadbetter Point and Damon Point (see especially Widrig 1979, 1980; Anthony 1987; Persons 1992; Sargent 1993). Most adults arrive during late April, with maximum numbers present in mid-May to late June. Clutches are initiated from late April to late June, chicks hatch a month after eggs are laid, and fledging occurs from late June through August.

General. The life expectancy of an adult snowy plover has been estimated to be 2.7 years (Paton 1994). Individuals sometimes are exceptionally long-lived; Rittinghaus (1975) reported 13-year-old Kentish plovers. Many snowy plovers breed in their second year (Warriner et al. 1986). A double-brooded, polygamous breeding system studied in a California population of snowy plovers was presumed by Warriner et al. (1986) to be commonplace in populations west of the Rocky Mountains. The polygamy was often manifested as sequential polyandry, but males sometimes remated with a new female after fledging or loss of a first brood. A skewed sex ratio (males outnumbered females) may have resulted in the predominance of polyandry (Warriner et al. 1986).

Population Dynamics. Page et al. (1983) recorded annual survivorship of 74% for adults and 64% for juveniles by observing color-marked birds. They calculated annual reproductive success of 0.80 young per breeding female to be necessary for maintenance of a stable population, assuming females breed annually beginning in their second year. Using a Jolly-Seber modeling approach for a population at Great Salt Lake, Paton (1994) estimated average annual survival probability for an adult to be 0.687.

Pair Bonding. Females generally precede males (slightly) in migrating to breeding grounds. Pair bonds appear to be established on the breeding grounds and mated birds from the previous season often reunite. However, new pairs may be established prior to territory formation or nest scraping. Males exhibit a higher degree of fidelity to their previous year's territory than do females (Warriner et al. 1986).

Pairs copulate within 1 m of a scrape, but that scrape may not be the one eventually containing eggs (Buchanan et al. 1991). Copulations occur up to 25 days prior to laying of the first egg and cease after laying of the first or second egg (Warriner et al. 1986).

Nest Site Selection. Males usually select the nest site. Nests may be in the open or under an object such as driftwood or a clump of living or dead vegetation (Page and Stenzel 1981, Paton and Edwards 1990). They consist of a shallow scrape or depression often sparsely lined with shell fragments and other debris collected nearby. Scrapes take 4-11 days to construct (Page et al. 1977). Multiple scrapes are made, but only one is used.

The amount and proximity of cover influence nest site selection. Nearby objects may provide concealment, protection from weather, or a cue to nest location (Page et al. 1985), and patches of vegetation may provide escape cover for chicks (Page et al. 1981). At coastal Oregon sites, Wilson-Jacobs and Meslow (1984) measured vegetative characteristics in the vicinity of plover nests. They found ground cover within 0.5 m (1.6 ft) of nests to average 28% (26% driftwood, 0.5% live vegetation, 1.5% other), an amount significantly greater than at paired random sites. Woolington (1985) frequently encountered scrapes constructed at the bases of *Ammophila* clumps, while Anderson and Maine (1983) and E. Cummins (pers. comm.) have found plovers nesting among patches of searocket (*Cakile* sp.). Grover and Knopf (1982) found 68% of nests within 5 cm (2 in) of debris and Page et al. (1985)

found 68% of nests within 15 cm (6 in) of an object. In contrast, Purdue (1976) stated that snowy plovers in Oklahoma frequently located their nests away from any large driftwood or debris, and the nearest vegetation often was several hundred meters distant. A mix of conditions for nest site placement has been found in Nevada and interior Oregon (J. Buchanan, pers. comm.).

Proximity to water may be important. Boyd (1972) found that plovers sometimes wet their eggs with moistened plumage, which could help to cool clutches in hot weather.

Nest density is highly variable globally and regionally. Density in California ranges from 0.1 to 5.7 pairs/ha (0-2.3 pairs/ac) (Stenzel et al. 1981). Boyd (1972) reported an average distance between nests of 85 m (279 ft), with the closest two 15-20 m (50-66 ft) apart. In Nevada and interior Oregon, distances between 15 pairs of nests averaged 35.7 m (range 12-63 m) (J. Buchanan, unpubl. data). Anthony (1987) found a shortest measure of 39 m (128 ft) between nests at Damon Point. Much higher densities and closer nest placement are reported from Europe (Cramp and Simmons 1983).

Egg Laying and Incubation. Snowy plovers usually lay three eggs. Nests with five or six eggs are assumed to be the result of laying by more than one female (Warriner et al. 1986). Time between egg layings ranges from 46.5 to 77.5 hours (usually 53-66 hr), with clutches completed in less time later in the season (Warriner et al. 1986).

Incubation begins when the clutch is complete and takes 26 to 32 days (mean 27 days), with earlier nests requiring a longer period. Females are the primary incubators during daylight, while males apparently perform most night-time incubation. Clutches reduced to a single egg (due to predators or other causes) are usually abandoned unless incubation is well advanced (Warriner et al. 1986).

Clutch Failure. Pairs generally remain together after clutch failure, but they often move to a new territory. Warriner et al. (1986) found about half the pairs with clutches which failed due to natural causes or human disturbance, and most of those lost to predators, moved to a new area before renesting. New sites may be 0.2-75 km (0.1-47 mi) distant (Page and Stenzel 1981, Warriner et al. 1986). Renesting occurs 2-14 days after clutch failure and up to five renesting attempts have been observed for a pair (Warriner et al. 1986).

Hatching and Nest Success. Hatching of all viable eggs within a clutch requires 1-33 hours (Warriner et al. 1986). Empty shells are removed immediately by an adult. Boyd (1972) found shells 10-70 m (33-230 ft) from nests, but shell fragments from pipping often remain in nest scrapes (Page et al. 1985, Bolln and Atkinson 1986, Paton and Edwards 1992).

Nest success (proportion of clutches which hatch at least one chick) varies by year and location. Unusually low success frequently is attributed to factors such as heavy predation, human disturbance, or particularly bad weather. Also, Page et al. (1985) reported a lower

hatching rate in nests beside objects than those in the open or partially under objects, but they noted this may have been an anomoly at their Mono Lake study area.

Warriner et al. (1986) reported a range of 38-86% nest success for 6 years at a single site, which encompasses most percentages reported elsewhere. Figures for Washington echo the variability in success rates across the plovers' range. An approximation of nest success can be gleaned from a few Damon Point and Leadbetter Point seasonal reports, which suggest success rates of 0, 29, 43, 75, and 100% (Anthony 1987; Willapa NWR 1988, 1989; Hogan 1991; Persons 1992).

Chick Rearing and Fledging. Chicks are led from the nest soon after hatching and quickly become very mobile and elusive. They are not fed by adults (Oreg. Dept. Fish and Wildl. 1987). Most chick mortality occurs by the age of 6 days (Warriner et al. 1986). On the Oregon coast, plover broods may travel along the beach up to 6.4 km (4 mi) from their natal area (Casler et al. 1993). Fledging period as defined by Warriner et al. (1986) is from hatching to first flight of at least 3 m (10 ft). They found fledging to occur at 28-33 days (mean 31 days) and at least 93% of chicks attaining the age of 16 days eventually fledged. Chicks are tended by males until they reach age 29-47 days and generally leave the nest territory prior to fledging (Warriner et al. 1986).

Reproductive success (young fledged per female, pair, or nest) ranges from 0.05 to 2.40 (U.S. Fish and Wildl. Serv. 1992). Estimates in Washington have been 0.5, 0.8, and 1.25 young fledged per nest with eggs at Damon Point (Anthony 1985, 1987; Persons 1992) and 0.43, 0.67, 0.86, 0.86, 1.0, and 1.6 young per nest at Leadbetter Point (Widrig 1980, 1981; Willapa NWR 1988, 1989). Survivorship data for Washington plovers do not exist. It is likely that the small population here is vulnerable to extirpation regardless of annual production.

Second Broods. In California, females often move to a new territory (sometimes quite distant), remate, and lay a second clutch within a few days after hatching their first (Warriner et al. 1986). Males sometimes renest during the brood-rearing period (rarely) or after the loss or fledging of a brood (Warriner et al. 1986). Double brooding in parts of the plover's range may be precluded by a short nesting season (Boyd 1972).

Mortality

Predation. Several bird and mammal species are known to prey upon plover eggs, chicks, or adults. Corvids, gulls, skunks, and canines predominate, but raccoons, weasels, cats, and raptors each may exact a toll. Nest loss is the best-documented result of predator presence in snowy plover nesting areas, but chicks and adults may be taken.

Anderson and Maine (1983) believed most egg loss in coastal Oregon could be attributed to crows and ravens. This view was supported by the documentation of more than 30% nest

loss to corvid predation during 2 years at Oregon coast study sites (Wilson-Jacobs and Meslow 1984). Common ravens (*Corvus corax*) are confirmed predators of eggs in Oregon and California (Page and Stenzel 1981, Stern et al. 1991a, Craig et al. 1992), and assumed predators at Great Salt Lake (Paton and Edwards 1992). Crows (*Corvus brachyrhyncos*) have taken eggs in California and Oregon (Warriner et al. 1986, Stern et al. 1990b) and have elicited alarm responses from plovers nesting at Damon Point (Hogan 1991).

Gulls are apparently opportunistic predators, taking eggs or chicks only when encountered accidentally (Warriner et al. 1986), except at Mono Lake where predation is deliberate and apparently due to proximity of a large nesting colony of California gulls (*Larus californicus*) (Page et al. 1983). Predation by California gulls has also been documented in Utah (Paton and Edwards 1992). A western gull (*Larus occidentalis*) has been implicated in a predation incident at Damon Point (Anthony 1987).

Loggerhead shrikes (*Lanius ludovicianus*) took at least 14 chicks in 1 year at a California site (Warriner et al. 1986) and caused predator avoidance behavior in southeast Oregon plovers (Herman et al. 1988). Merlins (*Falco columbarius*) have taken plovers during winter in Oregon (Oreg. Dept. Fish and Wildl. 1987). Kestrels (*F. sparverius*), using predator exclosures as perches, have preyed upon hatching eggs at a California site (Parker and Takekawa 1993). A peregrine falcon (*F. peregrinus*) has been seen hunting over occupied plover nesting habitat at Leadbetter Point (D. Williamson, pers. comm.), and a northern harrier (*Circus cyaneus*) has elicited an alarm response from a brooding male plover at Oyhut Wildlife Area (Sargent 1993).

Coyotes (*Canis latrans*) have been blamed for the loss of clutches at many sites, including Leadbetter Point (Page and Stenzel 1981, Grover and Knopf 1982, Bolln and Atkinson 1986, Page 1986, Willapa NWR 1988). It has been suggested that coyotes simply "stumble upon" those nests that they plunder (Page et al. 1983, Bolln and Atkinson 1986).

Red foxes (*Vulpes vulpes*) can destroy plover nesting attempts and reduce fledging success (Warriner et al. 1986, Page 1986, Paton and Edwards 1991). Foxes destroyed 63 plover nests at Salinas River National Wildlife Refuge in 1990 (Parker and Takekawa 1993).

Clutches have been taken by raccoons (*Procyon lotor*) in Oregon and Utah (Wilson-Jacobs 1986, Paton and Edwards 1991) and by skunks (*Mephitis mephitis*) in California, Oregon, and Utah (Page et al. 1983, Stern et al. 1990b, Paton and Edwards 1991, Craig et al. 1992). A long-tailed weasel (*Mustela frenata*) is suspected of causing failure of a nest on the Oregon coast (Craig et al. 1992). Domestic cats have destroyed clutches in California (Page 1986, Parker and Takekawa 1993), and are assumed to take nests in Oregon (Wilson-Jacobs and Dorsey 1985).

Parasites. Recent research on snowy plover parasites apparently has been conducted only on races other than *C. a. nivosus*. For example, helminth (worm) infections have been

described by researchers in Asia (Belopol'skaya 1985, Filimonova and Meredov 1985, Liang and Ke 1987). Mites in the former Soviet Union have been discussed by Butenko (1984) and Mester (1988) has reported on feather-lice infestations in some European populations.

Disease. One snowy plover was among dead birds found in late summer at Soda Lake, Nevada during what Alcorn (1942) described as an epidemic of botulism. Other species affected showed such symptoms as "limberness of the neck, greenish diarrhea, drooping of the wings, and muscular weakness" (Alcorn 1942:80). Birds often were observed feeding on dead larvae of what were thought to be soda flies (i.e., brine flies: Ephydridae).

Foraging

Snowy plovers are primarily visual foragers, using the run-peck-stop method typical of *Charadrius* species. They feed outside nesting territories at undefended areas (Page et al. 1983). At the coast they forage along the surfline, on mud flats, in decaying algae at the high tide line, and on dry sand (Hoffman 1927, Anderson and Maine 1983, Stern et al. 1990b). Feeding at inland sites is usually concentrated at seeps and lakeshores, areas with shallow saline water (Page 1991, Paton and Edwards 1991).

At Damon Point plovers have been observed foraging along the entire length of the east and south shorelines, the Catala Lagoon shoreline, mud flats surrounding the point, and on the interior plain (Anthony 1987, Fox 1990). They sometimes mix with semipalmated plovers (*Charadrius semipalmatus*), sanderlings (*Calidris alba*), and western sandpipers (*Calidris mauri*) (Anthony 1987, Moon 1990).

Food

Snowy plovers seek larval and adult forms of marine and terrestrial invertebrates. The diet of Washington snowy plovers is unstudied, but may resemble that of plovers elsewhere on the west coast. Stomachs of three plovers collected during the breeding season on the southern California coast contained remains of sand crabs (*Emerita analoga*), brine fly larvae (Ephydridae), polychaetes (especially Nereidae), a lined shore crab (*Pachygrapsus* sp.), various beetles, and other insects (Reeder 1951).

Stern et al. (1990) generated a list of possible prey items, primarily beetles and flies, found in plover foraging areas in south coastal Oregon (Table 1). Wilson-Jacobs (1986) observed adult plovers feeding on sand hoppers (Orchestoidea) and small fish on the Oregon coast during the breeding season. Johnsgard (1981) listed the following additional components of the snowy plover diet at coastal or interior locations: neuropterans, trichopteran larvae, bivalve and univalve mollusks, gammarid crustaceans, and brine shrimp (Artemiidae).

Brine flies are a seasonally important element of the plover diet at inland locations, where prey also includes beetles (including *Bledius* sp.), water boatmen (Corixidae), and

miscellaneous windblown insects (Purdue 1976, Grover and Knopf 1982, Paton and Edwards 1991).

Table 1. Common invertebrates found in areas used by foraging snowy plovers on Oregon beaches (adapted from Stern et al. 1990b).

Species	Class Order Family	Common Name and Habits
Megalorchestia californiana	Crustacea Amphipoda Talitridae	amphipods/small fleas; abundant along surf edge; emerge when sand is wet; most apparent on outgoing tide
Orbellia sp.	Insecta Diptera Heliomyzidae	small shore flies; abundant along wrack line; associated with decaying vegetation, usually kelp
Heliomyza mirabilis	Insecta Diptera Heliomyzidae	large shore flies; common along wrack line; associated with decaying vegetation, usually kelp
Thinopinus pictus	Insecta Coleoptera Staphylinidae	beige rove beetles; common along wrack line; nocturnal predator of sand fleas
Cafius seminitens	Insecta Coleoptera Staphylinidae	black rove beetles; common on beaches; generalist predator; hides under debris
Cafius canescens	Insecta Coleoptera Staphylinidae	black rove beetles; habitats same as *C. seminitens*
Neopachylopus sulcifrons	Insecta Coleoptera Histeridae	histerids; rare predator of fly larvae in decaying seaweed
Ragium inquisitor	Insecta Coleoptera Cerambycidae	long-horned beetle; common wood-borer in driftwood habitat on beach

Movements

Snowy plovers have the ability to travel hundreds of miles within the breeding season or during migration (Stern et al. 1991b; Point Reyes Bird Observatory, unpubl. data).

Nevertheless, intermixing between coastal and interior populations is limited. Nesting at interior sites by plovers banded at coastal breeding areas has been documented only twice, and no plovers hatched in the interior have been documented nesting on the coast (G. W. Page, pers. comm.). For this reason, coastal and interior populations are considered genetically isolated (U.S. Fish and Wildl. Serv. 1993a). Observations of banded birds indicate plovers from coastal California have bred in Washington (Appendix A), but snowy plovers generally return to nest in the same areas each year (Warriner et al. 1986). Plovers banded in Washington (Appendix B) have not been detected elsewhere.

Most plovers that breed at interior sites migrate to the coast for the winter (Page et al. 1986, Stern et al. 1990a), while Washington coastal populations apparently shift southward to some degree. Page et al. (1986) found that most western snowy plovers winter south of San Francisco Bay and believed that a considerable proportion spend the season in Mexico.

HABITAT REQUIREMENTS

Snowy plovers have adapted to life on unstable substrates with little or no vegetation. Coastal populations nest on sand spits and dune-backed beaches, utilizing unvegetated or sparsely vegetated areas above the high tide line (Wilson-Jacobs and Meslow 1984, Warriner et al. 1986, Anthony 1987). Salt pans, lagoons, dredge spoils, and salt evaporators along the coast are used less extensively by nesting plovers (Warriner et al. 1986).

Plovers nesting at interior locations select barren flats near inflow streams or standing bodies of water. High evaporation and low outflow create areas of alkaline substrate with little vegetation (Boyd 1972, Grover and Knopf 1982, Page et al. 1986, Warriner et al. 1986, Herman et al. 1988). Where vegetation is part of the interior landscape, characteristic species may include salt grass (*Distichlis stricta*) and greasewood (*Sarcobatus vermiculatus*).

Wintering plovers use a broader array of habitat zones than do breeding birds (Page et al. 1986). Urban and bluff-backed beaches, which are not used for nesting, support some plovers wintering in California, though the majority of plovers are found on sand spits and dune-backed beaches. In Washington, plovers are observed regularly in winter at their Leadbetter Point breeding area and have been encountered on other beaches only rarely.

POPULATION STATUS AND TREND

Western United States

Based on recent surveys, 28 snowy plover breeding sites or areas currently occur on the Pacific coast of the United States—20 (71%) in California, 6 (21%) in Oregon, and 2 (7%) in Washington (U.S. Fish and Wildl. Serv. 1992)—a reduction from 87 historic sites in the

three states. The most comprehensive summary of snowy plover abundance in western North America indicates that up to 10,200 breeding snowy plovers occurred in Washington, California, Oregon, and Nevada between 1977 and 1980, approximately 2,300 of which were at coastal locations (Page et al. 1991). In 1988-1989, numbers declined 11% to approximately 7,900 plovers, 1,900 of them at coastal locations. The decline was attributed in part to flooding of nesting habitat in southeast Oregon (Page et al. 1991). Recently, Paton and Edwards (1992) estimated the presence of more than 10,000 plovers at Great Salt Lake, Utah, during the breeding season, based on observation of 1,501 adults during a mark-recapture study.

The Oregon Department of Fish and Wildlife reported an average annual 7% decline of snowy plover numbers at coastal breeding sites between 1981 and 1992, with a 1993 coastal population of 45 breeding plovers (Oreg. Dept. Fish and Wildl. 1994). A similar decline may be occurring in Washington.

