Prince William Sound Sensitive Areas GIS Database and Mitigations Report

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Final Report

Study History: The Prince William Sound Sensitive Areas GIS Database and Mitigations project was initiated in 2007 to summarize the current state of knowledge relative to the distribution of species and habitats injured by the Exxon Valdez Oil Spill (EVOS) in Prince William Sound (PWS) into a single GIS database. It also summarizes current mitigations practices relative to human use disturbance which aim to prevent further impacts to injured species and habitats in the region. This project is part of a larger effort known as the Prince William Sound Framework, launched to provide land and resource managers with insight into the recovery status of recreation/tourism services in the aftermath of the March 1989 Exxon Valdez Oil Spill (EVOS). The objectives of this broader effort include, defining use types and distribution and the quality of the experience for various recreationists in the Sound. This project compliments this effort launched by the Chugach National Forest (CNF) to evaluate the dynamics of human use in PWS as they relate to recovering injured resources and services.

Abstract:
The recreation/tourism service will not be considered fully recovered until the resources upon which it depends are also recovered and management capabilities can accommodate changes in human use. Part of evaluating the condition of recovering resources and the recreation/tourism service is an assessment of sensitive resource areas with respect to potential impacts from human use and resource management decisions. Compilation of available species and habitat data for the PWS region occurred through collaboration with partner agencies including the: US Fish and Wildlife Service; US Geological Survey; National Marine Fisheries Service; Alaska Natural Heritage Program; and Alaska Department of Fish and Game. We also compiled and verified GIS layers for cultural resource sites and surveys in order to create a comprehensive layer with consistency throughout PWS. To support integrating these new data layers into management practice we evaluated conservation status and best mitigation practices relative to each sensitive species. This project produced GIS layers for 21 wildlife species, fish, and habitats as well as one layer of culturally sensitive areas affected by the oil spill. That resulting database, sans the cultural resources, is made available as a downloadable ArcGIS, Personal GeoDatabase with full metadata documentation.

Key Words: species, habitats, mitigations, GIS, database, Prince William Sound

Project Contact: the Chugach National Forest, Supervisor's Office, Anchorage Alaska. Contact Cjjorgensen@fs.fed.us or (907)-743-9500 to request access.

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Table of Contents

Evaluating the Recreation Service Recovery: Evaluation of Prince William Sound User Experience

EXECUTIVE SUMMARY

In 2007, the Chugach National Forest began an effort to synthesize the information available on the spatial distribution of species and habitats injured by the 1989 Exxon Valdez Oil Spill as well as generate a summary of best management practices to avoid human disturbance. The Chugach National Forest is the major land-owning Federal Trustee in Prince William Sound and plays an important role in the continuing spill recovery process. One area of critical importance to Forest managers is the distribution, behavior, and experience of human users throughout the Sound and the impact of these users have on recovering resources and services in the region. It is critical for management of sustainable human use and sensitive resources, that the location, timing, and nature of injured species and species and habitats be well understood by resource managers. This critical information need resulted in a GIS database composed of layers describing the spatial distribution of 21 species and habitats in Prince William Sound as well as mitigations reports that address specific risks to species that arise from human use. The resulting GIS database of species and habitat distributions is available as an ArcGIS *Personal GeoDatabase* from the Chugach National Forest. A mitigations report is included in support of this database to guide managers in possible conservation threats to species from human use in the Sound as well as possible management options. In addition, a synthesis of archaeological sites within the Sound was produced, though due to sensitivity about the nature of this information, it is not available as part of this Geodatabase. It is our hope that this synthesis of information might improve future management, research and monitoring efforts in the Sound and inspire an effort to update and maintain this type of database into the future.

INTRODUCTION

Twenty-one years after the *Exxon Valdez* oil spill, of the 27 species/habitats injured by the spill, 12 remain in status of: *recovering*, *unknown*, or *not recovering*. Simple explanations for the different recovery responses by different species do not exist. The ability of the species to recover from the effects of the spill depends on a multitude of factors, including food availability, habitat quality, breeding strategies, and other adverse pressures that may exist on the populations, in addition to any lingering oil effects (EVOS Trustees 2010). Human use is expanding within PWS, as it does there is an increasing potential that human disturbance will play a major role in the distribution and population dynamics on the wildlife species, the habitats they depend upon (Murphy *et al*. 2004), and on the human services such as subsistence that are so dependent on these resources.

As the recreation resource is managed more intensely to accommodate these increasing uses, there is potential for conflict with the conservation of wildlife species and cultural resources, which in turn may limit the ability to wisely locate recreational improvements and uses. This in turn may inadvertently create continued impact on species and services adversely impacted by the EVOS. Presently, much sensitive area distribution information exists across PWS but the

information has been collected in a piecemeal fashion in response to specific studies and agency or organizational priorities and requirements. No comprehensive spatial source of data is currently available which creates a situation where management of critical habitats is either ignored due to lack of knowledge of their existence, or they may require overly restrictive management regimes due to lack of locational specificity of sensitive resources. This project synthesizes existing information into a GIS database and mitigations report which can be used by EVOS Trustees and local managers to prevent injury from recovered and recovering resources and services.

Relevance to 1994 Restoration Plan Goals and Scientific Priorities

Recreation and tourism is a class of human services that is not yet fully recovered from the impacts of the 1989 EVOS. The service will not be considered fully recovered until the resources upon which it depends are recovered. There is growing concern from resource managers and PWS communities that increased competition and rapid growth in commercial and independent human use may be threatening the resources; particularly those injured and still recovering from EVOS - upon which the recreation/tourism depends. Of equal concern is whether the very wilderness experiences that native Alaskans and visitors are seeking are not equally being threatened. As recreational use levels increase in PWS (e.g., kayaking, wildlife viewing, pleasure boating, hunting, fishing, camping etc.) it is inevitable that encounter levels and associated impacts will increase, visitor conflicts could arise and native Alaskans could be displaced from traditional harvest areas. This is of particular concern in light of the displacement and redistribution of users in the aftermath of EVOS.

Part of evaluating the condition of (and impacts to) both recovering resources and the recreation/tourism service is an assessment of "filters" that would identify resource sensitive areas that could be evaluated/monitored with respect to potential impacts from Sound users and management decisions. In addition there is a need to define a system of consistent mitigations relative to these areas so that adverse impacts to recovered or recovering resources can be avoided.

Objectives

1. Using contemporary spatial data we aim to create a GIS database to identify biologically and culturally sensitive areas within Prince William Sound.
2. Identify concentration areas of injured resources that could be evaluated relative to management actions (permitting of commercial activities, campsite hardening, etc) and prioritization of future monitoring efforts.
3. Develop associated procedures for how the resulting GIS database can be updated for perpetuity and exist as a platform for the incorporation of other existing and future data collected by EVOS Trustees at large.
4. Evaluate existing mitigations recommended for EVOS sensitive resources by the Trustees, local managers and current peer reviewed literature in order produce a suite of suggested mitigation measures for identified sensitive areas along the shoreline of PWS.

Study Area

Prince William Sound is located in south-central Alaska at 61^{o} N, 148^{o} W (See Figure 1). The Chugach and Kenai Mountain ranges separate most of PWS from interior Alaska and two large islands, Montague and Hinchinbrook, shelter the hundreds of bays and islands that make up PWS from the Gulf of Alaska (Murphy *et al*., 2004). The maritime climate of PWS is characterized by heavy annual precipitation, much of which falls in the form of snow during long winters. Summers are generally cool and wet (Bowyer *et al*. 1995). The 7,000 km of convoluted shoreline are comprised of tall, rock cliffs, gravel beaches, tidal flats, rocky outcrops and islands, estuaries and tidewater glaciers. PWS shorelines are exposed to large fluctuations in tide (+6 m to -1 m) and different levels of wave action (Bowyer et al. 1995).

High elevation lowland dominated by old-growth Western Hemlock (*Tsuga heterophylla*) and Sitka Spruce (*Picea sitchensis*) forests (Larsen 1983, Bowyer *et al*. 1995). Terrestrial vegetation begins within 1-2 m of the high-tide line. Blueberries and huckleberry (*Vaccinium sp*.), Rusty Menziesia (*Menziesia ferruginea*), Devilsclub (*Oplopanax horridum*) and salmonberries and thimbleberries (*Rubus* spp.) are common understory species found in forests and disturbed areas. The CNF manages most of upland PWS, including the 2.1 million acre Nellie Juan Wilderness Study Area (Twardock and Monz 2000). The state of Alaska as well as the Chugach Alaska, Chenega, Tatitlek and Eyak Alaska Native Corporations own approximately 20% of land in PWS, with another ~1% being privately-owned.