The winter population in the western United States numbers approximately 4,000, suggesting the majority of western snowy plovers spend the season outside the country along the Gulf of California and the west coast of Baja California (Page et al. 1986). Root (1988) indicated that all snowy plover winter populations are found in areas that are warmer than 30°F (-1°C) in January, but the significance of this pattern is uninvestigated.

Washington

Present. Surveys in 1994 revealed up to six adults and four nests at Damon Point and Oyhut Wildlife Area, where three of four chicks fledged (Howard 1994). Up to 13 adults and four nests were documented at Leadbetter Point, where at least six of 10 chicks fledged (D. Williamson, pers. comm.). In 1993, four nests were documented at Damon Point and Oyhut Wildlife Area, three of which hatched chicks. Six of 10 chicks were known to have fledged (Sargent 1993). Two nests (both unsuccessful) and up to 16-20 adult plovers were observed at Leadbetter Point in 1993 (D. Williamson, pers. comm.).

Past. Ornithologists speculated that snowy plovers nested at coastal Washington locations long before eggs or chicks were found (e.g., Dawson and Bowles 1909, Kitchin 1934, Jewett et al. 1953, Larrison and Sonnenberg 1968). On 3 September 1899, C. W. Bowles collected the only snowy plover seen during a visit to Grays Harbor to furnish the first state specimen (Bowles 1918). Early evidence of probable breeding was provided by D. E. Brown's collection of a female containing "a large-sized egg" in Pacific County during May 1914 (D. E. Brown, unpubl. notes, Slater Mus. Nat. Hist., Univ. Puget Sound, Tacoma). Brown characterized snowy plovers as "quite common," noting that several were seen each day during a 3-day visit to the county. In the autumns of 1927 and 1931 juvenile females were collected at Westport, which indicates nesting probably was taking place in the Grays Harbor area. During the decades that ensued, observers found small numbers of adult plovers at

various coastal sites at all seasons, but not until 18 May 1967 at Leadbetter Point were Washington's first downy chicks discovered.

Determining the former abundance of snowy plovers in Washington is complicated by several factors. Snowy plovers are cryptically colored, making them difficult to see. At an inland California site, for example, Warriner et al. (1986) learned that about 1.6 males and 3.0 females were present for each one detected on a census. Not only are adults easy to overlook, but their well-camouflaged nests are unlikely to be noticed by a casual observer.

Effort expended searching for nesting plovers has been variable over the years. Leadbetter Point was rarely visited prior to 1964 and Damon Point was not visited regularly until 1971. Records of snowy plovers at Copalis Spit during the period they nested there are very scarce, and biologists visiting Westport typically did not indicate the number of plovers observed. Survey intensity has varied even in recent years.

In all, there were at least five historic breeding areas on the coast (Fig. 2), each supporting a small number of nesting pairs. Leadbetter Point and Damon Point remain active (Table 3), while Copalis Spit, Westport, and Cape Shoalwater no longer support plovers.

Plovers have been verified nesting at Leadbetter Point during 14 of 17 summers since 1978 (Table 2), with a maximum of 12 pairs in 1986 (Bolln and Atkinson 1986). At Ocean Shores (Damon Point and Oyhut Wildlife Area) nesting has been verified during 20 of 24 summers since 1971 (Table 2), with a maximum of eight pairs in 1985 (Anthony 1985).

A population of 6 to 12 breeding pairs reportedly once nested at Copalis Spit (G. D. Alcorn, letter dated 2 Mar 1983 to D. W. Heiser). Unfortunately, Alcorn kept no records of his observations, which he later believed may have been made in the late-1950's or early 1960's (G. D. Alcorn, pers. comm. 19 Oct 1983 to R. Vining). Although the area has been surveyed regularly since at least 1983, including five monthly visits in 1992 (Anthony 1985, Lapp 1988, Fox 1990, Persons 1992), the only subsequent sighting was a single male seen in 1985 (E. Cummins, pers. comm.). In 1984, Widrig estimated the habitat was capable of supporting up to four pairs.

A sand spit on the east shore of Westport between the marina and the airport formerly supported breeding plovers (G. D. Alcorn, letter dated 2 Mar 1983 to D. W. Heiser). Low numbers of plovers were recorded at the spit from 1915 to 1968 and scientific collection efforts were concentrated there through 1934. No recent activity has been reported from the vestigial spit or an adjacent dredge spoil.

An observation of a pair of plovers near the end of Midway Beach Road in June 1994 was the first reported snowy plover sighting along any portion of South Beach during the breeding season. Other sightings of plovers in the vicinity are limited to 1988 and 1992 winter (January) records north of Cape Shoalwater (Buchanan 1992; R. Canniff, pers.

Table 2. Nesting records for snowy plovers in Washington. Estimates are indicated by parentheses.

Year	Adults [a]	Pairs [b]	Nests [c]	Chicks [d]	Juv's [e]	Visits [f]	Dates [g]	Reference [h]
				Damon Point and Oyhut Wildlife Area				
94	6		3(4)	4	3	30	1 Apr-9 Aug	Howard 1994
93	7	2(3)	3(4)	10	6	34	12 Mar-25 Aug	Sargent 1993
92	5(7)	4	5	11	4	42	1 Mar-4 Sep	Persons 1992
91	5		2			10	1 May-10 Jun	Hogan 1991
90	10(17)		4(5)	5		18	21 Apr-31 Jul	Fox 1990, Moon 1990
89	2	1		3		5	12 May-4 Aug	Zahn 1989
88	4			2		>3	15 Apr-15 Jun	Lapp 1988
87	6			2		1	12 Jul	Anthony 1987
86	10(16-20) [j]	6	6(8) [j]	7	4	30	20 Mar-13 Aug	Anthony 1987
85	13(16-20)	8	3(8)	13(15)	10	27	1 Mar-19 Aug	Anthony 1987
84	15		3		1	>5	25 Apr-27 Aug	several observers
83			1			1	24 May	AB 37(5):904
80			1	2		2	9 May-17 May	several observers
79	3	1	2	1	1	4	25 May-10 Jul	several observers
78	6		1	4		2	2 Jul-6 July	WDFW files
77		4		3		2	July	WDFW files
75	4			1		3	9 May-26 Jul	G. Hoge, unpubl.
72	6			4		4	3 Jun-29 Jul	G. Hoge, unpubl.
71	4			1		6	1 May-10 Jul	G. Hoge, unpubl.
				Leadbetter Point				
94	13		3(4)	10	6	26	23 Mar-21 Sep	WNWR files
93	16(16-20)	2	2			3	11 Jun-13 Jul	WNWR files
92	7	3	2		(≥2)	5	7 May-8 Jul	WNWR files
91	5	3		2		6	11 Apr-9 Aug	WNWR 1991
89	7	4	7		6	12	28 Apr-1 Sep	WNWR 1989
88	8	4	7		6	15	30 Mar-1 Sep	WNWR 1988
86	23	12(≥14)	5(≥7)	1(6)	5(7)	25	22 May-19 Sep	Atkinson [k]
85	16	(6-8)	(3-4)	1		12	15 Apr-24 Jun	Hoover 1985
84	6		1	1	(1)	8	1 Jun-14 Jul	Atkinson 1984
82		10		10	(12)			Widrig unpubl.
81	31	11	3(11)	4	17(18)			Widrig 1981
80		5			5			Widrig 1980
79		5	5(9)	8	6			Widrig 1980
78	22	10	5(7)		3	4		Widrig 1980
67	1			2		1	18 May	AFN 21(4):533

[a] Adults: Maximum number of adults counted during a one-day survey.
[b] Pairs: Maximum number of breeding pairs known throughout season, including second mates taken within the season.
[c] Nests: Number of nests with eggs found. Estimates include nests assumed by unique spatial-temporal observation of broods.
[d] Chicks: Number of pre-fledging hatch-year birds observed.
[e] Juv's: Number of juveniles. Recently, chicks reaching age 16 days have been included, based on Warriner et al. (1986).
[f] Visits: Number of trips made to suitable habitat with the intent of looking for plover breeding activity.
[g] Dates: Period during which visits took place.
[h] References begin on page 52. WNWR refers to Willapa National Wildlife Refuge. Additional information is presented in Appendix C.
[j] Two inactive scrapes were counted as nests. Probably 4(6) nests; adult estimate may be overstated.
[k] J. Atkinson, letter dated 2 Oct 1986 to J. Anthony; Bolln and Atkinson 1986.

comm.) and the collection of a plover at "Tokeland" in 1914 (Appendix C). Historic snowy plover breeding in the area between Cape Shoalwater and Toke Spit is speculative.

Elsewhere in western Washington, Kitchin (1949) commented that snowy plovers were sighted annually on the shores of the Olympic Peninsula, but it is unknown exactly where these birds were seen. Plovers have occurred at La Push (September), Dungeness Spit (May and July), and Seattle (May) (Appendix C).

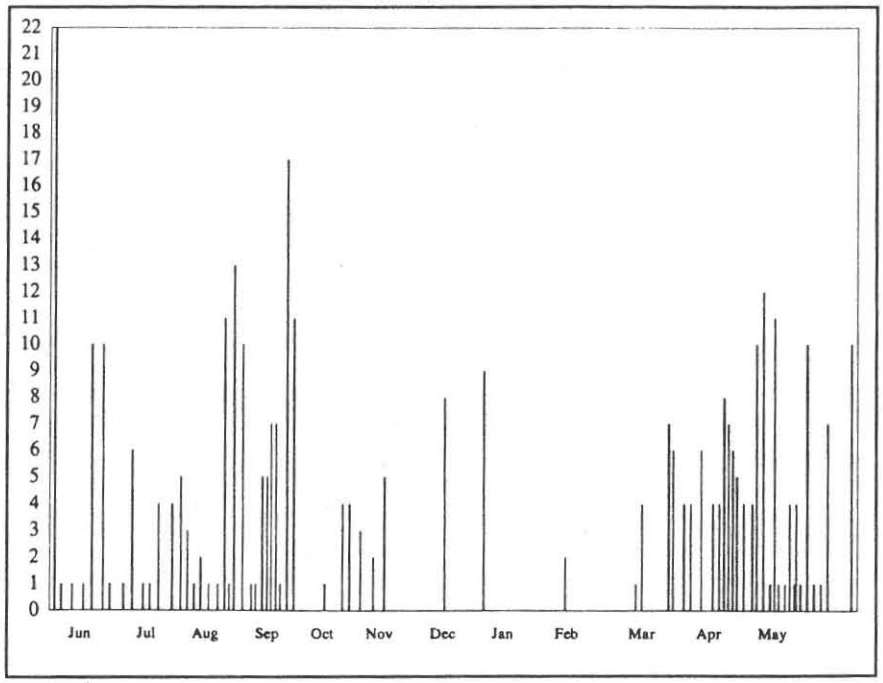

Figure 5. Snowy plover abundance at Leadbetter Point from 8 June 1978 to 4 June 1979 (from Widrig 1979). On this graph, counts of 1 indicate dates Widrig noted presence without counting individuals.

In addition to information on seasonal distribution and abundance presented in Appendix C, relative abundance of snowy plovers was tracked at Leadbetter Point during a full year by Widrig (1979). He found plovers during every month, with high counts in June and September (Fig. 5).

Plovers winter regularly at Leadbetter Point, with a high count of 28 birds in December 1978 and an average population of fewer than 10 individuals. A December 1960 count of 10 plovers at Grays Harbor and several pre-1928 Westport observations provide the northernmost winter records for the species.

Nesting has never been documented in eastern Washington. Although suitable nesting habitat exists in several counties, it is very limited and would be unlikely to support a stable population (Buchanan et al., in prep.). There are four records of snowy plovers seen east of the Cascades, all since 1967 (Appendix C). Single birds have been seen at Soap Lake, Grant County, Wallula, Walla Walla County, and Reardan, Lincoln County. A group of four individuals was seen on Goose Island in Banks Lake, Grant County.

HABITAT STATUS

Coastal Accretion and Erosion

Sand beaches of the Washington south coast have been built largely from sediments transported northward from the Columbia River (Phipps 1990). About 2,000 ha (5,000 ac) of sand dunes have been formed along 82 km (51 mi) of coastline (Schwendiman 1977, Wiedemann 1984). A pattern of winter erosion and summer accretion have reshaped the shoreline over time, varying the amount of nesting habitat available to snowy plovers both within and between seasons (Fig. 6 and 7).

During the early part of this century most of the sand accreting along the southwest Washington coast probably originated from Peacock Spit, a large shoal at the mouth of the Columbia River formed by the construction of jetties (Phipps 1990). Dams in the river greatly reduced the flow of sediments which formerly had regenerated Peacock Spit, leading Phipps (1990:7) to conclude that, "...in the case of Washington beaches and adjacent shelf there are more withdrawals than deposits." In other words, the Peacock Spit source material for accretion of Washington beaches had been depleted.

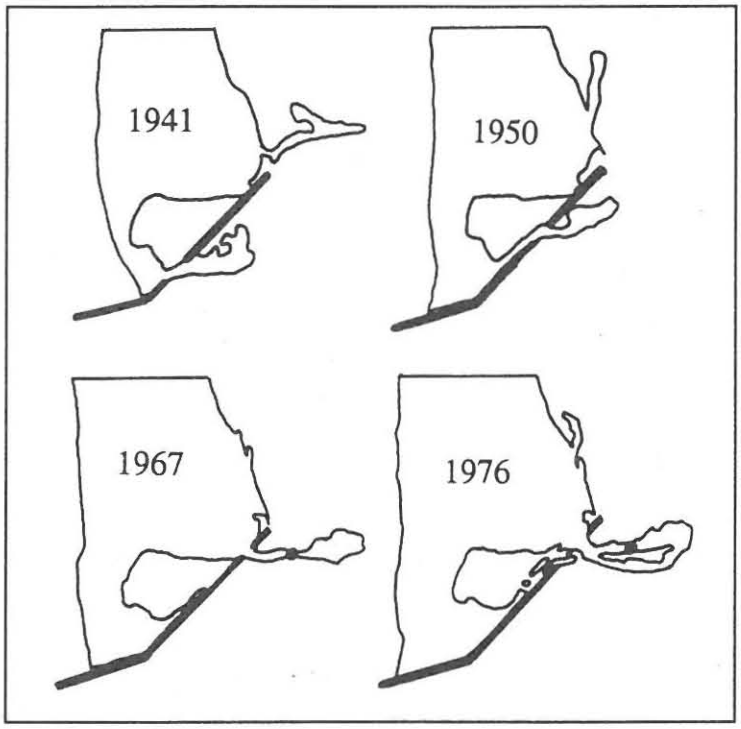

Figure 6. Coastline changes at the end of the Ocean Shores peninsula (based on Sharpe 1977). Heavy lines represent the North Jetty and closed circles represent the *S.S. Catala* shipwreck (now removed).

Accretion and erosion rates and patterns vary along the coast and are difficult or impossible to predict in the vicinity of jetties. Measurements made in 1988 (Phipps 1990) indicated beaches were accreting gradually on the north end of the Long Beach peninsula, but at a rate reduced from that of the previous 50 years. On the north side of Willapa Harbor erosion had occurred at the "spectacular" rate of 27 m (90 ft)/year. Much of the beach north of Grays Harbor was accreting at the highest rate found in Washington and sand was being added in front of sea cliffs north of the historic accretional-beach terminus.

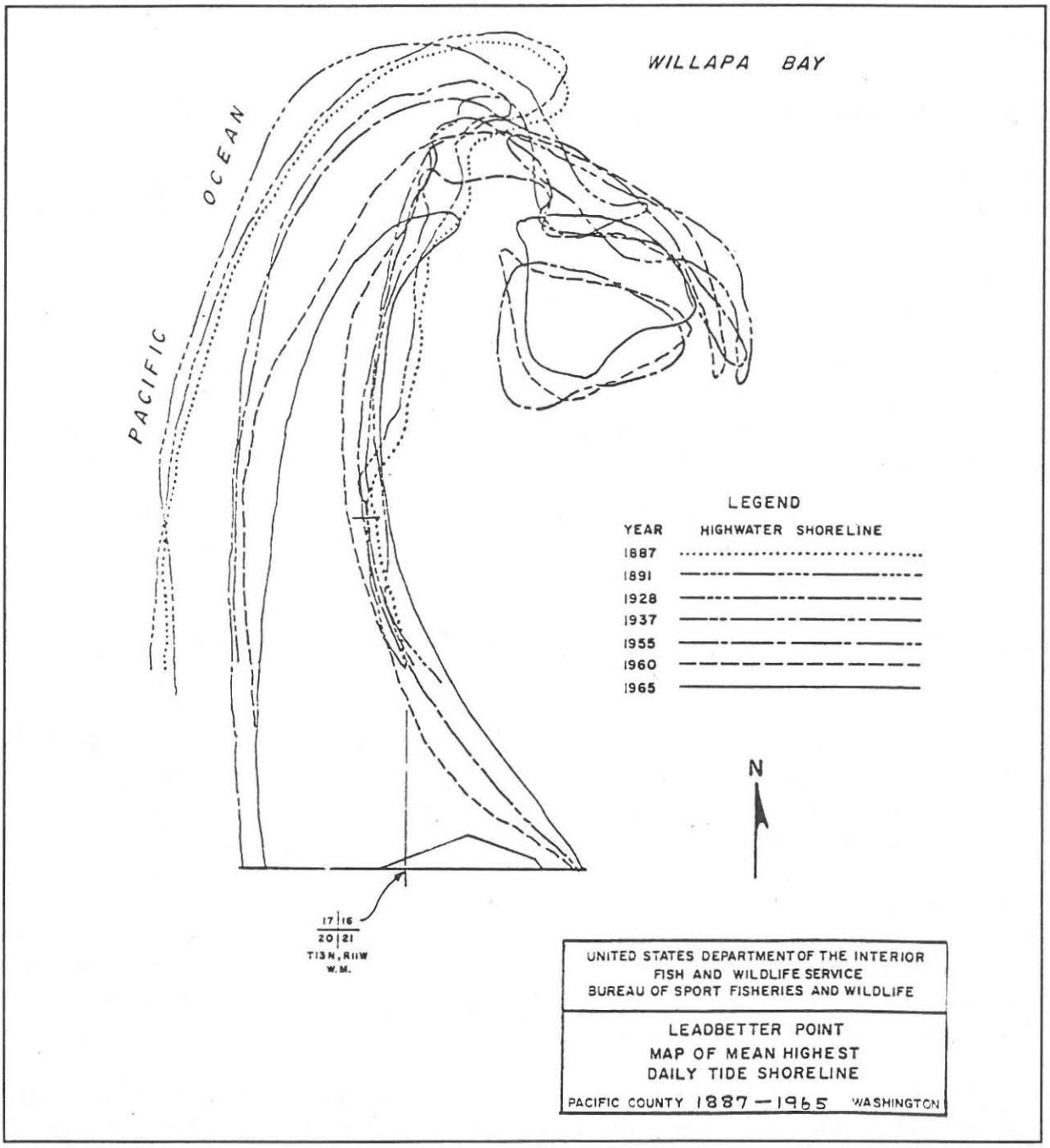

Figure 7. Coastline changes over time at Leadbetter Point, based on U.S. Army Corps of Engineers maps (from Willapa National Wildlife Refuge files).

Habitat Zones and Vegetation

Washington coastal dunes form as a parallel dune ridge system. Approximately 20 dune ridges can be mapped across the Long Beach peninsula (Phipps and Smith 1978). The dune system consists of three major zones: foredune, unstabilized dunes, and stabilized dunes. An additional component of some dune communities is the dune forest, which is found on the historic foredune.

Leadbetter Point. Concurrent with the slowed accretion on the Long Beach peninsula, the vegetation line moved westward to reduce the vegetation-to-water distance from 119 m (390 ft) in 1977 to 85 m (280 ft) in 1987 (Phipps 1990). Pioneering plants which have become established in the foredune include European beachgrass (*Ammophila arenaria*), American dunegrass (*Elymus mollis*), silver beach weed (*Ambrosia chamissonis*), yellow abronia (*Abronia latifolice*), American sea rocket (*Cakile edentula*), seashore lupine (*Lupinus littoralis*), and seashore bluegrass (*Poa macrantha*).

Despite the loss of historic plover nesting habitat, accretion at the tip of Leadbetter Point has provided new opportunities for plover nesting. This newly-accreted area is subject to inundation by surge tides, so sand-binding vegetation has not formed a protective dune which could reduce catastrophic losses of plover nests.

Damon Point. Three habitat zones were described at Damon Point by Anthony (1987): sandy beach (open dunes), vegetated deflation plain (flat sand surface formed by erosion of sand to the water table), and mudflat. Anthony observed that nesting plovers tended to concentrate on the southeast end of the spit, a recently-accreted area lacking vegetation. In 1985, she estimated one-third of the spit was vegetated, but encroachment of beachgrass in the mid-1980's reduced open area. Accretion outpaced pioneering vegetation from 1988 through 1991, resulting in a net gain of potential plover nesting habitat (E. Cummins, pers. comm.). By 1992, vegetation had spread to cover about two-thirds of the spit (Persons 1992). Vegetation density has continued to increase and likely has become a limiting factor for nest site placement.

The characteristic flora described for Damon Point in the mid-1980's by Anthony (1987) is probably unchanged, although the distribution and abundance of certain species have increased. Plants include European beachgrass (*Ammophila arenaria*), American dunegrass (*Elymus mollis*), American searocket (*Cakile edentula*), European searocket (*Cakile maritima*), red fescue (*Festuca rubra*), large-headed sedge (*Carex macrocephala*), slough sedge (*Carex obnupta*), seashore lupine (*Lupinus littoralis*), Pacific silverweed (*Potentilla pacifica*), and coast willow (*Salix hookeriana*).

Copalis Spit. Griffiths-Priday Ocean State Park is located on that portion of the Washington coast that recently has experienced relatively rapid accretion. The average distance between the high tide line and the vegetation along North Beach increased from 100 m (330 ft) in

1977 to about 162 m (530 ft) in 1987 (Phipps 1990). In a related movement, the mouth of the Copalis River migrated northward 824 m (2,700 ft) between 1952 and 1977 (Phipps and Smith 1978). Persons (1992) described the upper beach and low dunes as good plover nesting habitat, and noted the dunes were less overrun by *Ammophila* than most of the coast.

Westport. A sand spit extending northeast into Grays Harbor has eroded to a minor amount of vegetated habitat unlikely to support plovers. Adjacent to the dunes is a small dredged material disposal area with several unvegetated sections comprised of sand and broken shell.

A recent (December 1993) breach in the Grays Harbor south jetty may be repaired with dredged material, which could be managed as a plover nesting area.

Grayland Beach and Cape Shoalwater to Toke Point. When designated as Willapa National Wildlife Refuge in 1937, Cape Shoalwater had an area of 339 ha (837 ac), largely comprised of sand dunes capable of supporting snowy plover nesting (J. Hidy, pers. comm.). By 1992 the area had eroded to less than 8 ha (20 ac) and included virtually no plover nesting habitat (J. Hidy, pers. comm.). Migrating creek mouths north of the cape maintain very small amounts of relatively unvegetated sand beach. Most of the beach from the cape to Toke Point is narrow and/or too highly developed to be considered potential plover habitat, but a few small sand islands and spits are stable enough to support some vegetation. These potential nesting areas may be subject to periodic inundation and are commonly used by terns and gulls, which probably would exclude plovers. The south tip of Graveyard Spit may present the greatest potential for plover nesting (H. M. Zahn, pers. comm.).

Ownership of Current and Potential Habitat

Leadbetter Point. The north tip of the Long Beach peninsula was incorporated into Willapa National Wildlife Refuge (NWR) in 1968, thereby placing the area under the jurisdiction of the U.S. Fish and Wildlife Service. Lieu lands were accepted by the Washington State Parks and Recreation Commission (WSPRC) for any claims the state may have on the area.

The 1959 sighting of two snowy plovers at Stackpole Harbor (Appendix C) may have been made on land now encompassed by Leadbetter Point State Park, which is managed by the WSPRC.

Damon Point. Damon Point is non-trust state land under the jurisdiction of the Department of Natural Resources (DNR) and is managed cooperatively by the Washington Department of Fish and Wildlife, the WSPRC, and the City of Ocean Shores. Adjacent to Damon Point is the state-owned Oyhut Wildlife Area, which is under the jurisdiction of WDFW.

Copalis Spit. The state owns land along 1.6 km (1 mi) of coastline south of the mouth of the Copalis River. The area is managed by the WSPRC as Griffiths-Priday Ocean State Park.

Westport. Stabilized sand dunes and a dredged material disposal area north of the Westport Airport are on lands owned by the Port of Grays Harbor.

South Beach. The ocean beach between the mouths of Grays Harbor and Willapa Bay is under various ownerships. The WSPRC manages portions of the shoreline at Twin Harbors and Grayland Beach state parks.

Cape Shoalwater to Toke Point. This coastline, measuring roughly 8.5 km (6 mi), is under various ownerships. Portions under the jurisdiction of the U.S. Fish and Wildlife Service as part of its Willapa NWR have eroded to the degree that they no longer include potential snowy plover habitat. Additional areas, many of which are in private ownership, also have little potential for plover nesting. Perhaps the best habitat available to breeding plovers, along Graveyard Spit, is divided between the Shoalwater Indian Reservation and private land.

Newly-accreted Tidelands. Ownership of newly-accreted tidelands along the coast of Washington is clear only in cases which have been addressed in court. The state has been awarded ownership in some cases, while other landowners have been identified in additional cases. Where a specific landowner has not been identified, each newly-accreted land would be addressed separately by the Department of Natural Resources. Often this would lead to ownership by the adjacent upland owner, but this is not a given conclusion. Presently the DNR is operating under a "moving-boundary" theory, unless a court award exists to suggest other interpretations (J. Thomas, pers. comm.).

Development

Permanent settlement of the southern Washington coast in the late 19th century began more than a century of accelerated environmental change for the region. Drainage patterns were altered, spruce forests were logged, roadways were constructed, and land was cleared for pastures and lawns. Townships were founded upon the exploitation of natural resources. It is impossible to determine the effect of such coastal development on the snowy plover population. But each type of development on or near coastal dunes was threatened by the ephemeral nature of those dunes, and efforts were undertaken to control the movement of sand, which in turn threatened plover habitat.

Several types of development construction have occurred in snowy plover habitat in Washington. These include residential and industrial development, as well as construction of jetties, parks, and marinas. Construction in or near snowy plover nesting habitat may affect plover breeding success in two ways. Actual construction can be a disturbance factor depending on the proximity of the activity to the nesting area. Also, facilities which increase the human traffic near plover breeding areas will create longer-term effects. Disturbance related to development is believed to reduce the number of breeding plovers using the affected area and lower their reproductive success (Page and Stenzel 1981).

Snowy plover breeding habitat has been degraded to the extent that many historic nesting areas on the Pacific coast no longer support the species. There has been a 62% decline in the number of breeding sites in California since 1970 (Page and Stenzel 1981) and a 79% decline in the number of breeding sites from historic levels in Oregon (U.S. Fish and Wildl. Serv. 1993a). The number of Washington nest areas has been reduced at least 60%, from five or more sites to only two.

Jetty Construction. Phipps and Smith (1978) summarized the effects of jetty construction and rehabilitation on erosion and accretion. The Grays Harbor South Jetty was completed from 1898 to 1902. Subsidence and erosion of the jetty led to rehabilitation between 1933 and 1939 and again in 1966. The Grays Harbor North Jetty was constructed between 1907 and 1913 and needed to be raised and reconstructed in 1916. Additional reconstruction took place in 1966 and 1975. Phipps and Smith (1978:19) made the following observations:

a) Whether the beaches are eroding or accreting is dependent to a large degree upon the state of repair of the jetty system.
b) The area behind the North Jetty has accreted faster and further west than the land behind the South Jetty.
c) The effect of the South Jetty only extends a couple of miles down (southward) the beach while the accretion next to the North Jetty is probably responsible for the beach configuration up (northward) to Copalis Rocks.

The 1975 rehabilitation of the Grays Harbor North Jetty caused a temporary cessation of accretion at Damon Point by blocking the localized eastward movement of North Beach sands along the north side of the harbor mouth. Gradually, the beach north of the jetty accreted westward until sand "filled" the jetty, allowing movement of sand around the tip of the jetty and eastward, resulting in the significant growth of Damon Point over the past 15 years (D. Schuldt, pers. comm.).

Day-use Parks. Some park construction has occurred at Damon Point and Copalis Spit. A Parks Management Area was established at Damon Point in 1989. Development plans proposed for Damon Point included construction of parking areas, picnic sites, and vault toilets. Plan alternatives described various locations and sizes of the day-use facilities. In 1991, State Parks constructed three parking areas at the point. A five-space entrance parking area included an interpretive sign and two vault toilets. A five-space parking area midway out the spit allows access to the north cove and two picnic sites. At the tip of the spit a 12-space parking area was constructed with three picnic sites, two vault toilets, and an RV pull-through.

In 1984, State Parks established Griffiths-Priday Ocean State Park, which includes the historic plover breeding area at Copalis Spit. The day-use park is located at the base of the spit and includes 35 car stalls and three car/trailer stalls, two picnic sites, horseshoe pits, a

clam-cleaning station, a kitchen shelter, and other amenities. Snowy plover habitat was marked with signs indicating the dune area was closed to public use.

Marinas. The Ocean Shores Marina opened in 1963 and currently is in private ownership. The Westport Marina was constructed in 1929, expanded in 1930, and has been operated by the Port of Grays Harbor since 1930. It has 650 slips.

Ferry Terminal. A public passenger ferry service operated from 1976 to 1983, providing transportation between the Westport Marina and the Ocean Shores Marina for up to 149 passengers per trip. The ferry, 65 ft long, 22 ft wide, and with 4.5 ft draft, carried 12,000 passengers in 1976, 24,000 in 1979, 36,000 in 1980, and 66,000 in 1982 (Swindler and Hagge 1984). In 1984, ferry service ceased due to disputes between the Grays Harbor Transit Authority, the City of Ocean Shores, and the new marina owners. A private passenger ferry service begun in 1984 was inoperational within a year.

In 1987, another vessel began to provide ferry service for up to 71 passengers per trip. The boat's owner estimated up to 22,000 passengers made the trip between Westport and Ocean Shores during 1992, with about two-thirds of the riders originating in Ocean Shores (B. Walsh, pers. comm.). After disembarking at the Ocean Shores Marina almost all passengers travel into the city and therefore do not approach plover habitat. In 1993, the ferry schedule called for weekend trips from 15 May to 25 June and during September after Labor Day. Service was scheduled for 7 days per week through the summer.

Development of a new or rejuvenated ferry terminal at Ocean Shores was considered in the mid-1980's. Five potential sites were investigated, three of which were feasible. The tip of Damon Point was dropped from consideration because of the instability of the spit and the unlikelihood the site could pass an Army Corps of Engineers review. The site also would have been precluded from gaining federal funds due to the presence of the snowy plover, at that time a candidate species for federal listing. The recommended site was on the north side of the Marina, adjacent to present-day docking facilities (Swindler and Hagge 1984).

Routine ferry operations have little to no impact on snowy plovers.

Fishing Pier. A public fishing pier was considered concurrently with Ocean Shores ferry development investigations. Some consideration was given to combining the ferry terminal and the fishing pier. The tip of Damon Point was targeted for the pier, but there was opposition to development at the site. Funding for the proposed pier dissolved under a strained state budget in 1987.

Encroachment of European Beachgrass

European beachgrass (*Ammophila arenaria*) was introduced for sand dune reclamation programs on the west coast of the United States beginning in the 19th century (Wiedemann

1987). The species has a natural ability to spread rapidly, which was greatly enhanced by aggressive stabilization programs in Oregon in the 1930's and 1940's (Schwendiman 1977, Wiedemann 1987). Beachgrass spread profusely along the Washington coast and was well established by the 1950's.

Recent use of European beachgrass for stabilization has occurred north of the Grays Harbor North Jetty. By 1976, dune growth had raised the level of the dune as high as the jetty, which caused northerly winds to blow sand into the channel entrance (Phipps and Smith 1978). To stabilize the area, a planting project to introduce beachgrass over 0.8 ha (2 ac) was implemented by the City of Ocean Shores and the Soil Conservation Service. Beachgrass was used recently to repair breaches in the dune along the Long Beach peninsula, and during construction at Griffiths-Priday Ocean State Park bunches of beachgrass were transplanted to stabilize dunes in the developed area.

Beachgrass thrives on burial under shifting sand. It alters the dune structure, forming a high foredune unlike the hummock formations created by native species. Vegetative composition and proportion of vegetation coverage depart from native characteristics following establishment of European beachgrass. Snowy plovers lose preferred habitat to the encroachment of this exotic plant. In 1988, the spread of beachgrass was termed an "increasing threat" to traditional snowy plover nesting areas at Leadbetter Point, having become established where absent 4 years earlier (Willapa NWR 1988).

Stabilization of dunes with other plant species sometimes has been intentional, but invasive species often become established without assistance. Scotch broom (*Cytisus scoparius*), gorse (*Ulex europaeus*), and shore pine (*Pinus contorta*) have invaded the dunes of south coastal Oregon, not only reducing plover habitat but also allowing native mammalian predators (especially striped skunks) greater access to nesting areas (Stern et al. 1991a). A similar vegetative condition is evolving at Leadbetter Point.

The abundance and diversity of sand dune arthropods are markedly depressed in areas dominated by European beachgrass (Slobodchikoff and Doyen 1977). Plovers may shift foraging activity away from sites which support a reduced prey base.

Means of control for European beachgrass include manual digging, salting, burning, cutting, and use of herbicides. Manual digging is the method of choice at the Lanphere-Christensen Dunes Preserve in Arcata, California (Van Hook 1983). This method is effective for controlling beachgrass, but is labor-intensive (Pickart et al. 1990). Salting with rock salt may be effective, but precipitation can dilute the solution to a less-than-lethal level. Summer applications could reduce the possibility of overdilution, but would pose a threat of disturbance to plovers if conducted near active nesting areas. Salting with seawater may be effective, although there may be some risk of contamination if it is used above freshwater lenses. Testing of this method using about 1 m of seawater may begin in 1995 in Oregon (G. Dorsey, pers. comm.). Herbicides that have been utilized elsewhere have included

Rodeo, Round-Up, and Valpa L. (Use of trade names does not imply endorsement by the Washington Department of Fish and Wildlife). The most effective period for herbicide treatments is during the *Ammophila* flowering stage in mid- to late-May (Wiedemann 1987).

Resource Extraction

Dredging and Dumping. The U.S. Army Corps of Engineers has maintained a channel for navigation in Grays Harbor since 1905. Recently, to improve the efficiency of present and future deep-draft vessel navigation, the Corps prepared an Environmental Impact Statement (EIS) for widening and deepening of the channel (U.S. Army Corps Eng. 1989). Three types of dredges—hopper, pipeline, and clamshell—were considered for different locations and phases of the operation. The EIS specified sites where disposal would take place and described potential impacts of dredging and disposal. After initial construction the Corps estimated almost 3 million cubic yards of dredged material would be removed from the channel annually, with disposal occurring primarily at two open-water ocean sites. Two open-water estuary sites (north of Point Chehalis and north of the South Jetty) and two confined Aberdeen sites were selected for disposal of some dredged material. Upland alternatives for disposal were not considered feasible due to low capacity and difficulty of material transport.

Dredge spoils can offer important nesting habitat for plovers, but apparently are not used by plovers in winter, nor is dredged material a preferred foraging habitat (Wilson-Jacobs and Dorsey 1985).

Sand Removal. Extraction of sand, for use primarily as fill at construction sites and cranberry bogs, has occurred at Damon Point and on the Long Beach peninsula. Under management agreements, the Sand Extraction Area at Damon Point became part of the Wildlife Management Area when the lease for extraction activities was not renewed. Historically, low levels of sand mining activity had little direct effect on snowy plovers at Damon Point, however the location of the activities formed a "wedge" of disturbance into potential nesting habitat. A road constructed to the Sand Extraction Area caused an increase in recreational uses and associated vehicular and pedestrian traffic. This road was breached over time by tidal action and was not repaired, but habitual use by recreationists continues.

The Pacific County Planning Department and the City of Long Beach may issue permits for sand-removal from beach access roads and private property. Sand removal is not permitted within Willapa National Wildlife Refuge.

Driftwood Removal. Driftwood is taken from sand beaches and dunes for firewood and for decorative purposes. Snowy plovers often select nest sites with driftwood as a component, so removal of the wood may reduce nest-site availability. Driftwood also contributes to dune-building and adds organic material to the sand as it decays.

Irrigation. Water diversion may adversely affect snowy plover habitat when streams which supply inland lakes are diverted for irrigation. Reducing freshwater inflows to alkaline or saline basins may reduce the amount of habitat available for plover nesting, as may allowing groundwater levels to fall to the extent that seeps and springs might dry artificially (Wilson-Jacobs 1986). Water levels raised during the nesting season may cause nests to flood or broods to drown. The depth and salinity of inland lakes may influence prey availability (Wilson-Jacobs 1986).

CONSERVATION STATUS

Legal Status

In 1981, the Washington Wildlife Commission listed the snowy plover as endangered under Washington Administrative Code 232-12-014. The species has been listed as threatened in Oregon and is considered a species of special concern in California. The Pacific coast population of the western snowy plover was placed on the federal list of threatened species effective 5 April 1993 (U.S. Fish and Wildl. Serv. 1993a).

Critical Habitat

The U.S. Fish and Wildlife Service designates critical habitat to help protect federally-listed endangered or threatened species. Based on selection criteria for Washington sites, four areas have been suggested for critical habitat designation: Copalis Spit, Damon Point and Oyhut Wildlife Area, Cape Shoalwater vicinity, and Leadbetter Point. These sites currently support nesting or wintering plovers, or represent historic nest sites that form an important part of the species' range. The following synopsis of the meaning of critical habitat is exerpted from U.S. Fish and Wildlife Service (1993b:7-8):

> Critical Habitat is a regulatory term describing the areas of land, water, and air space containing the physical and biological features essential for the survival and recovery of Endangered or Threatened Species. ...Section 7 of the Endangered Species Act requires federal agencies to evaluate the effects that any activities they fund, authorize, or carry out may have on Endangered or Threatened species. ...The designation has no impact on individual, town, county, or state actions if there is no Federal involvement, nor does it signal any intent of the government to acquire or control the land.