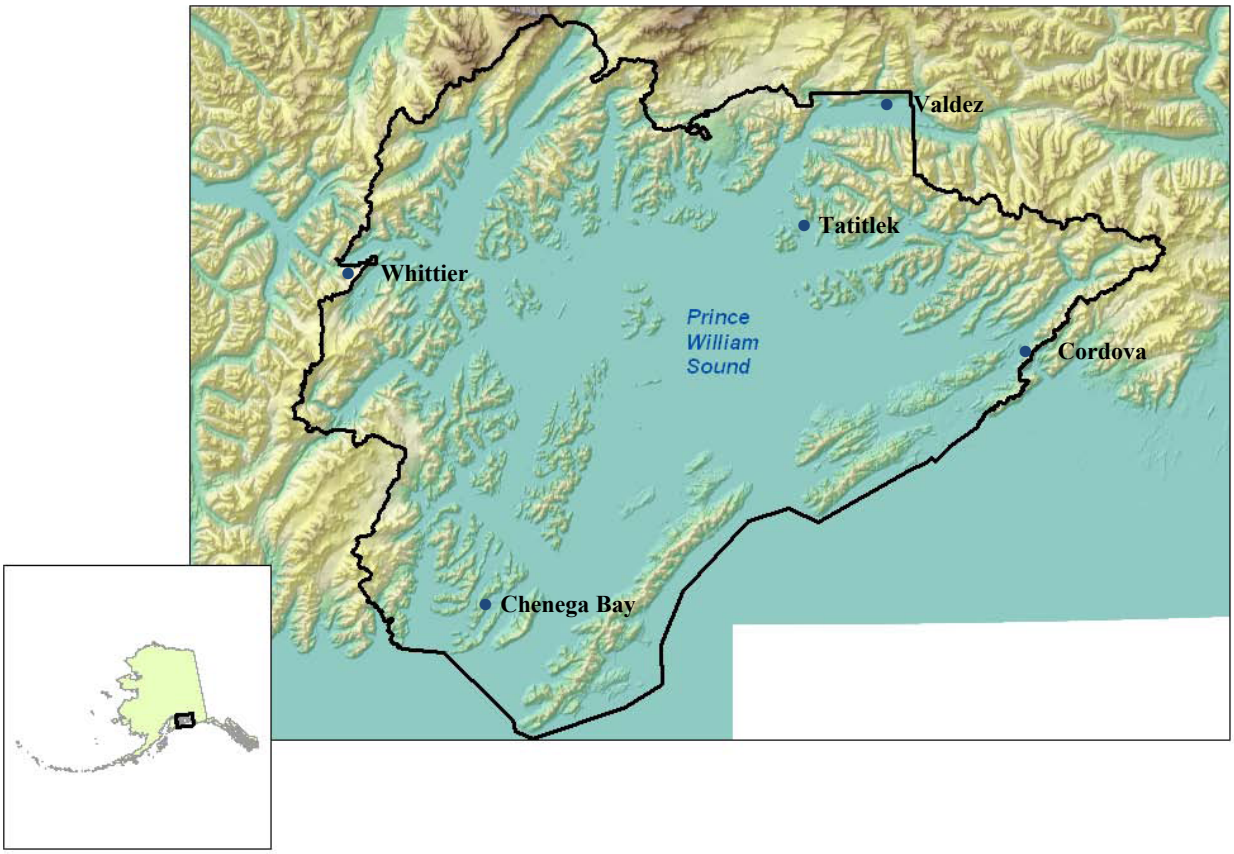

Figure 1. Prince William Sound Study Area.

METHODS

GIS Database

We began by evaluating the list of resources that were impacted by the EVOS as described in their 2006 status update (updated in 2010 at: http://www.evostc.state.ak.us/Recovery/status.cfm) to identify focal species and habitats (Table 1). We focused on those wildlife and fish species as well as habitats affected by the oil spill with distributions in PWS. We gave priority toward finding data sets for those species and habitats described by the EVOS Trustee Council as: *not recovering*, *recovering*, and *unknown*, but also included those defined as *recovered*. We also investigated archaeological resource and survey data layers maintained by the CNF to create a comprehensive layer of high priority sites for this injured resource in the region. We worked with researchers and data stewards from several organizations to determine the availability of GIS layers for each of the targeted species, habitats and resources. This was accomplished through collaboration with the: US Fish and Wildlife Service; US Geological Survey; National Marine Fisheries Service; Alaska Natural Heritage Program, Alaska Department of Fish and Game, and others.

All resulting data layers were imported into ArcGIS and evaluated for consistency, the degree to which they likely represented species distribution through time, the resolution of spatial extent and potential to inform PWS managers. Layers that appeared to be broadly representative of species/habitats in PWS, yet had enough resolution to be useful for managers, and could be tracked back to original survey or research work were imported into an ArcGIS Personal Geodatabase. In some cases (e.g., seabird locations collected on transect by the US Fish and Wildlife Service) data was summarized by point-density interpolation procedures in ArcGIS Spatial Analyst to create polygonal distributions. Metadata was created for all data layers in ArcCatalog using a standardized template. Fields from the template captured the methodologies used to create the data, restrictions on use, descriptions of attribute codes and reference literature or report citations. The resulting Geodatabase is housed at an online portal maintained by the CNF such that it can be available to researchers, managers and stakeholders.

The majority of data describing archaeological sites came from two sources. The first is known under the Alaska National Interest Lands Conservation Act of 1980, or ANILCA, which allowed for Alaska Native tribes to select sites to be conveyed from federal status into ownership by Alaska Native Corporations. Sites that have been selected by the Corporations are known as *14h1 sites* and are typically areas of significant cultural relevance to the Sound's first peoples. Given that they are in process of conveyance, and their cultural significance, they were included as sensitive sites for this layer. Another source was point locations identified during EVOS remediation efforts following the spill and subsequent CNF archaeological surveys in the region. These two data layers were components of our review but are not included in any database available to the public.

Table 1. Species, habitats and human services injured by the 1989 Exxon Valdez Oil spill and their recovery status between 1996 and 2006. [Adapted from EVOS Trustee Council 2006]

Resource	1996 Status	1999 Status	2002 Status	2006 Status
Archaeological Resources	Recovering	Recovering	Recovered	Recovered
Bald Eagles	Recovered	Recovered	Recovered	Recovered
Black Oystercatchers	Unknown	Recovering	Recovered	Recovering
Clams	Unknown	Recovering	Recovering	Recovering
Common Loons	Unknown	Not Recovering	Not Recovering	Recovered
Common Murres	Recovering	Recovering	Recovered	Recovered
Cormorants	Not Recovering	Not Recovering	Not Recovering	Recovered
Cutthroat Trout	Unknown	Unknown	Unknown	Unknown
Designated Wilderness	Unknown	Unknown	Recovering	Recovering
Dolly Varden	Unknown	Unknown	Unknown	Recovered
Harbor Seals	Not Recovering	Not Recovering	Not recovering	Recovered
Harlequin Ducks	Not Recovering	Not Recovering	Not recovering	Recovering
Intertidal Communities	Recovering	Recovering	Recovering	Recovering
Killer Whales	Not Recovering	Not Recovering	Recovering	Recovering
Kittlitz's Murrelets	Unknown	Unknown	Unknown	Unknown
Marbled Murrelets	Not Recovering	Recovering	Recovering	Unknown
Mussels	Recovering	Recovering	Recovering	Recovering
Pacific Herring	Not Recovering	Recovering	Not recovering	Not recovering
Pigeon Guillemots	Not Recovering	Not Recovering	Not recovering	Not recovering
Pink Salmon	Recovering	Recovering	Recovered	Recovered
River Otters	Unknown	Recovered	Recovered	Recovered
Rockfish	Unknown	Unknown	Unknown	Unknown
Sea Otters	Not Recovering	Recovering	Recovering	Recovering
Sediments	Recovering	Recovering	Recovering	Recovering
Sockeye Salmon	Recovering	Recovering	Recovered	Recovered
Subtidal Communities	Recovering	Recovering	Unknown	Unknown
Human Service				
Commercial Fishing	Recovering[a]	Recovering	Recovering	Recovering
Passive Use	Recovering[a]	Recovering	Recovering	Recovering
Recreation and Tourism	Recovering[a]	Recovering	Recovering	Recovering
Subsistence	Recovering[a]	Recovering	Recovering	Recovering

[a] *Classified as "Lost or Reduced Service" in 1996 Update, meaning that the service was negatively indirectly impacted by the spill due to its connection with impacted natural resources*

RESULTS

GIS Database

A total of 21 GIS data layers were identified and combined into the resulting ArcGIS Personal Database from this project (Table 2). They exist as a combination of point, line and polygon reflecting the best available information for these species and habitats within the Sound. Sources ranged from data maintained through ongoing monitoring efforts by partner agencies, to single or multi-year inventory efforts. The GIS data layer of archaeological sites identified some 180 prior locations within PWS for managers to consider as sensitive to impacts from human use. It is not available to the public but consultation aiming to promote better managment can be requested through CNF via the project contact listed for this report.

Table 2. Species and habitats within Prince William Sound included in the resulting ArcGIS Personal Geodatabase and Mitigations Report.