Management Activities

Grays Harbor Estuary Management Plan. The Grays Harbor Regional Planning Commission formed an Estuary Planning Task Force in late 1975. In September 1976, the task force received funds through the Grays Harbor Regional Commission and the Washington

Department of Ecology to prepare the Grays Harbor Estuary Management Plan (GHEMP). GHEMP does not eliminate or modify any federal, state, or local laws. It attempts to meld authorities and concerns for protection and development of the area's economic and natural resources. It provides guidance to the decision-making process; it does not make decisions itself. Damon Point is assigned to the category "conservancy managed."

The purpose of a conservancy managed categorization is to protect an area for purposes that directly use or depend on natural systems. The intent is not necessarily that conservancy managed areas will be preserved in their natural state, but the activities which occur in such areas are meant to be compatible with the natural systems. Recreational uses in conservancy managed areas are expected to be water dependent and designed to maintain the quality of the natural features of the area.

Damon Point Agreement. In October 1984, representatives from several agencies began to meet for discussions related to their disparate interests in management or development of Damon Point. The eventual result of these meetings was an Interagency Agreement for Management of the Damon Point Multiple Use Area (Damon Point Agreement), which became effective 5 February 1989. Signatories to the Damon Point Agreement were the Washington Department of Natural Resources (DNR), Washington Department of Wildlife, Washington State Parks and Recreation Commission, and the City of Ocean Shores. The intent of the Damon Point Agreement was to allow development for public recreational uses while setting aside a Protection Area for nesting habitat of snowy plovers. The Agreement is scheduled for review early in 1995 to resolve problems concerning implementation or to address issues not adequately addressed in the Agreement.

Prior to the 1994 nesting season, a portion of the snowy plover Protection Area was posted as closed to public entry by a Washington Conservation Corps crew under the supervision of the Department of Ecology.

Griffiths-Priday Ocean State Park. The Environmental Impact Statement for the development of this State Park, issued in 1984, identified possible displacement or continued displacement of the snowy plover as a potential impact of the project. State Parks also recognized that increased recreational use of the area could "spill over" into plover nesting habitat, but believed most visitors would not find the open areas as attractive for recreational pursuits. An area with good potential for plover use was marked for protection with the installation of "no entry" signs prior to the 1985 plover nesting season.

Leadbetter Point. The tip of the Long Beach peninsula was added to Willapa Bay NWR in 1968. At that time Leadbetter Point comprised 580 ha (1,433 ac), of which about 445 ha (1,100 ac) were dunes. In 1989, 690 ha (1,705 ac) at the point were set aside as a Research Natural Area.

Snowy plover nesting habitat has been closed and posted annually since 1979. Signposts originally were placed at intervals of about 320 m (1,050 ft) along the ocean side of the habitat. Spacing between signs around the protected area was reduced to about 50 m (about 150 ft) in 1993. Also in 1993, the interior side of the protection area was posted to reduce intrusions by hikers from the south and east. Approximately 125 ha (310 ac) are affected by the closure, which is in place from 15 March to 31 August. The U.S. Fish and Wildlife Service has enforcement jurisdiction for the upland areas of Leadbetter Point. State Parks, the Pacific County Sheriff Department, and WDFW conduct beach patrols and notify USFWS of plover protection area violations.

Predator Exclosures. Using exclosures to protect individual plover nests from avian or mammalian predators is an effective method for increasing nest success (Rimmer and Deblinger 1990, Stern et al. 1990b, Stern et al. 1991a, Craig et al. 1992, Melvin et al. 1992, Parker and Takekawa 1993). However, Parker and Takekawa (1993) suggested exclosures may have drawn attention to otherwise cryptic plover nest sites. They recorded low fledging success (21% in 1992) and assume red foxes preyed upon chicks after their departure from exclosures. The authors also suspected adult survival may have been affected by use of exclosures. Craig et al. (1992) warned that use of exclosures could be a labor-intensive, short-term solution to a problem best dealt with at a landscape level.

After evaluating several exclosure designs used for piping plovers (*Charadrius melodus*), Deblinger et al. (1992) recommended exclosures be made of metal fencing with a mesh of 2 $\times$ 2 in or 2 $\times$ 4 in, supported by at least four sturdy metal or wooden fence posts. They also suggested fencing should be buried by at least 20 cm (8 in) of sand and extend at least 90 cm (3 ft) above the sand. Stern et al. (1990, 1991) modified the recommended exclosures by adding a "roof" of dark twine spaced 15-20 cm (6-8 in) apart in parallel rows. This increased the exclosures' effectiveness against avian predators.

Completed cages can be installed by two people in about an hour (Stern et al. 1991a). Installation is done after clutches are completed and care must be taken to protect eggs from chilling or overheating during the work.

Electric fencing was used in North Dakota to reduce mammalian predation of piping plovers (Mayer and Ryan 1991). The fencing can be installed to contain a large area of potential nesting habitat prior to arrival of the plovers, minimizing disturbance during the breeding season. It also may be left in place from year to year, which reduces maintenance. Electric fencing probably has little influence on avian predators.

Captive Rearing. In a California study, snowy plovers hatched in captivity were able to reproduce successfully after their release into the wild (Page et al. 1989). The researchers suggested methods to improve the hatching success and survival of juveniles in a captive setting.

FACTORS AFFECTING CONTINUED EXISTENCE

Disturbance

Human activities may disrupt snowy plovers in four general ways, as stated by Hoopes et al. (1992) in reference to piping plovers: flushing of feeding birds; flushing of roosting or incubating birds; direct mortality from off-road vehicles, pedestrians, or pets; and compaction of foraging habitat by vehicles, thereby reducing availability of prey. Plovers disturbed by human activities will usually respond by shifting from foraging and energy conservation behaviors to vigilance and cryptic predator avoidance behaviors (Flemming et al. 1988, Hoopes et al. 1992).

Vehicles. The use of motor vehicles on coastal dunes has a destructive impact on dune vegetation, which destabilizes the dunes and causes alterations in their growth and form. More importantly to the snowy plover, driving in breeding habitat causes destruction of eggs, chicks, and adults, abandonment of nests, and considerable stress to plover family groups (Page 1986, Anthony 1987, Craig et al. 1992). Plovers often run away from vehicles, but adults and chicks may crouch in depressions such as footprints or tire tracks, making them vulnerable to collisions (Hoopes et al. 1992). Flemming et al. (1988) found piping plovers to be less disturbed by vehicles than by pedestrians, perhaps increasing the collision risk. However, Hoopes et al. (1992) found piping plovers to be more tolerant of pedestrians than ORV's.

The 1988 Washington State Legislature amended the Seashore Conservation Area Act to allow vehicles on a maximum of 60% of each beach area between 15 April and the day following Labor Day. Rules and regulations for beach driving are the same as those on city streets. Local law enforcement agencies are responsible for beach patrols.

The northernmost 10.7 km (6.7 mi) of beach along the Long Beach peninsula have been closed to vehicles on a year-round basis, except for access to clam beds during the razor clam season (City of Long Beach 1989). In 1981, the razor clamming season brought an unprecedented number of clammers to Leadbetter Point. An average of about 325 automobiles (maximum 643 on 6 June) per clam tide (0.5' and lower) parked on the beach adjacent to the West Flat plover nest area, effectively isolating the birds from potential foraging areas. State Parks implemented a beach-driving ban from 1 July to 1 October that year, which protected renesting and late-nesting pairs. Occasional vehicle use continues during clam seasons at Leadbetter Point, but disturbance is considerably less than it was a decade ago (J. Hidy, pers. comm.).

North Beach areas in the vicinity of snowy plover habitat have been placed in pedestrian/non-motorized use areas. These include a restriction from 15 April to the day following Labor Day on a 2.9 km (1.8 mi) length of beach from the North Jetty north to Marine View Drive in Ocean Shores and a year-round closure on a 2.4 km (1.5 mi) length of beach from Benner

Gap Road north to the north bank of the Copalis River. In both cases, vehicular access is permitted during razor clam seasons.

At Damon Point, operation of motor vehicles is allowed only on the gravel road which runs the length of the north side of Damon Point (Fig. 3). Grading of this road is the responsibility of the City of Ocean Shores and is scheduled to occur every 6 months. Operation of off-road vehicles is not allowed on Damon Point in accordance with Washington Administrative Code 332-52-030. State Parks and WDFW are responsible for enforcement of vehicle use in their respective Management Areas. The City of Ocean Shores has agreed to cooperate with state agencies to enforce restrictions on vehicle use.

The Damon Point Road was completed in 1975, at which time disturbance to plovers increased over the low level experienced in the early 1970's (G. Hoge, pers. comm.). During the early 1980's recreational use of Damon Point continued to grow, accompanied by increased use of off-road vehicles. There was a trend toward ATV's and ORV's as the vehicles of choice among dune riders (E. Cummins, pers. comm.). In 1985 and 1986, two off-road vehicle rental businesses operated on the spit at Damon Point without state permits. The illegal motorized activity encouraged private owners of off-road vehicles to bring their machines to the spit. In October 1984, the Damon Point Interagency Task Force began to meet to address issues including off-road vehicle use. In July 1986, the Ocean Shores City Council requested that the Department of Natural Resources ban completely any use of off-road vehicles on Damon Point. In April 1987, signs were erected at Damon Point to inform the public that off-road vehicles were banned.

Anthony (1987) observed dozens of motor vehicles in habitat where snowy plovers were nesting during 1985 and 1986 (Table 4), and reported nesting success was significantly higher in areas without off-road vehicle use. Hundreds of vehicles were observed in potential habitat and in habitat unsuitable for plovers. Anthony counted 90 parked vehicles at the point on a day of particularly high use. Counts on holiday weekend days included one of 36 and another of 50. This situation was exacerbated by the construction of a gravel road to the Sand Extraction Area, which provided a de facto parking area within potential snowy plover nesting habitat. Illegal use of the area for parking allowed easier public access to the south beach, which led to a greater level of disturbance from beachcombers and fishing parties.

The 1989 Damon Point Agreement prohibited off-road vehicle use at the point, but illegal use continues. Persons (1992) reported an apparent reduction of 4-wheeled vehicles, but indicated tracks of 2-wheeled vehicles were common and widespread. When off-road vehicle use at Damon Point is reduced, the area becomes more inviting for other recreational uses, such as fishing, beachcombing, and birdwatching, etc. (E. Cummins, pers. comm.). Pedestrian disturbance then becomes more important.

Table 3. Numbers and types of incursions into different habitats at Damon Point during 2 years. Data were collected on 17 days in 1985 and 28 days in 1986. Visits averaged 5 hours (from Anthony 1987).

	Usable habitat				Potential habitat				Unusable habitat			
	1985		1986		1985		1986		1985		1986	
Type of disturbance	N	%	N	%	N	%	N	%	N	%	N	%
VEHICULAR												
Automobiles, trucks, RV's	9	4	51	9	206	49	224	41	208	91	491	73
3- & 4-wheeled vehicles	88	42	409	68	61	15	135	25	7	3	160	24
Dune buggies	5	2	3	1	0	0	0	0	0	0	0	0
Motorcycles	2	1	9	2	2	1	4	1	0	0	7	1
Subtotal	104	50	472	79	269	65	363	67	215	94	658	98
OTHER												
Pedestrians	74	36	69	12	55	13	68	12	9	4	6	1
Anglers	19	9	35	6	93	22	89	16	0	0	0	0
Clammers, shrimpers	8	4	2	1	0	0	0	0	0	0	5	<1
Tenters	3	1	3	1	0	0	3	1	5	2	3	<1
Subtotal	104	50	128	21	148	35	183	33	14	6	14	2
Total	208	100	600	100	417	100	546	100	229	100	672	100

Pedestrians. Human disturbance causes adults to flush from nests, leaving eggs exposed to weather, predators, or accidental crushing. Page et al. (1977) found that when pedestrians approached snowy plovers, adults left their nests 78% of the time when people were within 1-50 m, 65% of the time when within 50-100 m, and 34% of the time when within 100-250 m. At heavily-disturbed sites some tolerance may be exhibited by the plovers (Page et al. 1977). Research on the ecologically similar piping plover indicated adults had a higher-level response to pedestrians than to predators or non-predatory species (Flemming et al. 1988). The researchers also found behavior of piping plover chicks was affected when pedestrians approached within 160 m. Chicks which are left unbrooded when the adults react to people are more susceptible to predation and are put at risk of chilling in inclement weather.

At Damon Point, Anthony (1987) observed that most people preferred to walk on the shoreline and hard-packed sand of the open beach, as opposed to soft sand and heavily vegetated areas of the upland. However, pedestrians often crossed through snowy plover habitat to reach the preferred hiking areas after parking along the gravel road. A de facto route across the dunes appears to receive escalated use by fishermen since the recent shift toward the south shore of the spit as a favored fishing area (E. Cummins, pers. comm.).

It is difficult to measure the effects of human disturbance on snowy plover nesting success. Woolington (1985) was unable to quantify a direct relationship between nest success and disturbance at some Oregon areas, but her observations were restricted to a limited portion of the plover nesting season. Likewise, Hoopes et al. (1992) found no correlation between rates of disturbance and percentage of chicks fledged or mean chicks fledged per pair, but they noted that protective management actions were in place at their sites. During the 1981 nesting season at Leadbetter Point, production of young per nest was higher in undisturbed areas than in disturbed areas (Widrig 1981).

Pets. Snowy plovers react to dogs as predators, flushing from their nests when dogs approach (Page et al. 1977). Plovers flush sooner and remain off nests longer when dogs accompany people, compared with pedestrians without dogs. Unleashed dogs have been seen chasing snowy plovers, which probably lowers nesting and fledging success (Page et al. 1977, Woolington 1985). Hoopes et al. (1992) reported two piping plover nests were destroyed by dogs.

Equestrian Traffic. Horse riders on the beach sometimes enter nest areas and disturb plovers or crush nests, as has occurred in Oregon and California (Woolington 1985, Page 1988, Craig et al. 1992). Equestrian traffic is allowed only on the drivable beach or on designated trails, but horses have been observed in and near snowy plover habitat at Damon Point (Anthony 1987, Fox 1990).

Fishing. Surf fishing has indirect impacts on plover nesting. Human activity near plover habitat disturbs adults and chicks. Improper disposal of offal, bait, and litter attracts crows, ravens, and gulls, which are predators of plover eggs and chicks. At Damon Point, anglers fish primarily for redtail surf perch (*Amiphistichus rhodoterus*). The most popular season for this fishery is April through July. Anthony (1987) saw most anglers using the southern shoreline, with fewer frequenting the tip of the spit. This preference is still shown by fishermen (K. Sargent, pers. comm).

Shellfishing. Ocean beaches are closed for harvest of all clams (except razor clams), oysters, scallops, and mussels from 1 April through 31 October each year due to the risk of paralytic shellfish poisoning (PSP or "red tide"). Razor clam openings are sometimes halted coast-wide or at certain locations due to the presence of PSP or for other reasons. Spring season razor clam seasons typically take place between mid-March and mid-May on morning tides. Fall season openings are late enough in the year not to conflict with plover breeding.

Razor clam beds are defined as the portion of Pacific Ocean beaches west of a line 153 m (500 ft) seaward and parallel to the base of the primary dune or cliff (Washington Administrative Code 220-16-257). Also defined as razor clam beds are those portions of the mouths of Grays Harbor and Willapa Bay which contain razor clams.

Annual distribution of razor clams along the Long Beach peninsula varies. During typical years, clams are distributed somewhat evenly along the beach, with higher productivity on the northern half. Every few years, however, higher concentrations are found on the northern one-quarter of the peninsula. The level of harvest effort near the Leadbetter Point plover breeding area may increase during such years.

Harvesting of razor clams may have indirect impacts on snowy plovers. Clammers in the vicinity of plover nesting areas disturb adults and chicks, and human activity in feeding areas may restrict plover foraging activity. Vehicle closures on ocean beaches provide an exception for the razor clam season, so motorized traffic increases near plover habitat when clam harvests and plover breeding seasons overlap.

An extensive razor clam population was found at Leadbetter Point in 1981, attracting thousands of clammers to the tide flats (Widrig 1981). Plover nesting areas were posted and patrolled. Clammers and other beachcombers were informed of the presence of the sensitive birds. However, far too many people approached the posted area to be intercepted by U.S. Fish and Wildlife Service enforcement personnel, and more than 200 people entered nesting habitat. Early nesting efforts by eight pairs of plovers took place in the vicinity of clamming flats and resulted in only 0.75 young fledged per nesting pair. Later-nesting pairs, some of them having failed in initial attempts, moved away from disturbed areas and fledged 2.0 young per pair.

Beginning in 1982, informational flyers were distributed to razor clammers at the time they received licenses. The flyers, produced by Willapa Bay NWR, briefly described the sensitivity of snowy plovers and included a map of the restricted area at Leadbetter Point.

In 1983, *Nucleobacterium siliqua*, a parasite dubbed NIX, killed millions of razor clams on the Washington coast and prompted a state-wide closure to clamming. Limited harvesting was permitted beginning in 1986 and there have been limited seasons since that time.

Ghost shrimp and mud shrimp can be harvested year-round from all public beaches, with a daily limit of 10 dozen shrimp. Shrimpers are sometimes active on the flats south of the Ocean Shores Marina.

Contaminants

Oil Spills. No acute or chronic mortality of snowy plovers due to oiling has been documented. However, plovers chase the surf line as they forage and will risk contamination during spills. A major oil spill off the coast of Washington during the breeding season (March through August) could destroy the species' nesting attempts and potentially decimate the state population. Chapman (1984) concluded snowy plovers on the barrier beaches of Texas were "not highly vulnerable" to oil spills, in part because of their limited use of the foreshore. But snowy plovers were stained with oil from a leaking tanker near San

Francisco Bay (Moffitt and Orr 1938), and G. W. Page (pers. comm.) reported observing snowy plovers with soiled plumage following two additional oil spills. Following the Gulf War, most Kentish plovers within oiled zones of the Saudi Arabian coast were contaminated, with 44% of 522 birds showing oil over at least 10% of their plumage (Evans and Keijl 1993).

In a recent review, Burger and Fry (1993) explained that swallowing small amounts of preened oil may lead to multiple physiological changes in birds. These include pathological effects on the alimentary tract, blood, adrenal glands, kidneys, liver, and other tissues and organs. Reproductive performance may be impaired as well. There is evidence that ingested oil causes delayed maturation of ovaries, altered hormone levels, thinning of eggshells, reduced egg productivity, reduced survival of eggs and chicks, reduced chick growth, and abandonment of nests by adults. Oil transferred to eggs from plumage or feet of incubating birds can kill embryos (Albers 1977, Albers and Szaro 1978, King and Lefever 1979).

Oil or other chemicals washed onto mud flats or sand beaches may also have an indirect impact on plovers by reducing the availability of invertebrate prey (Kindinger 1981, Tunnell et al. 1981).

Trace Elements. Selenium, a naturally-occurring trace element, may concentrate in agricultural drainage ponds, which are favored breeding areas for plovers at interior locations (Bradford et al. 1991). Although selenium can cause severe deformities in embryos and chicks of some species, snowy plovers appear to be relatively unaffected. The low susceptibility is thought to result from snowy plovers' high adaptation to saline environments (J. Skorupa, pers. comm.). However, reduced hatchability of eggs has been seen at one site in the Tulare Basin (J. Skorupa, pers. comm.). A sample of 47 randomly-collected eggs from seven study sites showed low selenium contamination, with only three eggs containing above 40 ppm (dry wt) and another seven eggs containing above 20 ppm. None of the 10 eggs with >20 ppm selenium contained abnormal embryos.

Pesticides. Alberto and Nadal (1981) analyzed eggs of 10 bird species for the presence of organochlorine insecticide residues and PCB. Snowy plover eggs had neither the highest nor the lowest overall concentration of residues of the species examined. However, concentration of dieldrin (mean 0.208 ppm/wet wt) was higher in plover eggs than in those of other species. Other mean concentrations included: PCB 2.696 ppm, DDE 1.560 ppm, and TDE 0.186 ppm. Ten eggs collected near Abert Lake, Oregon underwent similar testing (U.S. Fish and Wildl. Serv., unpubl. data). Organochlorine levels were below 0.05 ppm for all analytes except DDE, which was found at concentrations up to 0.19 ppm.

Transitory Nature of Favored Habitat

Accretion and erosion can affect the location and timing of plover nesting by increasing or reducing available habitat. Storm-induced flooding and erosion can eliminate habitat and

destroy plover nests in the affected zone (Page et al. 1983, Widrig 1979, Willapa NWR 1987). Even without a storm surge, higher high tides sometimes destroy nests by flooding (Warriner et al. 1986, Craig et al. 1992).

Because coastal sand dunes also are reshaped by strong winds, plover nests are sometimes buried under drifting sand (Willapa NWR 1988, 1989). Adults disturbed by humans or predators may remain off their eggs long enough for blown sand to cover them (Warriner et al. 1986, Craig et al. 1992).

The increased density of vegetation associated with dune stabilization will gradually lessen the amount of available nesting habitat in a given area.

Adverse Weather Conditions

Heavy rainfall can flood nests or chill unbrooded chicks (Warriner et al. 1986), while hail can damage untended eggs (Grover and Knopf 1982). Interior locations are subject to periodic drought and flooding (Grover and Knopf 1982, Paton and Edwards 1992). Drought can cause lakes to dry, while large-scale flooding can cover breeding areas with water; in both cases nest site availability is reduced.

Interspecific Relationships

Prey availability will influence snowy plovers, but little is known about plover dietary requirements and potential effects of variable prey densities on plover populations. More is known about plover relationships with vertebrates. At least seven species each of birds and mammals are known or expected to be predators on plover eggs, chicks, or adults in Washington, Oregon, or California. Among these, ravens, crows, gulls, and coyotes are the most likely to plunder nests at Washington nest sites. In addition, large mammals such as horses and deer may accidentally crush eggs when walking in nesting habitat.

CONCLUSION

Snowy plovers in Washington are found only on estuary-backed coastal sand spits where vegetation is sparse. The species formerly was more widespread in the state and was found in greater numbers than at present. The decline has continued during the past decade.

Vehicles and pedestrians in and near plover nest areas can reduce reproductive success. Introduced vegetation is expanding into open dune areas to reduce nesting opportunities. Predators may have increased in abundance following the growth in recreational use of potential plover habitat. Management activities must be implemented to reverse the decline in plover numbers in Washington. Part Two of this Recovery Plan describes recommended actions.

PART TWO

RECOVERY

RECOVERY GOAL

The goal of the snowy plover recovery program is to outline strategies which, when implemented, will enhance snowy plover habitat and numbers to a level where there is a high probability of continuous nesting through the foreseeable future.

RECOVERY OBJECTIVES

The snowy plover will be considered for downlisting from State Endangered status when the state supports:

1. A minimum 4-year average of at least 25 breeding pairs.
2. Average production of at least one fledged young per breeding pair per year.
3. Two or more active breeding areas with secure habitat.

The snowy plover will be considered for downlisting from State Threatened status when the state supports:

1. A minimum 4-year average of at least 40 breeding pairs.
2. Average production of at least one fledged young per breeding pair per year.
3. Three or more active breeding areas with secure habitat.

Rationale

In determining the population objective, a "minimum viable population" approach has been avoided in favor of re-establishing the number of plovers estimated to have existed in Washington prior to their decline. Snowy plovers in Washington live at the edge of a coastal range that extends to California, so the sub-population will continue to rely upon immigration for long-term persistence with genetic mixing.

Population objectives are based on the long-term ability of Leadbetter Point, Damon Point, and Copalis Spit to support breeding populations of snowy plovers. The known recent capacity of active breeding areas is at least 20 pairs. With vegetation management and continuing habitat and plover protection, it is believed that Leadbetter Point and Damon Point can each support higher population levels, and that Copalis Spit and other sites can support additional pairs.

Productivity objectives are based on the analysis of Page et al. (1985), who estimated 0.8 young per breeding female per year would be required to maintain a stable population.

Habitat objectives combine geographic dispersion with removal of threats, to create a core range for the population from which individuals can colonize underutilized habitat elsewhere in the state.

When a recovery plan for the Pacific coast population of the western snowy plover is prepared by the U.S. Fish and Wildlife Service, criteria will be established for delisting the species throughout its Pacific coastal range. Delisting from State Threatened status will occur when both state and federal objectives have been met.

Reclassification criteria may be reassessed, and changed if necessary, as new information becomes available.

RECOVERY STRATEGIES AND TASKS

1. Monitor the snowy plover population.

Knowing the distribution, abundance, and breeding success of snowy plovers is essential to making informed management decisions.

1.1. Determine population trends through annual surveys of abundance, distribution, and productivity.

An annual inventory of the numbers, location, and productivity of breeding pairs is needed to provide baseline data from which to monitor population trends, recruitment, changes in distribution, and other population parameters. Guidelines have been developed to maximize the efficiency and accuracy of the surveys and to minimize disturbance. Monthly site visits during the breeding season usually will allow only rough estimates of activity. Weekly visits should provide accurate estimates of population size and nesting activity. More frequent visits should provide greater accuracy and more confident measures of productivity parameters. One coordinated coastwide survey should be undertaken at the middle of the breeding season. Surveyors should identify existing and potential threats to plovers and their habitats during surveys.

1.2. Determine the distribution and abundance of wintering plovers.

To determine patterns of snowy plover distribution and abundance during the non-breeding season, an annual inventory of snowy plover numbers and locations should be undertaken between November and February. Ongoing censuses coordinated by the National Audubon Society (Christmas Bird Counts) and Point Reyes Bird Observatory may be incorporated into the survey design.

2. Protect the snowy plover population.

Factors limiting the distribution, abundance, and breeding success of snowy plovers must be identified and specific management strategies developed and implemented.

2.1. Reduce pedestrian disturbance.

People walking through or near snowy plover nesting habitat can reduce nesting success. Where appropriate, signs must be posted to inform beach users of the potential presence of nesting birds. Signs should be placed at access points and around breeding and foraging areas. They should provide adequate buffer zones while allowing for practical enforcement (Section 4). Rope fences may be used in some smaller areas.

2.1.1. Limit vehicular access in the vicinity of plover breeding areas.

Reducing accessibility for vehicles can limit the number of pedestrians and pets in the vicinity of plover nest areas. Maintenance of access roads may be discontinued and road closures may be considered. When razor clam seasons overlap with plover activity periods, site-specific alternatives to reduce disturbance should be evaluated and implemented.

2.2. Restrict pets from plover breeding areas.

Attended or unattended pets represent a common but manageable form of human-associated disturbance. Measures to prohibit or restrict pets on all plover nesting and feeding sites need to be implemented and enforced (Section 4).

2.3. Eliminate vehicular disturbance and mortality.

The use of off-road vehicles may prevent breeding plovers from establishing nesting territories and is a source of mortality for eggs and chicks. Off-road vehicles should be prohibited from plover nesting areas and restricted in foraging areas (Section 4). Regulatory signs should be installed to inform users of closed areas.

Beach driving can prevent plovers from using preferred foraging areas and may limit the distribution of breeding birds. Methods to limit the impacts of beach driving on plovers should be evaluated and implemented.

2.4. Reduce predation.

Mammalian and avian predators represent a major threat to snowy plover populations and significantly reduce the number of young produced at many plover breeding sites. Predation of nests is almost never directly observed, but evidence at and near sites of plundered nests often suggests the responsible species. Predation incidents will be described during monitoring surveys (Section 1.1). Investigations should be pursued to determine the relative impacts of various predator species at each breeding area and to determine appropriate responses (Section 7.5).

2.4.1. Reduce litter and garbage in and near snowy plover nesting areas.

Litter, garbage, offal, and other discarded waste attract predators known to prey on plover eggs. Regulations prohibiting the unlawful discharge of waste should be enforced (Section 4). Removal of waste products from the vicinity of plover breeding areas is essential to reducing the effects of predation.

2.4.2. Implement predator control measures as necessary.

The use of predator exclosures can significantly reduce the effects of predation on plover nests. Exclosure designs used elsewhere in the plover's range can be duplicated in Washington to improve hatching success. However, in some cases, exclosures may increase adult or chick vulnerability to predation. Therefore, careful evaluation of the benefits and potential harm of exclosures will be essential prior to their use. In addition, consultation with the U.S. Fish and Wildlife Service will occur before exclosures are deployed.

Electric fencing can be an effective method to control mammalian predation, but may have little application in Washington.

Removal of predators by live-trapping, nest destruction, poisoning, or shooting may be considered where other management options fail.

2.5. Protect plovers from contamination caused by oil or chemical spills.

Oil pollution and contaminants pose threats to plovers. Oil spill response teams can help minimize damage to habitat and birds by preventing oil from reaching the shore, reducing disturbance in affected zones, and promptly initiating survival enhancement efforts. During the breeding season, 15 March through 31 August, precautions must be taken to minimize disturbance of nesting birds.

2.5.1. React to habitat damage caused by oil spills.

Oil should be prevented from coming ashore in plover nesting and foraging areas. Where beaches are contaminated, rapid cleanup of deposits at the surf line and the high tide line may prevent plovers from coming in contact with oil while roosting or foraging. However, plovers nesting near deposition zones may be significantly disturbed by cleaning crews. Specific spill response activities will need to be determined on a case-by-case basis. Deposition of a clean wrack line (algae deposits at the high tide line) may be considered to provide fresh substrate for invertebrate prey.

2.5.2. Respond to plover contamination.

Substantial disturbance to nesting birds may result from attempts to capture plovers contaminated during the breeding season. Disturbance during the non-breeding season is a less critical factor in deciding whether to capture oiled birds for cleaning. Treatment actions for oiled plovers should be coordinated with the WDFW Spill Response Team, in addition to the WDFW Endangered Species Program and the U.S. Fish and Wildlife Service. If plover losses are substantial, captive rearing (Section 9.1) or captive breeding (Section 9.2) may be considered.

3. Manage habitat to increase plover abundance and productivity.

The snowy plover population has experienced alterations to its habitat which limit the viability of the species in Washington. Data from elsewhere in the species' range suggest it will respond positively to management activities designed to improve the suitability of habitat. The amount of habitat required for the achievement of the recovery objective should be determined and sites at which the snowy plover will be managed for recovery must be defined. Ultimately, habitat must be secure for long-term viability of the recovered population.

3.1. Determine ownership and management of sites used by breeding plovers.

Much of the existing coastal nesting habitat has limited protection from development through public ownership. The discovery of new breeding areas will require determination of ownership and land use practises, to allow coordination of plover management activities with land owners and managers.

3.2. Pursue ownership or management of plover habitat.

Needs of snowy plovers can be met most effectively when habitat is dedicated for the management of the species.

3.2.1. Evaluate fee acquisition of key sites through purchase, land exchanges, or charitable donations.

The Department may acquire land where snowy plovers breed, forage, and/or winter. Priority should be given to active and potential nesting areas where protection is less than optimal and where management for snowy plovers has a reasonable chance of success.

3.2.2. Evaluate less-than-fee protection of land occupied by snowy plovers.

Conservation easements and tax incentives such as open space designation may be used to encourage private landowners to protect snowy plover habitat. State lands may be designated Natural Area Preserves or Conservation Areas.

3.3. Evaluate the suitability of existing and potential nesting habitat to support an expanded breeding population.

Since the mid-1900's there has been a significant decline in the amount of plover habitat in Washington. Evaluation of habitat suitability for plovers will allow refinement of recovery objectives and management schemes.

3.3.1. Identify, survey, and evaluate potential of coastal and interior sites as suitable nesting and feeding areas.

Snowy plover nesting habitat requirements are fairly well known, so measurement of specific characteristics will provide a useful indication of habitat suitability. Areas should be evaluated for their potential for habitat restoration and maintenance, and their potential to eventually support breeding plovers. Site evaluation criteria must be established. Coastal areas to be surveyed include, but are not limited to, Taholah, Point Grenville, Copalis Spit, Grays Harbor islands, Westport Spit, South Beach, Graveyard Spit, Toke Point, and Willapa Bay islands. Interior areas to be surveyed are described in Buchanan et al. (1994). Initial emphasis will be placed on Copalis Spit.

3.3.2. Monitor habitat capacity for nesting plovers.

Criteria for describing substrate should be established. Vegetative cover should be assessed annually using line intercept sampling as described by Canfield (1941) or Pickart et al. (1990). Circle plots may be investigated as an alternate monitoring tool. Cover may be categorized as described by Wilson-Jacobs (1986), i.e., bare substrate, vegetation (identified to species when possible), woody litter, leafy litter, shell, or miscellaneous debris.

3.4. Improve suitability of existing and potential habitat.

Habitat can be managed to create and maintain conditions favorable to plover breeding and foraging.

3.4.1. Reduce cover and reverse encroachment of vegetation.

Cover in snowy plover nesting areas may need to be reduced when the average of all cover exceeds 11% or when average cover by live vegetation exceeds 1% (Wilson-Jacobs 1986). Methods for eradication of European beachgrass should be investigated and experimental beachgrass control areas should be identified. Control may be attempted by manual digging and sifting, controlled burning, cutting, herbicide application, salting with seawater, salting with rock salt, or combinations of these and other methods.

3.4.2. Discourage dune stabilization and revegetation projects at plover nesting sites.

Dune stabilization activities reduce the availability of nesting habitat and in some cases may directly degrade plover nesting areas. Use of European beachgrass to stabilize dunes should be discontinued in favor of native plant species.

3.4.3. Discourage beach construction activity and plans for increased recreational use that will destroy or degrade plover habitat.

Beach development frequently reduces nesting habitat, and may also account for significant disturbance through associated recreational use. Construction activities in or adjacent to snowy plover nesting or foraging habitat should be discouraged through conservation easements, acquisition (Section 3.2), zoning, or other means. When such activities cannot be avoided, they should be minimized, with construction restricted to the plover non-breeding period (1 Sep-14 Mar).

3.4.4. Limit resource removal activities near plover habitat during the breeding season.

Removing sand or driftwood from snowy plover nesting areas can have a negative effect on the suitability of the habitat. In addition, disturbance associated with sand extraction or driftwood collection from beaches may influence plover use of affected areas. Resource removal activities should be eliminated or limited during the breeding season, 15 March through 31 August.

The uncertainty about effects of sand removal on beach dynamics (Phipps 1990) may warrant restrictions on sand extraction activities near snowy plover habitat. Permits should not be issued for sand removal in the vicinity of snowy plover nest areas.

The loss of nest site components warrants elimination of driftwood collection activities in plover nest areas. Permits should not be issued for collection of firewood in the vicinity of snowy plover nest areas.

3.4.5. Manage dredged material deposition areas to provide opportunities for plover nesting.

Deposition of dredge spoils may be beneficial to snowy plover nesting habitat. For the most suitable nesting substrate, dredged material should be sand or a combination of sand, gravel, and shell fragments. Deposition should occur when plovers are not present and will be most useful if the material gradually slopes to the water's edge and remains sparsely vegetated and unstabilized. Any deposition of dredged material should consider adverse effects on wintering and foraging habitat.

3.5. Develop and apply site-specific management plans to secure habitat.

Management plans should be written for sites currently or potentially occupied by plovers. Plans should describe methods to assure long-term habitat security, such as elimination or reduction of threats, and identify other recovery tasks particular to each site. A monitoring program should also be designed. Department biologists should provide expertise or assistance in preparation of plans written by other landowners (Section 8.4).

4. Enforce restrictions designed to protect snowy plovers.

Restrictions meant to aid the recovery of snowy plovers will be ineffective unless accompanied by a vigorous enforcement effort.

4.1. Patrol protected areas and issue citations for infractions.

Factors which may adversely impact snowy plovers include illegally-parked vehicles, trespassing off-road vehicles, and pedestrians and pets in restricted areas. Federal, state, and local authorities should provide a coordinated law enforcement effort to eliminate these activities. Specific actions to be implemented should include foot patrols in protected areas and car patrols to prevent illegal driving and parking. Enforcement emphasis should occur during the plover breeding period, 15 March through 31 August. Additional direction for enforcement activities may be provided by WACs 232-12-174, -177, -187, and -254.

5. Establish information management and retrieval systems.

Ready access to information gathered during surveys and investigations will be critical for management decision makers. A centralized information system exists at WDFW, Wildlife Survey Data Management. Summaries of data should be prepared annually and distributed to interested persons and agencies.

5.1. Maintain repository for snowy plover records.

Survey data should be submitted to the Wildlife Survey Data Management section at the earliest opportunity following data collection. Data entry, manual storage, and digitization should be done as appropriate.

5.2. Produce an annual snowy plover status review.

A report describing the status of the snowy plover population, as well as management activities and their effects, should be prepared each year for distribution to interested parties.

6. Develop public information and education programs.

Development of informational materials and educational programs for schools, beach users, community groups, and other special groups should begin.

6.1. Develop educational materials.

Updated fact sheets should be developed for distribution to beach users. Posters should be created for display in communities. A video and/or slide show describing the plight of the snowy plover and the status of recovery efforts should be produced.

6.2. Encourage volunteer participation in monitoring and other recovery tasks.

Conservation-minded individuals and groups can assist with monitoring, education, and other recovery tasks. Recruitment, training, and coordination of a self-sustaining volunteer team should be the aim of Department-directed efforts.

6.3. Promote media contact.

Encourage the production of news releases, public service announcements, and articles in newspapers and magazines.

7. Conduct research that will facilitate and enhance recovery efforts.

Much remains to be learned in Washington and throughout the range of the snowy plover about the species' habitat use patterns, food habits, and other ecological processes. Washington biologists should monitor regional trends in habitat availability and plover abundance. They should also remain abreast of research and management activities elsewhere in the snowy plover range. Based on knowledge gained, appropriate research should be designed and initiated.

Because of the sensitivity of the very small sub-populations in Washington, research involving capture of plovers should be discouraged until the species is downlisted to State Threatened.

7.1. Determine the long-term effects of human disturbance on habitat use, foraging behavior, growth, and survival of plover chicks.

Immigration and recruitment are the means by which the Washington population of snowy plovers may be naturally enhanced. Biologists should determine the extent to which different types of human activity impact the health of plover chicks and affect the rate of their recruitment into the Washington population, so that adequate control of disturbance can be effected.