Species/Habitat	Survey Date Range	General Data Type	Source	Feature Type
Bald Eagle	1990-2000	Presence/Absence	US Fish and Wildlife Service	Point
Biological Hotspots	2005	Reference	National Wildlife Federation	Polygon
Black Oystercatcher	1999-2009	Presence/Absence	Chugach NF	Point
Blue Mussel Beds	2009	Presence/Absence	Shorezone (NOAA & CORI)	Line
Common Loon	2003 - 2007	Presence	US Fish and Wildlife Service	Polygon
Common Murre	2003 - 2007	Presence	US Fish and Wildlife Service	Polygon
Cutthroat Trout	Updated 2008	Presence/Absence	Chugach NF	Line
Dolly Varden	Updated 2008	Presence/Absence	Chugach NF	Line
Eelgrass beds	2009	Presence/Absence	Shorezone (NOAA & CORI)	Line
Harbor seal	1991-1994	Presence/Absence	ADF&G	Polygon
Harlequin Duck	2003 - 2007	Presence	US Fish and Wildlife Service	Polygon
Killer whale	1995	Reference	Nat. Marine Fisheries Service	Polygon
Kittlitz's Murrelet	2001-2007	Presence	US Fish and Wildlife Service	Polygon
Marbled Murrelet	2003 - 2007	Presence	US Fish and Wildlife Service	Polygon
Pacific Herring	1973 - 2007	Presence/Absence	ADF&G	Polygon
Pigeon Guillemot	2003 - 2007	Presence	US Fish and Wildlife Service	Polygon
Pink Salmon	Updated 2008	Presence/Absence	Chugach NF	Line
Sea Bird Colonies	Updated 2009	Presence/Absence	US Fish and Wildlife Service	Point
Sea Lion Haulouts	Updated 2003	Presence/Absence	ADF&G	Polygon
Sea Otter	2003 - 2005	Presence	US Geological Survey	Polygon
Sockeye Salmon	Updated 2008	Presence/Absence	Chugach NF	Line

Mitigations Report

A compilation of 18 individual species/habitat reports is included herein as Appendix A and each is listed in Table 3. All species for which GIS data available except cutthroat trout were included and salmon species assessment was combined into a single report.

Table 3. Species and habitats for which an individual mitigations report was completed.

Injured Species/Habitat
Bald Eagle
Black Oystercatcher
Common Loon
Common Murre
Dolly Varden
Eelgrass beds
Harbor seal
Harlequin Duck
Killer whale
Kittlitz's Murrelet
Marbled Murrelet
Mussel Beds
Pacific Herring
Pigeon Guillemot
Salmon Species
Sea Bird Colonies
Sea Lion Haulouts
Sea Otter

CONCLUSION AND RECOMMENDATIONS

- With any ecological synthesis it is difficult to collectively represent data from individual projects in a way mindful of their original intent and overall quality. We request that anyone intending to use these layers for further research or management familiarize themselves with the original published methodologies under which they were collected to assess limitations of their use. The metadata structure of our Geodatabase makes a special attempt to assist with such an evaluation.

- The data synthesized and made available by this project likely represents the most comprehensive spatial database of species and habitats injured by the EVOS. However, by the very nature of science and management in a well-studied environment like the Sound it only represents a snap shot in time. Relevant, new spatial datasets have doubtless been established in the intervening years since this project was initiated. We recommend that the CNF --as a major land manager in the region make an effort on a regular time interval, perhaps every 5 years, to refresh and republish this information. This effort might best be implemented in partnership with another regional entity like the Prince William Sound Science Center or others with a broad focus.

- Research synthesis in an area that is a key focus area for so many scientists and managers affords the CNF an opportunity to play a convening role in the effort to understand and manage the Sound. By engaging with the other agencies and researchers the CNF has the

opportunity to look for synthesis between its own efforts and those of others as well as connect local stakeholders with those leading the effort to understand the ecosystem of the Sound.

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APPENDIX A. MITIGATIONS REPORTS

Bald Eagle (Haliaeetus leucocephalus)

The bald eagle is Alaska's largest resident bird of prey with a wingspan of up to 7 ½ feet long and weights of up to 14 pounds. These magnificent birds are the symbol of the United States and Alaska boasts the largest population of eagles in the country (30,000). The eagle is obviously named for the white coloration of the feathers on the adult eagles head. Immature eagles do not fully get these conspicuous markings until they are approximately 5 years old. Bald eagles are found along the pacific coast from Alaska to California and throughout the continental US. Bald eagles remain close to waterways such as ocean coastlines, rivers, and lakes. They generally require large, old growth trees for nesting and reproduction. The trees must be large enough to support the nests, which can get to be enormous (10 feet wide by 20 feet in depth). Trees may also play an important role in hunting for food. The coastal rainforests of Alaska provide a vast amount of prime habitat for these incredible birds.

Bald eagles are opportunistic feeders and will hunt or scavenge for a wide variety of prey. In Alaska, salmon are a primary component of their diet. Salmon are an energy rich, easily obtainable food for eagles during the nesting season. Bald eagles are formidable hunters with long talons and a sharp curved beak for tearing apart meat. However, they often steal meals from other predators or scavenge on carcasses. In addition to fish, they will take rabbits, ducks, geese, and other small prey.

Prince William Sound (PWS) supports a healthy population of eagles and the population has increased overall since 1982 (Bowman et al. 1997). Summer populations in PWS have been estimated at 6,000 individuals (Bowman 1999). Nest locations in western PWS were collected during aerial and boat based surveys supporting Exxon Valdez Oil Spill (EVOS) monitoring efforts in the 1990s. A biological database of nest locations in Alaska (Alaska Bald Eagle Nest Atlas) is maintained by the US Fish and Wildlife Service and is available to the public online at http://alaska.fws.gov/mbsp/mbm/landbirds/alaskabaldeagles/default.htm . Based on this data there are approximately 853 individual nests recorded in PWS. Recent surveys have not been conducted to evaluate actual occupancy of these previously identified sites.

As apex predators, bald eagles are highly susceptible to the effects of contaminants. Contaminants bio-accumulate in the tissues their prey and can then be extremely toxic to the predacious eagles. From 1947 to 1968 DDT was used extensively as an insecticide and caused a severe collapse in the bald eagle population of the lower 48 states (Garrard and Bortolotti 1988). Other potential contaminants that might effect current eagle populations include mercury, lead, selenium, and organochlorine compounds.

Human land use and recreational activities that disturb eagles are another potential threat. Disturbance during the nesting period is probably the biggest concern. In Prince William Sound the active nesting season is generally from March 1 to August 31 (USDA Forest Service 2002b). The Chugach National Forest Land Management Plan requires adherence to Bald Eagle nest protection standards established in an interagency MOU between USFWS and Alaska Region USFS. Specifically those standards call for a 330 foot retention zone from potentially disruptive land management activities between March and August. The National Bald Eagle Management Guidelines (USFWS 2007) provides further recommendations that are specific to different types of human activities:
In general, to avoid disturbing nesting bald eagles, we recommend (1) keeping a distance between the activity and the nest (distance buffers), (2) maintaining preferably forested (or natural) areas between the activity and around nest trees (landscape buffers), and (3) avoiding certain activities during the breeding season. The buffer areas serve to minimize visual and auditory impacts associated with human activities near nest sites. Ideally, buffers would be large enough to protect existing nest trees and provide for alternative or replacement nest trees.

Timber operations and forestry practices can greatly affect eagles and their habitat by removing current or potential nesting trees. These additional guidelines apply to timber specific activities:
- Avoid clear cutting or removal of overstory trees within 330 feet of the nest at any time.
- Avoid timber harvesting operations, including road construction and chain saw and yarding operations, during the breeding season within 660 feet of the nest. The distance may be decreased to 330 feet around alternate nests within a particular territory, including nests that were attended during the current breeding season but not used to raise young, after eggs laid in another nest within the territory have hatched.
- Selective thinning and other silviculture management practices designed to conserve or enhance habitat, including prescribed burning close to the nest tree, should be undertaken outside the breeding season. Precautions such as raking leaves and woody debris from around the nest tree should be taken to prevent crown fire or fire climbing the nest tree. If it is determined that a burn during the breeding season would be beneficial, then, to ensure that no take or disturbance will occur, these activities should be conducted only when neither adult eagles nor young are present at the nest tree (i.e., at the beginning of, or end of, the breeding season, either before the particular nest is active or after the young have fledged from that nest). Appropriate Federal and state biologists should be consulted before any prescribed burning is conducted during the breeding season.
- Avoid construction of log transfer facilities and in-water log storage areas within 330 feet of the nest.

Recommendations from the National Bald Eagle Management Guidelines (USFWS 2007) for

other potential disturbance categories are given as follows:

Off-road vehicle use (including snowmobiles).
No buffer is necessary around nest sites outside the breeding season. During the breeding season, do not operate off-road vehicles within 330 feet of the nest. In open areas, where there is increased visibility and exposure to noise, this distance should be extended to 660 feet.

Motorized Watercraft use (including jet skis/personal watercraft).
No buffer is necessary around nest sites outside the breeding season. During the breeding season, within 330 feet of the nest, (1) do not operate jet skis (personal watercraft), and (2) avoid concentrations of noisy vessels (e.g., commercial fishing boats and tour boats), except where eagles have demonstrated tolerance for such activity. Other motorized boat traffic passing within 330 feet of the nest should attempt to minimize trips and avoid stopping in the area where feasible, particularly where eagles are unaccustomed to boat traffic. Buffers for airboats should be larger than 330 feet due to the increased noise they generate, combined with their speed, maneuverability, and visibility.

Non-motorized recreation (e.g., hiking, camping, fishing, hunting, birdwatching, kayaking, canoeing).
No buffer is necessary around nest sites outside the breeding season. If the activity will be visible or highly audible from the nest, maintain a 330-foot buffer during the breeding season, particularly where eagles are unaccustomed to such activity.

Helicopters and fixed-wing aircraft.
Except for authorized biologists trained in survey techniques, avoid operating aircraft within 1,000 feet of the nest during the breeding season, except where eagles have demonstrated tolerance for such activity.

Blasting and other loud, intermittent noises.
Avoid blasting and other activities that produce extremely loud noises within 1/2 mile of active nests, unless greater tolerance to the activity (or similar activity) has been demonstrated by the eagles in the nesting area. This recommendation applies to the use of fireworks classified by the Federal Department of Transportation as Class B explosives, which includes the larger fireworks that are intended for licensed public display.

Recommendations for avoiding disturbance at foraging areas and communal roost sites.
1. Minimize potentially disruptive activities and development in the eagles' direct flight path between their nest and roost sites and important foraging areas.
2. Locate long-term and permanent water-dependent facilities, such as boat ramps and marinas, away from important eagle foraging areas.
3. Avoid recreational and commercial boating and fishing near critical eagle foraging areas during peak feeding times (usually early to mid-morning and late afternoon), except where eagles have demonstrated tolerance to such activity.
4. Do not use explosives within 1/2 mile (or within 1 mile in open areas) of communal roosts when eagles are congregating, without prior coordination with the U.S. Fish and Wildlife Service and your state wildlife agency.

5. Locate aircraft corridors no closer than 1,000 feet vertical or horizontal distance from communal roost sites.

Additional management practices that landowners and planners can exercise for added benefit to bald eagles.

1. Protect and preserve potential roost and nest sites by retaining mature trees and old growth stands, particularly within 1/2 mile from water.
2. Where nests are blown from trees during storms or are otherwise destroyed by the elements, continue to protect the site in the absence of the nest for up to three (3) complete breeding seasons. Many eagles will rebuild the nest and reoccupy the site.
3. To avoid collisions, site wind turbines, communication towers, and high voltage transmission power lines away from nests, foraging areas, and communal roost sites.
4. Employ industry-accepted best management practices to prevent birds from colliding with or being electrocuted by utility lines, towers, and poles. If possible, bury utility lines in important eagle areas.
5. Where bald eagles are likely to nest in human-made structures (e.g., cell phone towers) and such use could impede operation or maintenance of the structures or jeopardize the safety of the eagles, equip the structures with either (1) devices engineered to discourage bald eagles from building nests, or (2) nesting platforms that will safely accommodate bald eagle nests without interfering with structure performance.
6. Immediately cover carcasses of euthanized animals at landfills to protect eagles from being poisoned.
7. Do not intentionally feed bald eagles. Artificially feeding bald eagles can disrupt their essential behavioral patterns and put them at increased risk from power lines, collision with windows and cars, and other mortality factors.
8. Use pesticides, herbicides, fertilizers, and other chemicals only in accordance with Federal and state laws.
9. Monitor and minimize dispersal of contaminants associated with hazardous waste sites (legal or illegal), permitted releases, and runoff from agricultural areas, especially within watersheds where eagles have shown poor reproduction or where bioaccumulating contaminants have been documented.

Bald eagles are federally protected under the Migratory Bird Treaty Act of 1918 (MTBA) and the Bald Eagle Protection Act of 1940. The MBTA (16 U.S.C. 703-712) prohibits the taking of any migratory bird or any part, nest, or egg, except as permitted by regulation. The MBTA was enacted in 1918; a 1972 agreement supplementing one of the bilateral treaties underlying the MBTA had the effect of expanding the scope of the Act to cover bald eagles and other raptors. Implementing regulations define “take” under the MBTA as “pursue, hunt, shoot, wound, kill, trap, capture, possess, or collect. The Bald Eagle Protection Act of 1940 makes it illegal to kill, harm, harass, or possess bald eagles, alive or dead, or any part of an eagle, including eggs and feathers.

The Coastal Zone Management Act protects coastal environments throughout the US, including Bald Eagle habitat. In Alaska, all major human activities that have the potential to affect the coastal zone must pass a “determination of consistency” with the Coastal Zone Management Act

of 1972. The determination is done by multiple state and federal agencies, and coordinated through the Alaska Coastal Management Program.

Species Protections Summary:

EVOS Recovery Status

- Recovered

US Forest Service Management Plan

- USFS and USFWS MOU: Human activities will provide a minimum distance of 330 feet from eagle nesting trees during the nesting period (March 1 – August 31).
- Management of Fish and Wildlife Habitat - Goal: Maintain habitat to produce viable and sustainable wildlife populations that support the use of fish and wildlife resources for subsistence and sport hunting and fishing, watching wildlife, conservation, and other values.
- General Wildlife Guidelines 1. Design and locate facilities or apply seasonal restrictions on human activities when necessary and appropriate to reduce disturbance in important habitat areas, such as birthing areas, nesting areas and winter ranges (Table 3-5).

Federal Protections

- Migratory Bird Treaty Act of 1918
- Bald Eagle Protection Act of 1940
- Coastal Zone Management Act of 1972

State of Alaska Protections

- Alaska Coastal Management Program (ACMP, Department of Natural Resources)

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Black Oystercatcher (*Haematopus bachmani*)

The black oystercatcher is a large black shorebird that spends its entire life in or near intertidal shoreline habitats of the Pacific coast of North America. It ranges from the Aleutian Islands of Alaska to the Baja California peninsula. The bird sports a long orange-red bill, bright yellow eyes, and large pink feet. Black oystercatchers depend on marine shorelines for feeding and breeding, and are most abundant on low gradient gravel or rocky shorelines. Intertidal marine invertebrates are the primary food item of black oystercatchers, especially bivalves (clams and mussels) and mollusks (limpets, whelks, and chitons). These birds are relatively uncommon because of the patchy distribution of their preferred habitat. The entire world population is estimated at about 11,000 individuals and more than 50% of that population can be found in Alaska (Andres and Falxa 1995).

Black oystercatchers are a species of high conservation concern throughout its range. The species is listed as such within the United States, Canadian, Alaskan, and Northern and Southern Pacific shorebird conservation plans (Donaldson et al. 2000; Drut and Buchanan 2000; Brown et al. 2001; Alaska Shorebird Working Group 2000). It was selected as a U. S. Fish and Wildlife Service (USFWS) Focal Species for priority conservation action due to its small population size and restricted range, threats to preferred habitat, susceptibility to human-related disturbances, a lack of base-line data to assess conservation status, and a suite of ongoing anthropogenic and natural factors that may potentially limit long-term viability. The Black Oystercatcher is also listed as a Bird of Conservation Concern by the USFWS (U.S. Fish and Wildlife Service 2008). The black oystercatcher is considered a keystone indicator species along the north Pacific shoreline and a management indicator species (MIS) in the Chugach National Forest (USDA Forest Service 2002).

Because of their dependence on intertidal areas, black oystercatchers can be particularly susceptible to oil spills, coastal development, and recreational activities. The Exxon-Valdez Oil Spill (EVOS) greatly affected black oystercatcher breeding on oiled beaches in PWS (Andres 1997). Approximately 40% of pairs abandoned nests and chick production in 1989 was half of the production in previous years (Andres 1997). Black oystercatchers in PWS continued to be exposed to oil well after the spill since oil contaminants persisted in intertidal communities that include their prey species. Chronic exposure to oil contaminants has been documented into 2004, but the effect of this on the overall population trend in PWS is not known (EVOSTC 2006).

There is a growing concern that pressure from recreational activities in and around breeding areas could have deleterious effects on oystercatchers in PWS. Increasing pressure from the tourist industry in the form of growing visitation by cruise ships, sightseeing vessels, water taxis and private boats raises the likelihood that nests will be flooded by large wakes, especially during periods of high-high tides. Increased human presence by campers, kayakers, and fishermen in remote coastal areas could interfere with parental care and foraging, may result in nest abandonment, and increases the likelihood that nests and eggs will be inadvertently trampled.

Federal protections for black oystercatchers and intertidal habitats include the Migratory Bird

Treaty Act of 1918, The Clean Water Act of 1972, and the Coastal Zone Management Act of 1972. The Migratory Bird Treaty (MBTA 16 U.S.C. 703-712) prohibits the taking of any migratory bird or any part, nest, or egg, except as permitted by regulation. The MBTA was enacted in 1918; a 1972 agreement supplementing one of the bilateral treaties underlying the MBTA had the effect of expanding the scope of the Act to cover bald eagles and other raptors. Implementing regulations define "take" under the MBTA as "pursue, hunt, shoot, wound, kill, trap, capture, possess, or collect.

The Clean Water Act makes it illegal to knowingly or accidentally spill oil or other toxic pollutants into the waters of the US. The Coastal Zone Management Act protects coastal environments throughout the US. In Alaska, all major human activities that have the potential to affect the coastal zone must pass a "determination of consistency" with the Coastal Zone Management Act of 1972. The determination is done by multiple state and federal agencies, and coordinated through the Alaska Coastal Management Program.

Species Protections Summary:

EVOS Recovery Status

- Recovering

US Forest Service Management Plan

- Chugach National Forest Management Indicator Species (MIS)
- Management of Fish and Wildlife Habitat - Goal: Maintain habitat to produce viable and sustainable wildlife populations that support the use of fish and wildlife resources for subsistence and sport hunting and fishing, watching wildlife, conservation, and other values.
- General Wildlife Guidelines 1. Design and locate facilities or apply seasonal restrictions on human activities when necessary and appropriate to reduce disturbance in important habitat areas, such as birthing areas, nesting areas and winter ranges (Table 3-5).
- Provide a minimum distance of 330 feet from human activities on the ground and waterfowl or shorebird intertidal concentration or nesting areas (including black oystercatchers). Forest vegetation within these zones is considered to be unsuitable for timber production (*Waterfowl and Shorebird Habitats Management* section of Forest Plan, page 3-32)

Federal Protections

- Migratory Bird Treaty Act of 1918
- USFWS Bird of Conservation Concern
- Coastal Zone Management Act of 1972
- Clean Water Act of 1972

State of Alaska Protections

- Alaska Coastal Management Program (ACMP, Department of Natural Resources)
- Species of high concern in Alaskan Shorebird Conservation Plan.