7.2. Determine the extent to which disturbance during courtship and territory establishment limits distribution and reproductive potential of breeding pairs.

Learn the effects on plovers of various disturbances at different distances and intensities. Determine changes in responses as breeding season progresses.

7.3. Determine the importance of substrate, vegetation, and other habitat features to nesting and foraging plovers.

Learn the relative importance of various habitat characters to provide guidance in manipulating vegetation (Section 3.4.1) to increase plover distribution, abundance, and reproductive success. Investigations of climate and microclimate at plover breeding areas in Washington may provide insight into physiological limitations at the periphery of the plover range.

7.4. Determine primary prey base of plovers and seasonal changes in diet and foraging ecology.

Little is known about the relative importance of different habitat types to foraging efficiency of plovers at various life stages.

7.5. Determine survivorship and recruitment patterns at breeding areas.

In addition to measures of reproductive success, survivorship and recruitment will provide an indication of the viability of the Washington plover population and its reliance on immigration. The frequency and cause of predation should be determined to ascertain when control measures may be required (Section 2.4.2).

8. Coordinate and cooperate with public agencies and other landowners.

Working in concert with other entities will enhance the potential success of WDFW recovery activities.

8.1. Review State regulations influencing snowy plover habitat and populations.

Evaluate regulations concerning use of lands owned, leased, or controlled by the Department of Fish and Wildlife and other state agencies to determine their compatibility with recovery goals.

8.2. Review the Grays Harbor Estuary Management Plan (GHEMP).

The Damon Point snowy plover population nests and forages in an area categorized in the GHEMP as "conservancy managed." The GHEMP should be reviewed to determine if there are activities currently allowable which are incompatible with recovery objectives. Other management category designations which could improve protection of the relatively undisturbed dune system should be considered. Oyhut Wildlife Area snowy plovers nest and forage in an area categorized as "natural" under the GHEMP.

8.3. Review the Interagency Agreement for Management of the Damon Point Multiple Use Area.

The Damon Point Agreement should be reviewed to determine the status of its implementation, and to determine whether the current Agreement allows a level of protection for snowy plovers which is consistent with recovery goals.

8.4. Provide management recommendations to landowners.

If plover breeding sites are discovered on private land, specific conservation recommendations and management actions should be discussed with landowners. Appropriate strategies may include, but are not limited to, voluntary protection agreements and management agreements (site-specific management plans, Section 3.5), or regulatory protection via the State Environmental Policy Act and Shoreline Management Act, or local Critical Area Ordinances. Strategies can be developed for each locality for the benefit of both plovers and landowners.

8.5. Participate in Federal recovery planning.

The U.S. Fish and Wildlife Service may designate Critical Habitat, assemble a Recovery Team, and write a Recovery Plan for the Pacific Coast population of the western snowy plover. Department biologists should participate in these efforts.

8.6. Create information exchange network between appropriate agencies.

Regular exchanges of information between state and federal agencies involved in snowy plover management will assist in assessment of local and regional trends.

8.7. Obtain funding to support recovery activities.

Investigate availability of grants, cost-share agreements, and other types of funding to assist in implementation of recovery objectives. Consider federal, state, private, and non-profit sources.

9. Prepare for direct population management.

The Washington snowy plover population is reinforced by birds from Oregon and California. If the range of Pacific coast population recedes, interstate movements may be limited. Should the snowy plover become extirpated from Washington, some active management techniques may be necessary to restore the species to portions of its former range.

9.1. Investigate captive-rearing and captive-breeding techniques.

Evaluate the feasibility of incubating and hand-rearing plover chicks for release into the wild, and of captive breeding a population of snowy plovers for production of young to be introduced into the wild.

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PART THREE

IMPLEMENTATION

IMPLEMENTATION SCHEDULE

The outline of strategies and tasks on the following pages identifies Washington Department of Fish and Wildlife responsibilities, provides estimates of annual expenditures, and assigns priority to recovery tasks, as follows.

Priority 1

Actions necessary to halt the decline and prevent the extirpation of the species in Washington and to monitor the population.

Priority 2

Actions meant to maintain the benefits of Priority 1 tasks and to enhance recovery efforts by stabilizing and rebuilding the population.

Priority 3

Actions that provide direction for future conservation needs.

Acronyms and symbols used to indicate WDFW responsibilities are:

WLM	Wildlife Management
WSDM	Wildlife Survey Data Management
ENF	Enforcement
CTRL	Wildlife Control
RES	Research
HAB	Habitat
SRT	Spill Response Team
LAND	Land Resources
IMR	Information and Media Relations

Implementation of Recovery Strategies is contingent upon availability of sufficient funds to undertake Recovery Tasks.

Strategies Tasks	Priority	Duration	Responsibility	Annual cost in thousands of $ 95	96	97	98	99
Monitor Washington snowy plover population								
1.1. Determine population trends through annual surveys of abundance, distribution, and productivity.	1	continuing	WLM	25	25	25	25	25
1.2. Determine the abundance and distribution of wintering plovers.	3	annual	WLM	2	2	2	2	2
Totals				**27**	**27**	**27**	**27**	**27**
Protect the snowy plover population								
2.1. Reduce pedestrian disturbance.	1	continuing	LAND	3	3	3	3	3
2.1.1. Limit vehicular access in the vicinity of plover breeding areas.	1	continuing	LAND		Done with 2.1.			
2.2. Restrict pets from plover breeding areas.	1	continuing	LAND		Done with 2.1.			
2.3. Eliminate off-road vehicle disturbance and mortality.	1	continuing	LAND		Done with 2.1.			
2.4. Reduce predation.								
2.4.1. Remove litter and garbage from beaches.	2	annual	LAND	.5	.5	.5	.5	.5
2.4.2. Implement predator control measures as necessary.	2	as needed	CTRL		Dependent upon method.			
2.5. Protect plovers from contamination caused by oil or chemical spills.								
2.5.1. Mitigate habitat damage due to spills.	1	as needed	SRT		Dependent upon event.			
2.5.2. Respond to plover contamination.	1	as needed	SRT		Dependent upon event.			
Totals				**3.5**	**3.5**	**3.5**	**3.5**	**3.5**
Manage habitat to maximize plover abundance and productivity.								
3.1. Determine ownership and management of sites used by breeding plovers.	1	continuing	LAND	.5	.5	.5	.5	.5
3.2. Pursue ownership or management of plover habitat by wildlife agencies.								
3.2.1. Evaluate fee acquisition through purchase, land exchanges, or charitable donations.	3	as needed	WLM		1			1
3.2.2. Evaluate less-than-fee protection of land occupied by snowy plovers.	3	as needed	WLM		1			1
3.3. Evaluate the suitability of existing and potential nesting habitat to support an expanded breeding population.								
3.3.1. Identify, survey, and evaluate potential of coastal and interior sites as suitable nesting and feeding areas.	1	3 years	WLM	2	2			2
3.3.2. Monitor habitat capacity for nesting plovers.	1	4 years	WLM	5	5	5	5	

Strategies / Tasks	Priority	Duration	Responsibility	Annual cost in thousands of $ 95	96	97	98	99
3.4. Improve suitability of existing and potential habitat.								
3.4.1. Reduce vegetative cover and reverse vegetation encroachment.	1	4 years	LAND		10	10	10	10
3.4.2. Discourage dune stabilization and revegetation projects at plover nesting sites.	1	continuing	LAND/WLM	1	1	1	1	1
3.4.3. Discourage beach construction activity and plans for increased recreational use that will destroy or degrade plover habitat.	2	continuing	HAB	1	1	1	1	1
3.4.4. Limit resource removal activities near plover habitat.	2	continuing	LAND	.5	.2	.5	.2	.5
3.4.5. Manage dredged material deposition areas to provide opportunities for plover nesting.	3	continuing	WLM/HAB					
3.5. Develop and apply site-specific management plans.	1	continuing	WLM		5	5	5	
Totals				**10**	**26.7**	**23**	**22.7**	**17**
Enforce restrictions designed to protect snowy plovers.								
4.1. Patrol protected areas and issue citations for infractions	1	continuing	ENF	5	5	2.5	2.5	2.5
Totals				**5**	**5**	**2.5**	**2.5**	**2.5**
Establish information management and retrieval systems.								
5.1. Maintain repository for snowy plover records.	1	annual	WSDM	1.5	1.5	1.5	1.5	1.5
5.2. Produce an annual snowy plover status review.	2	annual	WLM	.5	.5	.5	.5	.5
Totals				**2**	**2**	**2**	**2**	**2**
Develop and initiate appropriate public information and education programs.								
6.1. Develop educational materials.	1	continuing	IMR	5	1	3	1	1
6.2. Encourage volunteer participation in monitoring and other recovery tasks	1	continuing	WLM	2	2	1	1	1
6.3. Promote media contact.	2	continuing	IMR	1	1	1	1	1
Totals				**8**	**4**	**5**	**3**	**3**
Conduct research that will facilitate and enhance recovery efforts.								
7.1. Determine the long-term effects of human disturbance on habitat use, foraging behavior, growth, and survival of plover chicks.	2	4 years	RES		5	5	5	5
7.2. Determine the extent to which disturbance during courtship and territory establishment limits the distribution of breeding pairs.	2	4 years	RES		5	5	5	5

Strategies / Tasks	Priority	Duration	Responsibility	Annual cost in thousands of $ 95	96	97	98	99
7.3. Determine importance of substrate, vegetation, and other habitat features to nesting and foraging plovers.	2	3 years	RES	10		10		10
7.4. Determine primary prey base of plovers and seasonal changes in diet and foraging ecology.	3	2 years	RES		Post-1999 activity.			
7.5. Determine survivorship and recruitment patterns at breeding areas.	3	annual	RES		Post-1999 activity.			
Totals				**10**	**10**	**20**	**10**	**20**
Coordinate and cooperate with public agencies and other landowners.								
8.1. Review state regulations influencing plover habitat and populations.	2	1 year	WLM	1				
8.2. Review the Grays Harbor Estuary Management Plan.	3	1 year	WLM		1			
8.3. Review the Interagency Agreement for Management of the Damon Point Multiple Use Area	2	1 year	WLM		1			
8.4. Provide management recommendations to landowners.	2	continuing	HAB	.5	.5	.5	.5	.5
8.5. Participate in Federal recovery planning.	2	continuing	WLM	2	2	2	2	2
8.6. Create information exchange network between appropriate agencies.	2	continuing	WSDM	.5	.5	.5	.5	.5
8.7. Obtain funding to support recovery activities	1	continuing	ALL		Done as part of other tasks.			
Totals				**4**	**5**	**3**	**3**	**3**
Prepare for direct population management.								
9.1. Investigate captive-rearing and captive breeding techniques.	3	1 year	WLM				2	
Totals							**2**	

APPENDICES

Appendix A. Banded snowy plovers sighted in Washington.

Date(s)	Loc.[a]	Sex	Banding Scheme and Notes[b]	Reference
29 Jun, 20 Jul 1994	LP	F	yellow/white--white/red	Willapa NWR files
			Banded in 1994 in south Oreg. Hatched eggs there in 1994.	M. Stern, pers. comm.
24 May 1994	Oy	M	red/blue--white (wide)	pers. obs.
			Banded as chick 21 Jun 93 at Floras Lake, Oreg.	M. Stern, pers. comm.
Apr-May 1994	LP	?	white/lime--white (wide)	Willapa NWR files
			Banded as chick 3 Jul 92 near Bandon, Oreg.	M. Stern, pers. comm.
Feb 1994	LP	?	unknown	Willapa NWR files
11 Jun 1993	LP	?	light blue/dark blue--yellow	Willapa NWR files
11 Jun 1993	LP	F?	yellow/light blue--none	Willapa NWR files
1991	DP	M	blue--orange	Hogan 1991
1990	DP	F	no details	Fox 1990
22 May 1990	DP	M	none--metal	Moon 1990
2 Jun 1990	DP	M	none--metal	Moon 1990
4 May-5 Jun 1986	DP	F	yellow--light blue/dark blue	Anthony 1987
			Banded in 1982 at Monterey Bay. Hatched three chicks.	"
24 May 1985	DP	M	yellow--blue	Anthony 1987
			Banded as chick in spring 1982 at Monterey Bay.	"
24 Jul 1984	DP	?	Adult. No details.	AB 38:1054
2 and 9 May 1979	LP	F	light green/orange--wide orange	Lippert[c]
			Banded 6 Aug 1978 at Florence, Oreg. Seen there Apr '79.	Widrig 1979

[a] Locations of sightings are Damon Point (DP), Oyhut Spit (Oy), and Leadbetter Point (LP).
[b] Combinations are reported left leg top/bottom--right leg top/bottom.
[c] M. S. Lippert, letter dated 22 Jun 1979 to R. Wilson. In files at Willapa NWR.

Appendix B. Snowy plovers banded in Washington under various permits. All were banded at Damon Point. Information was taken from the files of the Washington Department of Fish and Wildlife and data provided by the U.S. Fish and Wildlife Service Bird Banding Laboratory. An "x" in the band number represents an unknown digit.

Date	Age/Sex	Band Number	Permittee	Permit Number
8 Jul 1986	female	971-13101	Wash. Dept. Fish and Wildl. (Game)	06508
8 Jul 1986	male	971-13102	Wash. Dept. Fish and Wildl. (Game)	06508
8 Jul 1986	male	971-13103	Wash. Dept. Fish and Wildl. (Game)	06508
12 Jun 1986	male	961-84002	USFWS, Nisqually NWR	21497
6 Jul 1978	chick	1211-6xxxx	Fred Hosea, WDG biologist	20774
6 Jul 1978	chick	1211-6xxxx	Fred Hosea	20774
Jul 1977	chick	1211-6xxxx	Fred Hosea	20774
Jul 1977	chick	1211-6xxxx	Fred Hosea	20774
1977	chick	1211-6xxxx	Fred Hosea	20774

Appendix C. Snowy plover sight records and museum specimens from Washington. For some recent years, a summary of breeding activity is provided.

Type[a]	YY/MM/DD	Location	Activity Level[b]	Observer[c]	Reference[d]
W	95/01/19	South Beach, Pacific Co.	8 birds, 1 banded	MZ	pers. comm.
B	94/06/08	South Beach, Pacific Co.	1 pr	SR	pers. obs.
N	94/04/21-09/21	Leadbetter Point	13 ad, 10 chicks, 6 juv	DW	pers. comm.
N	94/04/01-08/09	Damon Point/Oyhut WA	6 ad, 4 chicks, 3 juv	DHo	Howard 1994
N	93/07/13	Leadbetter Point	3 birds, 2nd nest	DW et al.	Willapa NWR files
N	93/06/11	Leadbetter Point	16-20 ad, 1 nest	DW, SR, HF	Willapa NWR files
N	93/03/18-08/04	Damon Point/Oyhut WA	5 ad, 4 nests, 6 juv	KS, PP, MZ	Sargent 1993
B	93/05/15	SE Soap Lake, Grant Co.	1 male, unbanded	FD et al.	pers. comm.
N	92/08/14	Leadbetter Point	1 male, 3 chicks	PP, MZ	Persons 1992
N	92/05/07-07/08	Leadbetter Point	7 ad, 3 pr, 2 nests	JA	Willapa NWR files
N	92/04/02-09/01	Damon Point/Oyhut WA	5 ad, 11 chicks, 4 juv	PP	Persons 1992
W	92/01/04	North Cove, Pacific Co.	3 birds	RC	pers. comm.
N	91/04/11-08/09	Leadbetter Point	5 ad, 3 pr, 2 chicks	JM	Willapa NWR files
B	91/07/15	Leadbetter Point	5 ad	NL	AB 45(5):1153
N	91/05/12-06/10	Damon Point	5 ad, 2 nests	CH	Hogan 1991
B	91/spring	Ocean Shores	4 ad	PS	AB 45(3):490
M	90/09/12	Ocean Shores	1 ad	EH	AB 45(2):310
M	90/09/08	Leadbetter Point	up to 5 ad	AS, MO	AB 45(2):310
N	90/07/04	Ocean Shores	2 ad, 3 imm	BW	AB 44(5):1178
B	90/05/02	Bottle Beach, Ocosta	1 bird	LC	pers. comm.
N	90/04/21-07/31	Damon Point	10 ad, 5 chicks	RF, AM	Fox 1990, Moon 1990
B	90/04/21	Ocean Shores	2 ad	KB	AB 44(3):487-488
B	90/04/21	Grays Harbor	1 ad	JW	AB 44(3):487-488
N	89/07/18	Damon Point	2 ad, 3 chicks	MZ	Zahn 1989
B	89/05/30	Ocean Shores	3 ad	PH	AB 43(5):1359
N	89/04/28-09/01	Leadbetter Point	7 ad, 4 pr, 6 juv	n.r.	Willapa NWR files
W	88/12/17	Leadbetter Point	2 birds	fide JS	AB 43(4):1109
M	88/09/09	S of Leadbetter Point SP	1 bird	ES, AG	WDFW files
N	88/03/30-09/01	Leadbetter Point	8 ad, 4 pr, 6 juv	n.r.	Willapa NWR files
N	88/06/12	Damon Point	1 female, 2 chicks	CL	Lapp 1988
B	88/05/15	Damon Point	4 ad	CL	Lapp 1988
B	88/04/25	Damon Point	1 pr	SR, EL	pers. obs.
B	88/04/19	Leadbetter Point	5 birds	DJ	pers. comm.
W	88/01/16	S end, Grayland Beach	5 birds	JB	Buchanan 1992
W	87/12/19	Leadbetter Point	6 birds	fide JS	AB 42(4):1067
B	87/05/08-06/17	Leadbetter Point	14 ad	JA	Willapa NWR files
N	87/07/12	Damon Point	6 ad, 2 chicks	JAn	Anthony 1987
B	87/05/10	Damon Point	4 ad	PE	unpubl. data
B	87/04/27-04/28	Walla Walla R, Wallula	1 bird	REW, KK, BT	AB 41(3):464
N	86/05/22-09/19	Leadbetter Point	23 ad, 12 pr, 5 juv	JA	Atkinson 1986
N	86/summer	Damon Point	10 ad, 6 pr, 4 juv	JAn	Anthony 1987
B	86/07/31	Dungeness Spit	2 birds	RH	AB 41(1):134
B	86/07/06	Dungeness Spit	6 birds	RH	AB 41(1):134