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Blue Mussels (*Mytilus trossulus*)

Pacific blue mussels are a small mollusk common in inter-tidal waters up to 40 m deep. They occur in clusters and are found attached to rocks that are relatively protected from wave activity. Like other bivalves, the adults consist of two elongate blue or brown colored outer shells (1 to 4 inches in length) that house the internal body parts including the siphon and foot. The siphon is used to feed by inhaling water and filtering detritus and plankton (microscopic drifting organisms). Mussels attach themselves to rocks and other substrates by secreting sticky threadlike fibers from the foot, known as byssal threads. In addition to rock substrates, mussels are often found attached to man-made structures such as docks, pilings, and boats.

Pacific blue mussels are an important part of marine food webs were they are found. Common predators include seastars, anemones, crabs, surf scoters, black oystercatchers, sea and diving ducks (harlequin ducks, Barrow's goldeneyes), gulls, crows, sea otters, river otters, and mink. Mussels are food for humans as well. In Alaska, mussels are collected and eaten in the wild by subsistence users and they are raised commercially in aquatic farms. As filter feeders, mussels can accumulate contaminants such as PCB's (polychlorinated biphenols) and PAH's (polycyclic aromatic hydrocarbons) in their tissues when feeding on plankton in polluted waters. These contaminates can then be transferred to predators that feed on mussels, including humans.

Mussels in Prince William Sound (PWS) were impacted by the Exxon-Valdez oil spill. An estimated 40 – 45% of the 11 million gallons of spilled oil washed ashore and therefore affected the intertidal zone where blue mussels are most commonly found (http://www.evostc.state.ak.us/Recovery/status_intertidal.cfm). In addition, the hot water high pressure washing used during clean up efforts after the spill likely destroyed mussel beds. Concentrations of hydrocarbon contaminants (PAH's) in mussel tissues increased rapidly directly after the spill (Short and Babcock 1993). PAH concentrations in mussels found at oiled sites were still significantly higher than at non-oiled sites six years after the spill and it is estimated that it will take several decades for mussel beds to reach pre-spill levels (Carls et al. 2001). Despite the contamination, the oiled mussels beds persisted and for the most part were not physiologically affected by the high hydrocarbon concentrations (Thomas et al. 1999). The mussels in PWS appear to have developed a tolerance for hydrocarbon contaminants (Thomas et al. 1999), possibly because of a history of exposure to natural oil or coal deposits in the region (Short et al. 1999).

However, the effect of the contaminated mussel beds on some predators is a great concern. Three bird species: the black oyster catcher, Barrow's goldeneye, and harlequin duck are still being

exposed to hydrocarbons. Although the path of exposure is not known, it is likely that they are ingesting contaminants while feeding on oiled food or food growing in oiled sediments (http://www.evostc.state.ak.us/Recovery/status_mussels.cfm). Human subsistence users may also be exposed to contaminants from eating mussels in certain parts of PWS.

The other potential human related impacts to Pacific blue mussels include aquaculture (aquatic farming) and the introduction of the invasive Mediterranean blue mussel (*Mytilus galloprovincialis*). The major concern with aquaculture is the spread of parasites, viruses, and diseases of shellfish that could negatively affect wild populations. These maladies can be introduced and spread from domestic shellfish or wild broodstock that are illegally brought in from foreign areas. The State of Alaska Department of Fish and Game has an extensive aquatic farm permit application process that protects against the potential effects of aquatic farms on wild populations and habitat. The process is regulated with the Aquatic Farming and Hatchery Permit Statutes (AS Title 16.40.100-199). Potential farms are screened through the application process, which requires over 1 yr to complete and includes cooperation from several other state agencies including the ADF&G, DEC, DNR, and ACMP. The State bans the import and culture of all exotic mussel species (http://www.cf.adfg.state.ak.us/geninfo/enhance/maricult/maricult.php).

Invasive Mediterranean blue mussels are not native to the Pacific Northwest North America, but have been documented there as far north as Puget Sound, BC (http://www.issg.org/database/species/references.asp?si=102&fr=1&sts=sss&lang=EN). This species may outcompete and replace native mussels in some locations because it can grow faster, be more tolerant to air exposure, and have a greater reproductive output than that of the indigenous species (Branch and Steffani 2004). One of the main vectors of introduction for aquatic organisms, including mussels, is through the dishcharge of ballast water from ships (Fay 2002). Foreign water and the organisms in it are taken up into the ships hull for ballast (offset weight difference for fuel or cargo). When a ship gets to another port to refuel or get new cargo, the ship discharges the ballast water. Thus, invasive nuisance species are often first established at large maritime ports.

There are several federal and State protections relevant to Pacific blue mussel conservation in PWS. The Clean Water Act makes it illegal to knowingly or accidentally spill oil or other toxic pollutants into the waters of the US. All vessels traveling in US waters are subject to this law from large commercial vessels to small private or recreational vessels. The Coastal Zone Management Act protects coastal environments throughout the US. In Alaska, all major human activities that have the potential to affect the coastal zone, including intertidal areas, must pass a "determination of consistency" with the Coastal Zone Management Act of 1972. The determination is done by multiple state and federal agencies, and coordinated through the Alaska Coastal Management Program (ACMP). In addition to the Aquatic Farm Permit, companies that wish to transport shellfish to markets in Alaska are required to obtain a state shellfish transfer permit.

The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 was established to prevent and control the introduction and spread of non-native species into coastal and inland waters of the US. In 2008, congress passed the Coast Guard Authorization Act (H.R. 2830). Title

V. of this Act requires ships to install ballast water treatment systems to eradicate potential invasive species prior to transferring ballast water. All ships will have treatment systems by 2014. The State of Alaska forbids the discharge of ballast water from a ship's cargo tank into state waters unless the safety of ship depends on it (AS 46.03.750).

Species Protections Summary

EVOS Recovery Status

- Recovering

US Forest Service Management Plan

- Management of Fish and Wildlife Habitat - Goal: Maintain habitat to produce viable and sustainable wildlife populations that support the use of fish and wildlife resources for subsistence and sport hunting and fishing, watching wildlife, conservation, and other values.

Federal Protections

- Coastal Zone Management Act of 1972
- Clean Water Act of 1972
- Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990
- Coast Guard Authorization Act of 2008

State of Alaska Protections

- Alaska Coastal Management Program (ACMP, Department of Natural Resources)
- Aquatic Farming and Hatchery Permit Statutes – Title 16.40.100-199.
- Ballast Water Discharge Statute – Title 46.03.750

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Common Murre (*Uria aalge*)

Common murres are one of the most abundant seabirds in the Northern Hemisphere. They are found throughout the arctic and sub-arctic coasts of North America and as far south as California in the Pacific. There are an estimated 13 – 20 million common murres worldwide, and approximately 2.8 million in Alaska (Ainley 2002). These relatively large seabirds are perfectly adapted to dive underwater in pursuit of small fish and crustaceans. They can dive to depths of 240 feet and use their wings for propulsion underwater. Common murres are highly social and can often be found drifting on the ocean in large rafts of over 250,000 birds. They also nest in high densities on cliff ledges and rocky slopes. The colonies exhibit breeding synchrony: egg laying, hatching, and colony departure from the nesting grounds occurs almost simultaneously.

Murres are extremely vulnerable to coastal oil spills because they have a low reproductive rate, large populations, dense concentrations in coastal habitats, and form “rafts” (flocks) on the water. During the Exxon Valdez Oil Spill (EVOS), over 30,000 seabird carcasses were recovered from the waters of Prince William Sound (PWS) and an estimated 74% of them were murres (Piatt et al. 1990). Many more birds actually perished in the disaster, with some estimates of common murre mortality over 185,000 birds (Piatt and Anderson 1996). However, in the case of EVOS, the effects on common murres were short term. By 1993 the breeding success of the most affected murre colony at Barren Island had returned to pre-spill levels (EVOSTC 2006). Erikson (1995) suggested that the rapid recovery by common murres is a result of: 1) overestimated mortality during the spill, 2) high immigration of birds into the population from other regions, and 3) a high recruitment of younger birds or less successful breeders into the population.

Common murres are susceptible to climate change, or changes in ocean conditions that would affect food quality or availability. Murres have high energetic (and thus, food) requirements. An adult murre eats 10-30% of its body mass daily and they continue to feed chicks for up to 12 months after they leave the nesting area (Ainley 2002). A shift in abundance or availability of certain prey species in the oceans can lead to reduced growth and health of individuals, and possibly populations (Ramano et al. 2006). It is unknown how the whole population of common murres would respond to such changes, but a shift in prey species type and abundance may have resulted in declines of the pigeon guillemot population in PWS (Hayes and Kuletz 1997).

Commercial fisheries in PWS might negatively affect common murres through boat disturbance, fisheries bycatch, and net entanglement. In Alaska, bycatch is monitored and recorded by the National Marine Fisheries Service, Alaska Marine Mammal Observer Program. Incidental mortality of common murres has been recorded in various types of commercial fisheries with the main source of incidental take being in gillnet fisheries. Observers reported that approximately 433 seabirds were found dead or seriously injured in Prince William Sound salmon gillnets in 1991 (Wynn et al. 1992). Over 70,000 murres (common and thick billed) nest within 60 miles of Kodiak Island and the bycatch for common murres in 2002 was estimated at 185 individuals. Murres comprised less than 1% of all colonial birds on Kodiak Island but they comprised 34% of the total bycatch.

Common murres and murre eggs are traditional subsistence foods in some parts of Alaska, but their use in the Prince William Sound region appears to be rare. No birds or eggs were harvested by subsistence users in any of the major communities between the years 1997 – 2004 (ADF&G Subsistence Harvest Database).

Common murres are federally protected under the Migratory Bird Treaty Act of 1918 (MTBA). The MBTA (16 U.S.C. 703-712) prohibits the taking of any migratory bird or any part, nest, or egg, except as permitted by regulation. The MBTA was enacted in 1918; a 1972 agreement supplementing one of the bilateral treaties underlying the MBTA had the effect of expanding the scope of the Act to cover bald eagles and other raptors. Implementing regulations define "take" under the MBTA as "pursue, hunt, shoot, wound, kill, trap, capture, possess, or collect.

The Coastal Zone Management Act protects coastal environments throughout the US, including any coastal habitats that are used for feeding and breeding by common murres. In Alaska, all major human activities that have the potential to affect the coastal zone must pass a "determination of consistency" with the Coastal Zone Management Act of 1972. The determination is done by multiple state and federal agencies, and coordinated through the Alaska Coastal Management Program.

Species Protections Summary

EVOS Recovery Status

- Recovered

US Forest Service Management Plan

- Management of Fish and Wildlife Habitat - Goal: Maintain habitat to produce viable and sustainable wildlife populations that support the use of fish and wildlife resources for subsistence and sport hunting and fishing, watching wildlife, conservation, and other values.
- General Wildlife Guidelines 1. Design and locate facilities or apply seasonal restrictions on human activities when necessary and appropriate to reduce disturbance in important habitat areas, such as birthing areas, nesting areas and winter ranges (Table 3-5).

Federal Protections

- Migratory Bird Treaty Act of 1918
- Clean Water Act of 1972
- Coastal Zone Management Act of 1972

State of Alaska Protections

- Alaska Coastal Management Program: Dept of Natural Resources.
- Seabird Indicator Species: Alaska's Comprehensive Wildlife Conservation Strategy

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Common Loon (*Gavia immer*)

The common loon is often associated with freshwater lakes of Canada and Alaska, and is a common resident of the North Gulf Coast, Prince William Sound Region (Isleib 1973). Spring migrants are common throughout inshore waters and larger lakes from mid-April to mid-May.

These waters likely function as a migration route for birds moving to and from inland breeding areas. Breeders occur on most of the larger upland lakes within the forests of the region. They are also fairly common in winter in sheltered bays and inlets.

Most use of the Prince William Sound region by common loons is by wintering and non-breeding birds on marine waters. Oil spills are a threat to loons because they dive rather than fly to escape oil slicks. (Tankersley and Ruggles 1993). Greater than 200 oiled common loons were discovered after the *Exxon Valdez* oil spill and likely many times that number died as a result of the spill.

Human conflicts with common loons in Prince William Sound should be infrequent since most recreation takes place during summer months when few loons remain on marine waters. Freshwater lakes within forests surrounding Prince William Sound are mostly remote and receive relatively light human use. Motorized boat use, which might have the greatest potential to disrupt nesting loons, in lakes where loons are nesting would be uncommon throughout Prince William Sound (Ream 1976). Loons are occasionally caught in Prince William Sound gillnet fisheries, but again, numbers are small as most of these fisheries take place in summer when few common loons are using marine waters (Wynne at al. 1991, Wynne at al. 1992). Subsistence harvest of loons occurs in parts of Alaska and more commonly in Canada; subsistence harvest of loons has not been documented specific to PWS (Evers 2004).

Common loons are considered to be a species of special concern in several states, but not in their Alaska range. Common loons are addressed in the ADFG nongame plan but are not considered to be of high conservation concern; red-throated and yellow-billed loons are considered to be of greater conservation concern.

Common loons are federally protected under the Migratory Bird Treaty Act of 1918 (MTBA). The MBTA (16 U.S.C. 703-712) prohibits the taking of any migratory bird or any part, nest, or egg, except as permitted by regulation. The MBTA was enacted in 1918; a 1972 agreement supplementing one of the bilateral treaties underlying the MBTA had the effect of expanding the scope of the Act to cover bald eagles and other raptors. Implementing regulations define “take” under the MBTA as “pursue, hunt, shoot, wound, kill, trap, capture, possess, or collect.

Species Protections Summary

<u>EVOS Recovery Status</u>

- Recovered

<u>US Forest Service Management Plan</u>

- Management of Fish and Wildlife Habitat - Goal: Maintain habitat to produce viable and sustainable wildlife populations that support the use of fish and wildlife resources for subsistence and sport hunting and fishing, watching wildlife, conservation, and other values.

- General Wildlife Guidelines 1. Design and locate facilities or apply seasonal restrictions on human activities when necessary and appropriate to reduce disturbance in important habitat areas, such as birthing areas, nesting areas and winter ranges (Table 3-5).

Federal Protections

- Migratory Bird Treaty Act of 1918.

State of Alaska Protections

- No specific recommendations or protections.

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Dolly Varden (Salvelinus malma)

Dolly Varden are a char species named after a vibrant and beautiful female character in Dikens's 1841 novel, *Barnaby Rudge*. Dolly Varden are one of the most locally abundant fishes found in coastal Alaskan waters. Their range in Alaska extends from the Southern tip of the panhandle to the Northern slope in the Artic Circle. There are two distinct forms of Dolly Varden in Alaska: a Northern and a Southern, which are geographically separated by the Aleutian Islands. The Prince William Sound populations are part of the Southern form.

The species can take on one or more different life-history strategies. Those fish that live their entire life in freshwater streams, such as a land-locked lake or above a barrier to migration (waterfall), are referred to as residents. Other fish usually spend time in both freshwater stream systems and in saltwater oceans and estuaries over the course of their lifetime. The latter strategy is referred to as anadromy. Reproduction, known as spawning, occurs in the fall (September – November) in freshwater streams. Young fish emerge from eggs laid in the gravel of a stream during the following spring (March - May), and the juvenile fish generally spend from 3 – 4 years rearing in streams before migrating out into the ocean as smolts. The smolt migration usually occurs from May through June.

Prince William Sound (PWS) Dolly Varden populations are thought to congregate in large mixed-stock groups during the summer and spend winters in large lakes. Historic mixing of the populations has resulted in a genetically similar population across PWS (Griswold 2002). Dolly Varden are known to travel over large distances and through open ocean water when migrating between spawning and winter habitats. They require cold, clean freshwater streams for spawning and rearing. Some resident populations have adult individuals that only reach 4 - 5 inches in size.

The human-influenced threats to PWS Dolly Varden include the destruction of spawning, rearing, estuary, and near shore habitat by oil spills and human development (hydro-electricity, road construction, etc.). The Exxon Valdez Oil Spill directly impacted Dolly Varden populations. Hepler et al. 1993 documented a decrease in Dolly Varden survival in oiled areas the year after the Spill. Although, survival did rebound by 1990 and there was no apparent effect of spilled oil on growth rates of Dolly Varden (Hepler et al. 1993). Dolly Varden are considered to be recovered from the effects of the oil spill (http://www.evostc.state.ak.us/Recovery/status_dollyvarden.cfm). Since Dolly Varden depend on clean, cold freshwater spawning and rearing habitat, and estuaries for migration, the populations could be at risk from oil, diesel, and other petroleum spills. Spills could result from accidents of oil tankers, large fishing vessels, cruise ships, ferries, or from the pipeline that crosses spawning and rearing habitat in streams throughout the PWS and Copper River Delta region.

Road construction and other human developments are another potential impact that could effect Dolly Varden populations in PWS. Roads, whether associated with resource management activities (logging, hydro-electric, etc) or residential developments, can degrade spawning and rearing habitat (Furniss et al. 1991). The greatest concerns with roads usually involve sediment loading and/or direct blockage of migration routes by improperly designed or failed culverts.

Fine sediments can reduce the quality of spawning habitats by limiting flow and oxygen exchange between the water and fish embryos that are developing within the streambed gravels (Tappel and Bjornn 1983). There are also negative effects to young fish that are rearing in habitats with an excess of fine sediment (Suttle et al. 2004).

Dolly Varden are an important subsistence resource in the northern part of its distribution, but in PWS the species is not highly sought after. Subsistence harvest of fish is jointly managed by State and Federal agencies and the reported number of fish harvested by subsistence users in PWS is low (T. Joyce, USFS Subsistence Biologist, personal communication). Because of their abundance, the State's sport harvest regulations for Dolly Varden are quite lenient compared to those for cutthroat trout. Anglers in the PWS Management area are allowed to keep 10 Dolly Varden per day and the season is open throughout the entire year (http://www.sf.adfg.state.ak.us/Static/Statewide/regulations/southcentral/SCpws.pdf).

In addition to species-specific regulatory protections, all anadromous fish (those that spawn in freshwater but spend some time in ocean waters) receive both state and federal protections. Alaska's Anadromous Fish Act (Statute 16.05.871) and the Fishway Act (Statute 16.05.841) provide protection to fish habitat and insure that streams remain passable to migrating fish. All land management or land use projects that may affect anadromous fish habitat must obtain a permit from the State of Alaska's Habitat Division of Sportfish (Title 16 Permit).