Type[a]	YY/MM/DD	Location	Activity Level[b]	Observer[c]	Reference[d]
N	85/04/15-07/27	Leadbetter Point	16 ad, 1 chick	DH	Hoover 1985
N	85/summer	Damon Point	13 ad, 8 pr, 10 juv	JAn	Anthony 1987
B	85/05	Goose I., Banks Lake	2 pr	RFr	pers. comm.
B	85/05/29	Copalis Spit	1 male	JAn	Anthony 1987
N	84/06/01-07/14	Leadbetter Point	6 ad, 1 chick	JA	Atkinson 1984
N	84/summer	Ocean Shores	15 birds, 3 nests	EC, EH	WDFW files
N	84/08/27	Damon Point	1 juv	GH	unpubl. notes
B	84/07/24	Ocean Shores	1 ad w/band	PM	AB 38(6):1054
B	84/05/06	Ocean Shores	1 bird	DP	unpubl. data
B	84/04/25	Ocean Shores	1 bird	DP	unpubl. data
B	84/spring	Ocean Shores	up to 3 ad	PM et al.	AB 38(5):949
B	83/07/12	Leadbetter Point	5 birds	CBr	WDFW files
N	83/05/24	Ocean Shores	nest w/2 eggs	G&WH	AB 37(5):904
W	82/12/18	Leadbetter Point	2 birds	fide GL	AB 37(4):731
N	82/summer	Leadbetter Point	12 juv (estimate)	RW	Willapa NWR files
N	82/summer	Leadbetter Point	10 pr, 10 chicks	RW	AB 36(6):1009
B	82/08/26	Ocean Shores	1 bird	DP	unpubl. data
B	82/07/21	Ocean Shores	2 birds	DP	unpubl. data
B	82/07/01	Ocean Shores	7 birds, 2 collected	DP	unpubl. data
B	82/07/01	Damon Point	male, no bursa	DP	UWBM 34618
N	82/07/01	Damon Point	female w/ brood patch	DP	UWBM 34617
M	81/09/07	Oyhut WA	4 birds	BT	unpubl. data
N	81/04/24-08/21	Leadbetter Point	31 ad, 11 pr, 17 juv	RW	Widrig 1981
B	81/04/19-05/02	Ocean Shores	1 pr	G&WH, CB	AB 35(5):855
W	80/12/20	Leadbetter Point	9 birds	RW fide DW	AB 35(4):688
M	80/09/07-11,23	Leadbetter Point	8 birds	SA, DN, CW	WDFW files
N	80/summer	Leadbetter Point	5 pr, 5 juv	RW	Widrig 1980
M	80/09/02	Damon Point	1 bird	MC	unpubl. notes
N	80/05/17	Ocean Shores	2 chicks (05/09 nest)	BWh fide GH	AB 34(5):808
N	80/05/09	Ocean Shores	nest w/3 eggs ↑	WS	AB 34(5):808
M	79/10/07	Fort Canby SP	present	JK	WDFW files
M	79/09/01	Damon Point	2 birds	MC	unpubl. notes
N	79/summer	Leadbetter Point	5 pr, 6 juv	RW	Widrig 1980
N	79/summer	Ocean Shores	1 fledge, 2d nest fail	KK, JSm	AB 33(6):891
B	79/07/10	Ocean Shores	3 birds	DP	unpubl. data
B	79/06/10	Ocean Shores	2 birds	DP	unpubl. data
N	79/05/25	Ocean Shores	pr w/chick	G&WH	AB 33(5):800
W	78/12/17	Leadbetter Point	28 birds	fide IB	AB 33(4):632
W	78/11/05	Leadbetter Point	8 birds	FK	AB 33(2):207
N	78/summer	Leadbetter Point	22 ad, 10 pr, 3 juv	RW	Widrig 1980
N	78/08/24	Leadbetter Point	downy chicks	RW	Widrig 1980
N	78/07/02-07/06	Ocean Shores	6 ad, 4 young	FH fide JSm	WDFW files
N	78/06/25	Ocean Shores	3 ad, 2 chicks	BH-T	unpubl. data
B	78/05/14	Dungeness Spit	1 bird	MS	AB 32(5):1047
B	78/04/29	Ocean Shores	2 birds	AR, G&WH	AB 32(5):1047

Type[a]	YY/MM/DD	Location	Activity Level[b]	Observer[c]	Reference[d]
W	78/02/24	Leadbetter Point	21 birds	JBul	AB 32(3):391
W	77/11/04-05	Leadbetter Point	several	CBo, FK	WDFW files
M	77/09/25	Ocean Shores	2 birds	DP	unpubl. data
B	77/07/21	Leadbetter Point	1 ad	BT	unpubl. data
N	77/summer	Ocean Shores	4 pr, 3 young banded	JSm	AB 31(6):1179
B	77/04	Ocean Shores	up to 4 pr	n.r.	AB 31(5):1038
W	77/02/08	Leadbetter Point	13 birds	DHa et al.	unpubl. data
B	76/08/16	Ocean Shores	1 bird	DP	unpubl. data
M	76/08/16-10/24	Ocean Shores	up to 6	n.r.	AB 31(2):214
M	76/08/16-10/24	Leadbetter Point	up to 6	EH	AB 31(2):214
B	76/05/15	Ocean Shores	2 birds	EH	AB 30(4):879
B	76/04/24	Ocean Shores	1 bird	G&WH	AB 30(4):879
M	75/09/14	La Push	2 birds	JW	AB 30(1):114
B	75/07/26	Damon Point	3 adults	GH	unpubl. notes
N	75/06/28	Ocean Shores	4 adults, 1 young	G&WH	AB 29(5):1022
B	75/06/17	Leadbetter Point	7 birds	MK, HN	AB 29(5):1022
B	75/05/17	Ocean Shores	8 birds	EH	AB 29(4):898
B	75/05/09,05/31	Ocean Shores	4 birds each date	G&WH	AB 29(4):898
B	74/06/23	Damon Point	5 adults, 4 on territory	GH	unpubl. notes
B	74/06/08	Leadbetter Point	2 pr	HN, CS	AB 28(5):939
B	74/04/24-05/22	Ocean Shores	up to 3	n.r.	AB 28(4):842
B	73/07-09	Willapa NWR	11 "nesting" pr	n.r.	Willapa NWR files
M	73/09/08	near North Jetty, O.S.	2 adults	JM fide GH	unpubl. notes
M	73/09/06	Ocean Shores	2 birds	JM	AB 28(1):93-98
B	73/07/28	Damon Point	4 adults	GH	unpubl. notes
B	73/07/28	Oyhut WA	2 adults	GH	unpubl. notes
B	73/07/07	Damon Point	4 adults on territory	GH	unpubl. notes
B	73/06/23	Ocean Shores	~3 pr "breeding"	JM	Morris 1974
B	73/06/11	Leadbetter Point	35 birds	n.r.	Willapa NWR files
B	73/05/25	Oyhut WA	1 adult	GH	unpubl. notes
M	72/09/16	Leadbetter Point	2 birds	WH	unpubl. notes
B	72/08/08	Oyhut WA	1 adult	JM fide GH	unpubl. notes
N	72/06/03-07/29	Oyhut WA	6 adults, 4 young	GH	unpubl. notes
W	72/01/11	Willapa NWR	1 bird	n.r.	Willapa NWR files
N	71/07/10	Oyhut WA	2 adults, 1 chick	GH	unpubl. notes
B	71/06/04	Damon Point	2 adults on territory	GH	unpubl. notes
B	71/05/28-06/26	Oyhut WA	4 adults	GH	unpubl. notes
B	71/05/01	Damon Point	2 adults	GH	unpubl. notes
B	71/05/01	Leadbetter Point	8 birds	TW	AB 25(4):791
M	70/08/15-10/3	Leadbetter Point	1 to 6 birds	n.r.	AB 25(1):94-99
B	70/05/01	Leadbetter Point	30 birds	DP	AFN 24(4):635-638
M	69/09/20	Leadbetter Point	20 birds	GK, HN	AFN 24(1):82-88
B	69/05/17	Leadbetter Point	6 birds	DP	unpubl. data
M	68/09/22	Leadbetter Point	12 birds	HC, JO	AFN 23(1):94-99

Type[a]	YY/MM/DD	Location	Activity Level[b]	Observer[c]	Reference[d]
B	68/04/27-05/18	Westport	small numbers	n.r.	AFN 22(4):567-571
B	68/04/27-05/18	Leadbetter Point	small numbers	n.r.	AFN 22(4):567-571
M	67/09/09	Leadbetter Point	2 birds	HN et al.	AFN 22(1):78-83
M	67/09/02	Leadbetter Point	1 bird	HN et al.	AFN 22(1):78-83
B	67/05/28	Reardan	1 bird, photographed	JAc, WHa	AFN 21(5):588
N	67/05/18	Leadbetter Point	1 ad, 2 chicks	DM	AFN 21(4):533
M	66/09/10	Leadbetter Point	6 birds	JG	AFN 21(1):69
M	64/09/19	Leadbetter Point	4 birds	n.r.	AFN 19(1):68-71
B	62/05/12	Westport	ad F coll., "breeding"	GA?	PSM 08897
B	61/06/12	Westport	3 birds	LL	AFN 15(5):487-489
B	61/05/10	Oyehut	6 birds	PN	AFN 15(4):433
W	60/12/16	Grays Harbor	10 birds	LL	AFN 15(3):352-353
M	60/08/23	Tokeland	4 birds, 2 ad M coll.	LL	CRCM 60-233,60-234
M	59/08/25	Stackpole Harbor, LP	2 birds	BB, EB	AFN 14(1):65-67
B	57/04/04	Westport	ad female collected	TDB	CRCM 57-303
M	53/09/09	Copalis Spit	male collected	WG	UWBM 14215
B	49/03/21	Westport	1 collected, unsexed	ZS	UWBM 12967
B	48/06/25	North Cove, G.H. Co.	1 collected, unsexed	GEH	CRCM 48-217
M	42/09/27	Long Beach	no details	SJ	Jewett et al. 1953
B	42/05/29	Long Beach	no details	SJ	Jewett et al. 1953
B	42/05/28	Copalis	female collected	SJ	USNM 367054
W	42/01/16	Long Beach	8 birds	SJ	Jewett et al. 1953
W	42/01/16	Ocean Park, Pacific Co.	male collected	n.r.	USNM 365277
M	41/08/10	Willapa NWR	present	WGM	WDFW files
B	34/04/14	Westport	male collected	DEB?	UWBM 11473
B	34/04/14	Westport	female collected	DEB?	UWBM 11472
B	34/04/04	North Cove, G.H. Co.	2 birds collected	DEB	unpubl. notes
M	31/09/09	Westport	juv female collected	GA?	PSM 08265
M	31/09/09	Westport	2 birds	GA, JHB	Bowles 1931
W	27/12/19	Westport	no details	JHB	Bent 1962
W	27/11/27	Westport	juv female collected	DEB?	UWBM 7732
M	27/09/15	Westport	juv female collected	DEB?	UWBM 7731
B	24/05/26	Westport	female coll, "breeding"	DEB	UMMZ 118,641
W	20/11/27	Westport	ad male collected	ACM	UWBM 10166
B	20/03/27	Westport	1 collected	FSH	Rathbun, unpubl. notes
B	20/03/27(30?)	Westport	several birds	SW et al.	Warburton et al. 1920
B	18/04/07-04/13	Grays Harbor Co.	several collected	DEB	unpubl. notes
B	18/04/10	Westport	ad male collected	EK?	PSM 06483
W	18/03/12	Westport	ad male collected	EK?	PSM 06482
W	17/11/18	Westport, near jetty	1 collected	CLi?	Rathbun, unpubl. notes
W	17/10/29	Westport, near jetty	1 bird	CLi?	Rathbun, unpubl. notes
B	15/04/08	Westport	ad male collected	SW	PSM 06481
B	14/05/15	Tokeland	male collected	DEB?	UWBM 7733
B	14/05/15	Tokeland	female collected	DEB	FMNH 157656
B	14/05/14-05/16	Pacific Co.	several seen	DEB	unpubl. notes
B	14/05/06	Seattle area	1 bird	DEB	Rathbun 1915
M	99/09/03	Grays Harbor	ad collected, unsexed	CWB	UWBM 16519

Appendix C (continued). Notes for sightings summary.

[a] Types of observation are:

N = Nesting confirmed by nest with eggs, chicks, recently fledged young, or adult with brood patch.
B = Present during Washington breeding season (15 March - 31 August)
M = Migrants outside of breeding season, except for wintering birds
W = Winter observation (1 November - 29 February)

[b] Summary of seasonal data or most convincing observation of breeding/presence is reported.

[c] For reports of collected birds, the collector is indicated when known. When unknown, the original holder of the collection is indicated and followed with a question mark. The entry "n.r." indicates the observer was not recorded. Other observers were James Acton (JAc), Gordon Alcorn, Janet Anthony (JAn), Jim Atkinson, Scott Atkinson, Carla Baugher (fide Thais Bock), Bob Boggs, Elsie Boggs, Cathy Bolles (CBo), C. W. Bowles, J. Hooper Bowles, D. E. Brown, K. Brown, Charlie Bruce (CBr), Joe Buchanan, John Bulger (JBul), T. D. Burleigh, Irving Burr, Michael Carmody, Lanny Carpenter, Russell Canniff, John Crowell, Eric Cummins, Fred Dobler, Pat Evans, Howard Ferguson, Ron Fox, Ron Friesz (RFr), Jeff Gilligan, William Goodge, Ami Greenberg, F. S. Hall, Warren Hall (WHa), Dave Hayward (DHa), Paul Hicks, Roger Hoffman, Colleen Hogan, Glen (GH) and Wanda Hoge (WH), Doug Hoover, Fred Hosea, Dianne Howard (DHo), George E. Hudson, Eugene Hunn, Don Johnson, Mike Johnson, E. A. Kitchin, Gordon Knight, Ken Knittle, Mark Koninendyke, Fayette Krause, J. Kuhn, Lynn LaFave, Christopher Lapp, Eric Larsen, Nick Lethaby, Carl Lien (CLi), Greg Lippert, David Marshall, Phil Mattocks, W. G. McFarland, A. C. McGrew, James Morris, Harry Nehls, Darryl Nelson, Paul Newcomb, Mark Oberle, James Olson, Dennis Paulson, Phil Persons, Alan Richards, Scott Richardson, James Sayce, Zella Schultz, Eric Seabloom, Chas. Smith, Jack Smith (JSm), Maurita Smyth, Andy Stepniewski, Paul Sullivan, Wally Sumner, Bill Tweit (BT and BH-T), Terry Wahl, Cathy Wentworth, Bart Whelton (BWh), Darrel Whipple, Ralph Widrig, Don Williamson, John Wingfield, Bob Woodley (BW, REW), Max Zahn.

[d] Dated references are found in the References Cited section. AB and AFN signify seasonal reports in *American Birds* and *Audubon Field Notes*. Museum specimens are identified with catalog numbers from: Conner Museum, Washington State University, Pullman (CRCM); Burke Museum, University of Washington, Seattle (UWBM); Slater Museum, University of Puget Sound, Tacoma (PSM); Field Museum of Natural History, Chicago (FMNH); Museum of Zoology, University of Michigan, Ann Arbor (UMMZ); U.S. National Museum, Smithsonian Institution, Washington, D.C. (USNM).

Regional editors for Washington snowy plover records published in *Audubon Field Notes* (AFN) and *American Birds* (AB), from 1953 to 1993.

Region[a]	Editor(s)	Title	Volume (Number)
NPC	Zella M. Schultz	AFN	8-13(1)
	Martha Flahaut		8-10
	William Goodge		10(3)
	Bob and Elsie Boggs		14-15
	Werner and Hilde Hesse		19(3,4)
	John B. Crowell, Jr. and Alan Baldridge		19(5), 20
	John B. Crowell, Jr. and Harry B. Nehls		20-24
NRM-I	Thomas H. Rogers	AB	25-43
NPC	John B. Crowell, Jr. and Harry B. Nehls		25-31(5)
	Eugene Hunn		31(6)-37(5)
	Philip W. Mattocks, Jr.		31(6)-37(5), 38(6), 41(1)
	William Harrington-Tweit		32(6), 33(6), 36(6), 38(6), 41(1), 42(2)-43
	David Fix		38(5)
OR/WA	Bill Tweit		44-46
	David Fix		44(3), 45(2)
	Philip W. Mattocks, Jr.		44(5)
	Jim Johnson		44(5), 45(5), 46(3,5)
	Jeff Gilligan		45(3), 46(2,3)

[a] Regions as follows: Northern Pacific Coastal (NPC), Northern Rocky Mountain-Intermountain (NRM-I), Oregon and Washington (OR/WA).

Appendix D. Washington Administrative Code 232-12-297. Section 11 addresses Recovery Plans.

WAC 232-12-297 Endangered, threatened, and sensitive wildlife species classification.

PURPOSE

1.1 The purpose of this rule is to identify and classify native wildlife species that have need of protection and/or management to ensure their survival as free-ranging populations in Washington and to define the process by which listing, management, recovery, and delisting of a species can be achieved. These rules are established to ensure that consistent procedures and criteria are followed when classifying wildlife as endangered, or the protected wildlife subcategories threatened or sensitive.

DEFINITIONS

For purposes of this rule, the following definitions apply:

2.1 "Classify" and all derivatives means to list or delist wildlife species to or from endangered, or to or from the protected wildlife subcategories threatened or sensitive.

2.2 "List" and all derivatives means to change the classification status of a wildlife species to endangered, threatened, or sensitive.

2.3 "Delist" and its derivatives means to change the classification of endangered, threatened, or sensitive species to a classification other than endangered, threatened, or sensitive.

2.4 "Endangered" means any wildlife species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state.

2.5 "Threatened" means any wildlife species native to the state of Washington that is likely to become an endangered species within the forseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats.

2.6 "Sensitive" means any wildlife species native to the state of Washington that is vulnerable or declining and is likely to become endangered or threatened in a significant portion of its range within the state without cooperative management or removal of threats.

2.7 "Species" means any group of animals classified as a species or subspecies as commonly accepted by the scientific community.

2.8 "Native" means any wildlife species naturally occurring in Washington for purposes of breeding, resting, or foraging, excluding introduced species not found historically in this state.

2.9 "Significant portion of its range" means that portion of a species' range likely to be essential to the long term survival of the population in Washington.

LISTING CRITERIA

3.1 The commission shall list a wildlife species as endangered, threatened, or sensitive solely on the basis of the biological status of the species being considered, based on the preponderance of scientific data available, except as noted in section 3.4.

3.2 If a species is listed as endangered or threatened under the federal Endangered Species Act, the agency will recommend to the commission that it be listed as endangered or threatened as specified in section 9.1. If listed, the agency will proceed with development of a recovery plan pursuant to section 11.1.

3.3 Species may be listed as endangered, threatened, or sensitive only when populations are in danger of failing, declining, or are vulnerable, due to factors including but not restricted to limited numbers, disease, predation, exploitation, or habitat loss or change, pursuant to section 7.1.

3.4 Where a species of the class Insecta, based on substantial evidence, is determined to present an unreasonable risk to public health, the commission may make the determination that the species need not be listed as endangered, threatened, or sensitive.

DELISTING CRITERIA

4.1 The commission shall delist a wildlife species from endangered, threatened, or sensitive solely on the basis of the biological status of the species being considered, based on the preponderance of scientific data available.

4.2 A species may be delisted from endangered, threatened, or sensitive only when populations are no longer in danger of failing, declining, are no longer vulnerable, pursuant to section 3.3, or meet recovery plan goals, and when it no longer meets the definitions in sections 2.4, 2.5, or 2.6.

INITIATION OF LISTING PROCESS

5.1 Any one of the following events may initiate the listing process.

5.1.1 The agency determines that a species population may be in danger of failing, declining, or vulnerable, pursuant to section 3.3.

5.1.2 A petition is received at the agency from an interested person. The petition should be addressed to the director. It should set forth specific evidence and scientific data which shows that the species may be failing, declining, or vulnerable, pursuant to section 3.3. Within 60 days, the agency shall either deny the petition, stating the reasons, or initiate the classification process.