Federal protection includes the Magnuson-Stevens Act, which as amended in 1996 (Sustainable Fisheries Act), mandates the conservation of all Essential Fish Habitat (EFH). EFH is described by the National Marine Fisheries Service (NMFS) as follows:

> "Essential fish habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (Magnuson-Stevens Act, 16 U.S.C. 1801 et seq). For the purpose of interpreting the definition of essential fish habitat: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and spawning, breeding, feeding, or growth to maturity covers a species' full life cycle (EFH Interim Final Rule, 62 FR 66531)."

If a project, activity, or land use has the potential to impact EFH, the agencies or individuals involved must consult with NMFS and take the appropriate mitigation measures to prevent degradation of fish habitat. The Clean Water Act of 1972 makes it illegal to knowingly or accidentally spill oil into the waters of the US.

Species Protections Summary

<u>EVOS Recovery Status</u>

- Recovered

US Forest Service Management Plan

- Identified as a Management Indicator Species (MIS)
- Management of Fish and Wildlife Habitat - Goal: Maintain habitat to produce viable and sustainable wildlife populations thatsupport the use of fish and wildlife resources for subsistence and sport huntingand fishing, watching wildlife, conservation, and other values.
- Water, Wetland and Riparian Areas – Goal: Provide for the proper functioning of streams, riparian areas, lakes, and wetlands.

Federal Protections

- Magnuson-Stevens Act and Sustainable Fisheries Act of 1996 – Essential Fish Habitat
- Clean Water Act of 1972

State of Alaska Protections

- Anadromous Fish Act and Fishway Act (Title 16 Permit)
- ADF&G sport harvest limit of 10 fish per angler per day.

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Eelgrass (Zostera marina)

Eelgrass is not really a grass, but a perennial flowering plant that grows in intertidal and shallow subtidal sandy mudflats. It is widely distributed throughout the world, but in the Pacific it can be

found in waters from the Seward Peninsula, Alaska, to the Baja Peninsula, Mexico. The rhizomous root structure tends to stabilize soft sediments and creates a thick mat or bed of vegetation. These eelgrass beds form an incredibly diverse biological ecosystem that is critical rearing and foraging habitat for many fish and invertebrate species. The eelgrass blades and plant structures provide living substrates and cover as well as generate food and nutrients to the soft bottom community through primary productivity and plant decay. The algae and invertebrates that attach themselves to eelgrass blades (epibiota) are an important food source for a myriad of other species.

Many important commercial and subsistence species depend on eelgrass habitats in coastal Alaska. Eelgrass provides a nursery rearing area for the most commercially important fish species in PWS, including Pacific herring (*Culpea pallasi*) and juvenile pink (*Oncorhynchus gorbuscha*) and chum (*O. keta*) salmon (Johnson et al. 2003). The small crustaceans (zooplankton) that thrive in eelgrass provide food for these fish species. Dungeness crabs, clams, octopus, scallops, sea urchins, shrimp, flounder, and sole are other important marine species that use eelgrass beds (Mumford 2007).

Eelgrass habitats in Prince William Sound are susceptible to human impacts including oil spills and water pollution. During the Exxon-Valdez oil spill 220 miles of coastline in PWS was heavily oiled. An estimated 40 – 45% of the 11 million gallons of spilled oil washed ashore and therefore impacted the intertidal zone where eelgrass flourishes (http://www.evostc.state.ak.us/Recovery/status_intertidal.cfm). Although heavily oiled, the direct effects of oil on eelgrass itself appeared to be small. No beds were eliminated and there were no differences in biomass between oiled and references sites in 1990 (Dean et al. 1998). However, the small organisms that live in the sediments and on the vegetation within and around oiled eelgrass beds were affected for many years (Jewett et al. 1999). Jewett et al. (1999) found that oil sensitive amphipods (crustaceans), an important food source for juvenile salmon, were dramatically reduced at oiled sites. Since the spill, there has been a slow recovery of some important invertebrate species and a lingering of bio-available oil in sediments associated with eelgrass and the intertidal zone in general (http://www.evostc.state.ak.us/Recovery/status_intertidal.cfm).

Eelgrass beds need clean clear water because photosynthesis requires sunlight penetration under the water surface. Thus, high sediment or nutrient loads can create cloudy water that will inhibit eelgrass beds. Coastal development such as docks and roads can increase the amount of sediment discharged into near shore waters and has lead to the destruction of eelgrass beds in populated coastal areas. Estuaries, or river mouths, can be particularly susceptible to high sediment and nutrient loads because rivers often transport and empty these materials from large populated watersheds directly into coastal areas.

The other potential human related impacts to eelgrass beds include aquaculture (aquatic farming) and the introduction of the invasive species dwarf eelgrass (*Zostera japonica*). Oyster farms in the Pacific Northwest US can alter the size and density of eelgrass beds (Tallis et al. 2009). The type of oyster farming makes a big difference in the level of disturbance, with bottom dredge harvest of oysters being the most harmful to eelgrass (Tallis et al. 2009). Dwarf eelgrass is a species native to Asian waters that has been found throughout the Pacific Northwest

(http://www.issg.org/database/species/ecology.asp?si=859&fr=1&sts=). If this species is established, it can change the physical structure and biological elements within the native eelgrass beds. A completely different benthic fauna is associated with introduced dwarf eelgrass beds and such a change can alter the entire ecology of near shore habitats, from the fish to the birds that feed on them.

The federal protection of eelgrass habitat includes the Magnuson-Stevens Act because eelgrass is recognized as a critic fish habitat in coastal areas by the National Marine Fisheries Service (NMFS). This Act, which as amended in 1996 (Sustainable Fisheries Act), mandates the conservation of all Essential Fish Habitat (EFH). EFH is described by NMFS as follows:

> "Essential fish habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (Magnuson-Stevens Act, 16 U.S.C. 1801 et seq). For the purpose of interpreting the definition of essential fish habitat: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and spawning, breeding, feeding, or growth to maturity covers a species' full life cycle (EFH Interim Final Rule, 62 FR 66531)."

If a project, activity, or land use has the potential to impact EFH, the agencies or individuals involved must consult with NMFS and take the appropriate mitigation measures to prevent degradation of fish habitat.

The Clean Water Act makes it illegal to knowingly or accidentally spill oil or other toxic pollutants into the waters of the US. The Coastal Zone Management Act protects coastal environments throughout the US. In Alaska, all major human activities that have the potential to affect the coastal zone must pass a "determination of consistency" with the Coastal Zone Management Act of 1972. The determination is done by multiple state and federal agencies, and coordinated through the Alaska Coastal Management Program.

Species Protections Summary

<u>EVOS Recovery Status</u>

- Recovered

<u>US Forest Service Management Plan</u>

- Management of Fish and Wildlife Habitat - Goal: Maintain habitat to produce viable and sustainable wildlife populations that support the use of fish and wildlife resources for subsistence and sport hunting and fishing, watching wildlife, conservation, and other values.

Federal Protections

- Magnuson-Stevens Act and Sustainable Fisheries Act of 1996 – Essential Fish Habitat
- Coastal Zone Management Act of 1972
- Clean Water Act of 1972

State of Alaska Protections

- Alaska Coastal Management Program (ACMP, Department of Natural Resources)

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Harbor Seal (*Phoca vitulina*)

Harbor seals (*Phoca vitulina*) are found on both coasts of North America but in the Pacific, occur from Baja Mexico to western Alaska. The diet of the species as a whole is diverse and includes many pelagic and benthic fishes, cephalopods, and crustaceans. In Prince William Sound they eat pollock in fall and winter, herring winter and spring, and salmon in summer. Spawning runs of eulachon attract large numbers of harbor seals to the lower Columbia River and the Copper River Delta each spring (Wilson and Ruff 1999).

Harbor seals regularly use particular haul-out sites, which can be intertidal ledges, rocky islets, reefs, mud flats, remote sand or cobble beaches, and glacial ice. Harbor seals are wary when hauled out and usually flee into the water when approached by boats or humans.

Harbor seal populations declined 63% in Prince William Sound between 1984 and 1997 (Frost et al. 1996). Several studies in Alaska have demonstrated the sensitivity of harbor seals to human

disturbance in the form of cruise boats, smaller motor boats, kayaks and hikers. Harbor seals were displaced from iceberg haulouts by cruise ships at distances up to 500m with 75% of seals being flushed if the cruise boat was within 200m (Jansen et al. 2006). These regular disturbances by cruise ships, however, did not influence seal abundance in the area. In Glacier Bay, 93% of groups (small motor boats, kayaks and hikers) disturbed seals in violation of the Marine Mammal Act (Lewis and Mathews 2000). Prolonged disturbance resulted from camping right on seal haulouts, with seals being displaced for up to 52 hours (Mathews 1999).

The Nation Marine Fisheries Service provides guidelines to prevent human disturbance when viewing marine mammals (http://www.nmfs.noaa.gov/pr/pdfs/education/viewing_wildlife.pdf).