5.1.3 An emergency, as defined by the Administrative Procedure Act, chapter 34.05 RCW. The listing of any species previously classified under emergency rule shall be governed by the provisions of this section.

5.1.4 The commission requests the agency review a species of concern.

5.2 Upon initiation of the listing process the agency shall publish a public notice in the Washington Register, and notify those parties who have expressed their interest to the department, announcing the initiation of the classification process and calling for scientific information relevant to the species status report under consideration pursuant to section 7.1.

INITIATION OF DELISTING PROCESS

6.1 Any one of the following events may initiate the delisting process:

6.1.1 The agency determines that a species population may no longer be in danger of failing, declining, or vulnerable, pursuant to section 3.3.

6.1.2 The agency receives a petition from an interested person. The petition should be addressed to the director. It should set forth specific evidence and scientific data which shows that the species may no longer be failing, declining, or vulnerable, pursuant to section 3.3. Within 60 days, the agency shall either deny the petition, stating the reasons, or initiate the delisting process.

6.1.3 The commission requests the agency review a species of concern.

6.2 Upon initiation of the delisting process the agency shall publish a public notice in the Washington Register, and notify those parties who have expressed their interest to the department, announcing the initiation of the delisting process and calling for scientific information relevant to the species status report under consideration pursuant to section 7.1.

SPECIES STATUS REVIEW AND AGENCY RECOMMENDATIONS

7.1 Except in an emergency under 5.1.3 above, prior to making a classification recommendation to the commission, the agency shall prepare a preliminary species status report. The report will include a review of information relevant to the species' status in Washington and address factors affecting its status, including those given under section 3.3. The status report shall be reviewed by the public and scientific community. The status report will include, but not be limited to an analysis of:

7.1.1 Historic, current, and future species population trends.

7.1.2 Natural history, including ecological relationships (e.g., food habits, home range, habitat selection patterns).

7.1.3 Historic and current habitat trends.

7.1.4 Population demographics (e.g., survival and mortality rates, reproductive success) and their relationship to long term sustainability.

7.1.5 Historic and current species management activities.

7.2 Except in an emergency under 5.1.3 above, the agency shall prepare recommendations for species classification, based upon scientific data contained in the status report. Documents shall be prepared to determine the environmental consequences of adopting the recommendations pursuant to requirements of the State Environmental Policy Act (SEPA).

7.3 For the purpose of delisting, the status report will include a review of recovery plan goals.

PUBLIC REVIEW

8.1 Except in an emergency under 5.1.3 above, prior to making a recommendation to the commission, the agency shall provide an opportunity for interested parties to submit new scientific data relevant to the status report, classification recommendation, and any SEPA findings.

8.1.1 The agency shall allow at least 90 days for public comment.

8.1.2 The agency will hold at least one public meeting in each of its administrative regions during the public review period.

FINAL RECOMMENDATIONS AND COMMISSION ACTION

9.1 After the close of the public comment period, the agency shall complete a final status report and classification recommendation. SEPA documents will be prepared, as necessary, for the final agency recommendation for classification. The classification recommendation will be presented to the commission for action. The final species status report, agency classification recommendation, and SEPA documents will be made available to the public at least 30 days prior to the commission meeting.

9.2 Notice of the proposed commission action will be published at least 30 days prior to the commission meeting.

PERIODIC SPECIES STATUS REVIEW

10.1 The agency shall conduct a review of each endangered, threatened, or sensitive wildlife species at least every five years after the date of its listing. This review shall include an update of the species status report to determine whether the status of the species warrants its current listing status or deserves reclassification.

10.1.1 The agency shall notify any parties who have expressed their interest to the department of the periodic status review. This notice shall occur at least one year prior to end of the five year period required by section 10.1.

10.2 The status of all delisted species shall be reviewed at least once, five years following the date of delisting.

10.3 The department shall evaluate the necessity of changing the classification of the species being reviewed. The agency shall report its findings to the commission at a commission meeting. The agency shall notify the public of its findings at least 30 days prior to presenting the findings to the commission.

10.3.1 If the agency determines that new information suggests that classification of a species should be changed from its present state, the agency shall initiate classification procedures provided for in these rules starting with section 5.1.

10.3.2 If the agency determines that conditions have not changed significantly and that the classification of the species should remain unchanged, the agency shall recommend to the commission that the species being reviewed shall retain its present classification status.

10.4 Nothing in these rules shall be construed to automatically delist a species without formal commission action.

RECOVERY AND MANAGEMENT OF LISTED SPECIES

11.1 The agency shall write a recovery plan for species listed as endangered or threatened. The agency will write a management plan for species listed as sensitive. Recovery and management plans shall address the listing criteria described in sections 3.1 and 3.3, and shall include, but are not limited to:

11.1.1 Target population objectives.

11.1.2 Criteria for reclassification.

11.1.3 An implementation plan for reaching population objectives which will promote cooperative management and be sensitive to landowner needs and property rights. The plan will specify resources needed from and impacts to the department, other agencies (including federal, state, and local), tribes, landowners, and other interest groups. The plan shall consider various approaches to meeting recovery objectives including, but not limited to regulation, mitigation, acquisition, incentive, and compensation mechanisms.

11.1.4 Public education needs.

11.1.5 A species monitoring plan, which requires periodic review to allow the incorporation of new information into the status report.

11.2 Preparation of recovery and management plans will be initiated by the agency within one year after the date of listing.

11.2.1 Recovery and management plans for species listed prior to 1990 or during the five years following the adoption of these rules shall be completed within five years after the date of listing or adoption of these rules, whichever comes later. Development of recovery plans for endangered species will receive higher priority than threatened or sensitive species.

11.2.2 Recovery and management plans for species listed after five years following the adoption of these rules shall be completed within three years after the date of listing.

11.2.3 The agency will publish a notice in the Washington Register and notify any parties who have expressed interest to the department interested parties of the initiation of recovery plan development.

11.2.4 If the deadlines defined in sections 11.2.1 and 11.2.2 are not met the department shall notify the public and report the reasons for missing the deadline and the strategy for completing the plan at a commission meeting. The intent of this section is to recognize current department personnel resources are limiting and that development of recovery plans for some of the species may require significant involvement by interests outside of the department, and therefore take longer to complete.

11.3 The agency shall provide an opportunity for interested public to comment on the recovery plan and any SEPA documents.

CLASSIFICATION PROCEDURES REVIEW

12.1 The agency and an ad hoc public group with members representing a broad spectrum of interests, shall meet as needed to accomplish the following:

12.1.1 Monitor the progress of the development of recovery and management plans and status reviews, highlight problems, and make recommendations to the department and other interested parties to improve the effectiveness of these processes.

12.1.2 Review these classification procedures six years after the adoption of these rules and report its findings to the commission.

AUTHORITY

13.1 The commission has the authority to classify wildlife as endangered under RCW 77.12.020. Species classified as endangered are listed under WAC 232-12-014, as amended.

13.2 Threatened and sensitive species shall be classified as subcategories of protected wildlife. The commission has the authority to classify wildlife as protected under RCW 77.12.020. Species classified as protected are listed under WAC 232-12-011, as amended. [Statutory Authority: RCW 77.12.020. 90-11-066 (Order 442), § 232-12-297, filed 5/15/90, effective 6/15/90.]

Appendix E. Responses to written comments received during Recovery Plan review, organized by plan section and indicating number of commenters to include each remark.

Section	Comment *Response*	No.
Executive Summary	Indicate the percentage of active west coast breeding sites found in Washington. *The percentage has been included in the Population Status section.*	1
Natural History	Over 50 plovers banded in eastern Oregon have wintered on the California coast. *A citation has been added.*	1
Population Dynamics	The mating system description is confusing. *The mating system description has been clarified.*	1
	Additional predators have been identified at Washington or Oregon nest areas. *The predation section has been modified to include new information.*	3
	One-egg clutches may not always be abandoned or incomplete. *A statement to the contrary has been removed.*	1
Population Status	The Washington sub-population makes a minor contribution to the size of the coastal population of the western snowy plover. *Although Washington supports only a small portion of the population, birds that breed or winter here form a defining element of the species' range. Also, the effort to recover a viable population of snowy plovers in Washington reflects a commitment to maintain the state's wildlife diversity.*	2
	Washington may already support its peak "sustainable" population. *The number of breeding plovers found during recent years is less than that known to be present a decade ago. It is unlikely that these depressed numbers represent the highest population levels attainable under improved conditions.*	1
	That the snowy plover population in Washington has declined could be questioned. *The number of active breeding areas in Washington has declined from at least five to only two. Native dune systems have been largely eliminated from the coast and human activities near the ocean have increased substantially over time. Although a detailed historic record of plover abundance in the state is unavailable, it is believed that loss of habitat and increased disturbance have reduced the size of the population.*	1
	The snowy plover home is in Nevada and Texas. *A distribution map for western North America has been included. Snowy plovers in Texas are members of a different subspecies.*	1
	How was the Copalis Spit capacity estimated by Widrig in 1984? *Widrig made his estimate based on years of snowy plover experience at California and Washington nesting areas. His knowledge of suitable habitat and approximate nesting densities allowed him to provide a rough estimate of carrying capacity.*	1

Habitat Status	Salt used for beachgrass control is not considered an unregistered herbicide. *A statement to the contrary has been removed.*	1
	A dredged material disposal site is one of the key plover nesting areas in Oregon. *The potential importance of dredged material disposal is stated.*	1
	The great care exhibited by State Parks in development, interpretation, and management at the three nesting sites is inadequately depicted. *Efforts by the Washington State Parks and Recreation Commission to protect plovers through public education have been important. Elaboration of the methods used can occur during the development of site-specific management plans.*	1
Factors Affecting Continued Existence	Information presented on disturbance at Damon Point in 1985-1986 was poorly documented and not representative of current conditions. *Additional information on incursions into active and potential nesting areas was presented in Anthony (1987).*	1
	Address risks to plovers through toxic substances used in the Grays Harbor pulp industry. *Pulp industry toxins are not known to affect snowy plovers directly. Toxins have lower persistence in the sandy substrates where plovers feed. In finer substrates, such as mud and silt, toxins have greater persistence and may affect invertebrates. Because plovers generally do not probe in mud for food, they probably avoid benthic toxins.*	1
	There may be physiological limitations on Washington's plover population, because it occurs at the northern extent of the species' range. *Research task 7.3 has been modified to address this issue.*	2
	Additional testing for contaminants in plover eggs has been done. *The results of these tests have been presented.*	2
Recovery Objectives	The downlisting objectives are adequate. *Objectives are unchanged in the final version.*	2
	Downlisting objectives are unrealistic. *The objectives should be attainable using reasonable recovery methods. Objectives are meant to represent the size of the population judged to be present on the Washington coast prior to considerable modification of habitat through dune stabilization and development.*	1
	The downlisting objective should be revised upward if habitat manipulation is successful. *Objectives are based in part upon successful vegetation management.*	2
	The downlisting habitat objective should incorporate three sites rather than two. *Meeting population objectives at current nesting areas will be a significant improvement in the status of the Washington plover population. Enhanced plover abundance at two geographically distant breeding sites that are free of threats will diminish the risk of extirpation.*	3

	Removal or reduction of threats should be added as a downlisting objective. *Habitat security is among recovery objectives.*	2
	Additional information on how recovery objectives were determined should be provided. *Additional detail on derivation of objectives has been included.*	2
	Uncertainties about the mating system of plovers should influence the wording of the productivity objective. The female plover role will influence carrying capacity and measures of productivity upon which recovery objectives are based. *Population and productivity recovery objectives will be measured using "breeding pairs," to be based on observations of paired adults, nests with eggs, or broods. This is consistent with previous practice in Washington, but differs from the measure used in Oregon. The occurrence of renesting and polygamy will complicate estimating the number of breeding pairs accurately. The option of basing estimates on females has been considered, but is believed to be subject to greater inaccuracy without marked (color-banded) individuals. As the population recovers, banding plovers may become desirable.*	1
	Criteria would produce a minimal effect on the size of the overall population. *While the recovery of plovers in Washington to the levels specified in this plan will not contribute greatly to the overall population, it will maintain the historic northern periphery of the species' breeding and wintering range.*	1
General	A section related to funding should be added. *Section 8.7 addresses funding.*	1
	Reviewers should be provided with a copy of the distribution list. *Distribution lists will be made available upon request. In the future, peer and agency reviewers will be provided with a distribution list.*	1
	Survival of the species is critical regardless of economic cost or private rights. Recovery measures should be tied to need and benefit. *Site-specific management plans should balance the needs of snowy plovers with those of the public. Recovery should be achievable using reasonable methods.*	1 1
Monitoring and Protection	Monitoring, by itself, will not bring about protection. *Monitoring objectives have been separated from management and protection objectives.*	1
	Provide more specifics in the description of annual inventories. *Section 1.1 now characterizes level of intensity of survey effort.*	1
	Not all nests will be found and searching for them is very time consuming. *The difficulty of finding nests is addressed in survey guidelines.*	1
	Monitoring at high intensity would be beyond the capacity of the current staff at the Leadbetter Point nesting area. *Low-intensity surveys can provide indexes of abundance and reproductive success.*	1

Vegetation encroachment should be listed as a limiting factor. 1
Strategies have been reorganized and no longer include a discussion of limiting factors.

Higher priority should be given to reducing pedestrian disturbance. 4
Task 2.1 has been included in the Priority 1 group. Recent installation of signs at Damon Point and Oyhut Wildlife Area has been discussed.

Beach driving should be completely eliminated from breeding areas. 3
Active nest sites already are afforded some protection from beach driving. To modify the exception made for razor clam seasons will require revision of the Washington Administrative Code.

Data do not indicate beach driving negatively affects snowy plovers. 1
A beach-driving closure beginning 15 May, rather than 15 March, would be adequate. 1
Direct mortality of snowy plovers is unlikely to be observed by biologists and indirect effects of vehicular activity near nesting sites is difficult to quantify. However, productivity was lower at Leadbetter Point in 1981 for an area of high vehicular use, compared with an adjacent area with little traffic. Research on the ecologically similar piping plover leaves little doubt that vehicular traffic impacts dune- and beach-nesting shorebirds. An effective closure will encompass the period during which plovers prospect for nesting sites, undertake breeding, and raise chicks to fledging age.

Incorporate a strategy that allows flexibility for seasonal closures. 1
Development of site-specific management plans will allow more specific protective measures for each breeding area.

Pets, with or without a leash, should be prohibited from breeding sites. 3
Prohibition or restriction of pets should be considered on a site-specific basis within site management plans.

Predator control should be given high priority. 1
Although predators may destroy plover nesting attempts at some sites, they have not yet proven to be detrimental to populations in Washington. Surveyors will document predation and the presence of predators or their sign in plover nesting areas. A research task (7.5) has been identified to learn more about potential predators at breeding sites in Washington.

Predator control will be controversial. 1
Ideally, recovery will be accomplished without the need for control of predators.

Recommend against using poisons for predator control. 1
If a predator control program becomes necessary, alternatives to the use of poisons will be employed initially. However, poisoning is sometimes the most practical and effective method to control certain predators. Any application will be subject to stringent guidelines and will occur with cognizance of potential impacts on non-target organisms.

	Careful evaluation and justification is needed before using predator exclosures.	1
	Exclosures may do more harm than good.	3
	Use of exclosures could result in "take."	1
	The possible use of exclosures will be approached with caution. Researchers in other states have developed exclosure designs that will minimize effects on plovers. The U.S. Fish and Wildlife Service is developing guidelines for determining what actions may constitute "take."	
	Litter and garbage removal is essential.	2
	Task 2.4.1 addresses this issue.	
	Snowy plovers should be incorporated into Subregion Response Strategies for oil spills.	1
	The Department's Spill Response Team is knowledgeable about snowy plover biology and distribution.	
	Clarify responsibility for spill response.	1
	Section 2.5.2 now identifies the Department program involved in treatment of oiled birds.	
	Describe more clearly what is meant by "Protected Area."	1
	Task 2.1 has been modified to be more specific.	
Emergency Intervention	Captive rearing and captive breeding should be used only as a last resort.	2
	Recommend against captive techniques at this time.	1
	Captive techniques are not expected to be used during the foreseeable future. An investigation of the state of the art should be undertaken to prepare for contingencies.	
Evaluate and Manage Habitat	Nesting areas should be managed with plovers as the top priority.	2
	Snowy plovers are central to management of three Washington coastal dune areas.	
	Department should purchase current and future nesting areas.	2
	Strategy 3.2 recognizes ownership as a management ideal. In some situations, equivalent protection may be provided under alternate ownership. Limited funding for Department acquisitions will require flexibility in approaches to management of plover habitat.	
	Eliminate European beachgrass in favor of native plants.	4
	Tasks 3.4.1 and 3.4.2 address this Priority 1 task.	
	Providing recommendations to landowners should be given higher priority.	1
	A new strategy addressing cooperation and coordination has been added.	
	Beachgrass control should occur at Leadbetter Point only if habitat becomes limiting.	1
	Monitoring the percentage of vegetation cover will provide an indication when European beachgrass control should be initiated.	

	Use of herbicides will be controversial. *Alternatives to herbicides will receive primary emphasis during control efforts. Manual or mechanical techniques will be favored during initial treatments.*	1
	No beach development should occur near plover habitat. *Development of site-specific management plans is addressed as task 3.5.*	2
	No removal of sand or driftwood should take place except when it would be in the best interest of plovers. *Task 3.4.4 addresses this issue.*	2
	Dredge spoil deposition would be inappropriate. *Coos Bay North Spit, one of the key nesting sites for plovers on the Oregon coast, is a dredged material disposal site.*	1
	Dredge spoils should be used for creation of new habitat only, and not be used in occupied habitat unless well justified. *Neither Damon Point nor Leadbetter Point is considered appropriate for dredge spoil deposition.*	1
Regulatory	Address the Endangered Species Act and the federal recovery planning process. *The recovery planning process, the proposal of Critical Habitat, and the Federal listing of snowy plovers under the Endangered Species Act are now addressed.*	1
Enforcement	Enforcement should be given high priority. Closures are ineffective without a vigorous enforcement effort. *Enforcement has been assigned Priority 1.*	2 2
Information and Education	Coordination with other entities is important to long-term management. *A strategy addressing cooperation and coordination has been added.*	2
	A continuing effort (beyond 2 years) to provide improved educational material and interpretive displays should be provided. *A short-term, product-oriented effort should be appropriate for the creation of interpretive displays. The production of annual status reports, considered in task 5.2, will provide an additional educational tool.*	1
Research	Research on birds should wait until the population becomes viable. *Section 7 has been modified to address this idea.*	2
	Monitor brood movements. *This can be done with tasks 1.1 and 7.1.*	1
	Determine an appropriate buffer size around nesting and brood movement areas. *This can be done with task 7.1.*	1
	Assess the effectiveness of signs in reducing disturbance. *This can be done with task 7.1.*	1

	Determine the accuracy of 0.8 young per female as necessary for population stability. *This can be done with task 7.5.*	1
Post-recovery Planning	Development of site plans should be higher priority.	1
	Responsibility for preparation of site plans should be determined. *A new section on coordination and cooperation has been added. Site-specific plans now have higher priority (Section 3.5).*	1

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