These general guidelines can minimize disturbance when viewing marine mammals :

1. View marine mammals from no less than 100 yards distance.
2. Approach and depart from marine mammals slowly.
3. Determine behavioral state from a distance greater than 100 yards before approaching marine mammals for viewing. Be responsive to the specific situation.
4. Terminate viewing if behavioral changes are seen.
5. Keep noise levels down around marine mammals. Do not use horns or whistles. Do not shout or race motors.
6. Communicate with other ship's captains to coordinate timing and behavior of vessels around marine mammals. Allow no more than 15 minutes observation time for each vessel when there are multiple vessel and no more than 20 minutes when alone.
7. All vessels observing marine mammals should remain near each other on the same side of the animal(s). Do not box in animals against shorelines or corral animals between boats. Avoid rapid changes in speed or direction. Avoid shifting gears unnecessarily.

Additional viewing guidelines for pinnipeds and sea otters include:

1. Observe pinnipeds or sea otters one vessel at a time.
2. Conduct narration before and after (not during) observation.
3. Do not use camera flashes.
4. Be mindful that hauled out pinnipeds react to human smells. Attempt to keep vessel down-wind of haul-outs, if possible.
5. Minimize time around mothers and pups.

The Marine Mammal Protection Act of 1972 made it illegal to knowingly kill (harvest or “take”) harbor seals in most instances. Harbor seals are hunted by Alaska natives through cooperative agreements between NOAA and individual tribes. Approximately 1,644 harbor seals were taken in 2006 with 441 taken in Lower Cook Inlet and Prince William Sound. Additionally, harbor seals are occasionally taken in gillnets, with a minimum estimate of 103 killed in a single year.

Other threats faced by harbor seals in Prince William Sound include exposure to contaminants from oil spills and human garbage wastes.

Recent declines in harbor seal numbers in Alaska has prompted the State of Alaska to list the harbor seal as a Species of Special Concern. The state defines this as “any species or subspecies of fish or wildlife or population of mammal or bird native to Alaska that has entered a long-term

decline in abundance or is vulnerable to a significant decline due to low numbers, restricted distribution, dependence on limited habitat resources, or sensitivity to environmental disturbance."

Species Protections Summary

EVOS Recovery Status

- Recovered

US Forest Service Management Plan

- All projects will comply with Marine Mammal Protection Act (3-33); Know sensitivity of haulout sites during pupping (late May through mid-july) and molting (June through October) (Table 3-5 page 3-28); "Manage human activities within 750 feel of any hauled-out sea lion or seal on land areas to avoid disturbance" (page 3-33, guideline #1 under Threatened and Endangered Species).

Federal Protections

- Marine Mammal Protection Act of 1972
- Clean Water Act of 1972

State of Alaska Protections

- Designated Species of Special Concern.

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Harlequin Duck (Historonicus historonicus)

Harlequin ducks are small, compact sea ducks that inhabit Alaska's coastal regions for most of the year. Male harlequins are brightly colored with a blue-gray body adorned by bold white, maroon, and black accents around the head, neck, and chest. Females are generally uniform gray with white patches on the check and above the eye. The Pacific population of harlequin ducks ranges along the coast from the Aleutian Islands to northern California. During the spring or early summer, harlequins usually fly inland to breed along fast flowing rivers. Breeding and summer ranges extend from the coastal mountains of Alaska to California and along the northern Rocky Mountains to northwestern Wyoming (Bellrose 1980). In Alaska, Prince William Sound (PWS) is significant as a wintering area for large numbers of ducks. Harlequin ducks are one of the least studied duck species in North America because they inhabit such wild and remote locations.

Much of what is known about harlequin ducks in PWS came about from research after the Exxon Valdez oil spill (EVOS). It was estimated that approximately 1,000 ducks were killed directly by the initial oil event and research indicates that effects lingered for as much as nine years after the spill (Eisler et al. 2000). In 1998, winter survival of ducks in oiled areas was found to be less than those wintering in un-oiled habitats (Eisler et al. 2000). These survival differences were likely related to the persistence of oil in the inter- and sub-tidal areas of PWS, and the continued contamination of the benthic invertebrate prey species of harlequin ducks (Eisler et al. 2000). More recent research indicates that there are no significant differences between harlequin duck populations rearing in oiled and un-oiled habitats of PWS (Rosenberg et al. 2005). However, populations in the sound still remain below pre-spill levels and are therefore considered to be recovering but not recovered by the EVOS Trustee Council (Integral Consulting Inc. 2006)

In addition to oil spills, harlequin duck populations can be affected by human development, land management practices, and recreation along rivers and streams. Harlequin ducks nest on the ground or in root wad cavities adjacent to streams. Therefore, successful breeding requires adequate cover in which to hide nests from potential predators. Healthy riparian areas provide essential breeding habitat for these ducks including large trees, root wads, and downed woody debris. Human activity around harlequin ducks can disrupt nesting birds or scare birds out of a potential nesting area. Lewis and Kraege (1999) provide some general guidelines to reduce impacts to harlequin ducks and their breeding habitat:

1. Maintain woody debris and riparian vegetation in and adjacent to streams.
2. Maintain at least a 50 m (164 ft) buffer along nesting streams.
3. Logging activity in the riparian corridor should be avoided.
4. Stream alterations that would cause surface runoff, change water levels or lower macro-invertebrate levels should be avoided.
5. Trails or roads should be at least 50 m from streams used by harlequin ducks.
6. Fishing, rafting, and canoeing activities should be limited on streams used by nesting harlequins, especially during critical nesting seasons (April – August).

Known winter habitat areas along coastal shorelines should also be protected. Boating activity could disrupt ducks, especially when the birds are molting.

Sea ducks can be legally hunted in Prince William Sound, but the level of the harlequin duck harvest in the region is not known. Some sea duck hunting occurs near Whittier and in the Coghill flats near College Fiord (D. Crowley, ADF&G personal communication). There is some subsistence harvest from Chenega residents (Statton et al. 1986) as well as residents of Cordova, Tatitlik, Port Gravina, and Valdez. Annual reported subsistence harvests have ranged from 0 - 159 over the years 1987 – 2003 (ADF&G CSIS Database: http://subsistence.adfg.state.ak.us/CSIS/index.cfm/FA/harvInfo.resourceRegionData).

Federal protections for harlequin ducks and habitats include the Migratory Bird Treaty Act of 1918, The Clean Water Act of 1972, and the Coastal Zone Management Act of 1972. The Migratory Bird Treaty Act (MTBA 16 U.S.C. 703-712) prohibits the taking of any migratory bird or any part, nest, or egg, except as permitted by regulation. The MBTA was enacted in 1918; a 1972 agreement supplementing one of the bilateral treaties underlying the MBTA had the effect of expanding the scope of the Act to cover bald eagles and other raptors. Implementing regulations define "take" under the MBTA as "pursue, hunt, shoot, wound, kill, trap, capture, possess, or collect.

The Clean Water Act makes it illegal to knowingly or accidentally spill oil or other toxic pollutants into the waters of the US. The Coastal Zone Management Act protects coastal environments throughout the US. In Alaska, all major human activities that have the potential to affect the coastal zone must pass a "determination of consistency" with the Coastal Zone Management Act of 1972. The determination is done by multiple state and federal agencies, and coordinated through the Alaska Coastal Management Program.

Species Protections Summary

EVOS status

- Recovering

US Forest Service Management Plan

- Human activities must maintain minimum distance of 330 feet from waterfowl intertidal concentration and nesting areas between May-June and September-November.
- Minimize disturbance in known molting areas between July-August.
- Management of Fish and Wildlife Habitat - Goal: Maintain habitat to produce viable and sustainable wildlife populations that support the use of fish and wildlife resources for subsistence and sport hunting and fishing, watching wildlife, conservation, and other values.

Federal Protections

- Migratory Bird Treaty Act of 1918.
- Coastal Zone Management Act of 1972
- Clean Water Act of 1972

State of Alaska Protections

- Alaska Coastal Management Program (ACMP, Department of Natural Resources)

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Killer Whale (*Orcinus orca*)

Killer whales are the largest member of the dolphin family. Current research recognizes three distinct forms of killer whales in the northeastern Pacific Ocean: residents, transients and offshores (NMFS 2008). Prince William Sound is known to be used by over 160 killer whales in eight resident pods, as well as occasional use by transient killer whales and year-round use by the AT1 transient group. Use of the area by offshore killer whales is infrequent and has not been a focus of research (Matkin et al 2008). The transient AT1 pod and the resident AB pod have been of particular concern to researchers examining the species recovery in PWS (EVOSTC 2006; Matkin et al 2008). The Recovery Objective for killer whales in the EVOS Restoration Plana return to a prespill number of 36 whales for the AB pod (EVOSTC 2006). The AT1 group was designated as a depleted stock under the Marine Mammal Protection Act (MMPA) in 2004.

The most recent designation of the recovery status of killer whales under the EVOS Restoration Plan is “Recovering” (EVOSTC 2006). Recent analysis of over 20 years of killer whale inventories and population growth rates in the northern Gulf of Alaska suggests that the AB pod is likely to eventually recover to pre-spill numbers in the absence of additional unforeseen setbacks; the AT1 group, however is likely to be extinct within the next few decades (Matkin et al 2008).

As noted in the 2008 Recovery Plan for the federally listed Southern Resident Killer Whale (NMFS 2008), “There is considerable uncertainty regarding which threats may be responsible for the decline in the population or which is the most important to address for recovery” (executive summary, pp iv-v). In general, threats to killer whales are thought to potentially include contaminants, depletion of prey species, ship collisions, oil spills, disturbance from noise of industrial or military activities, entanglement in fishing gear, (NMFS 2008) and behavioral changes in the presence of boats ranging from commercial fishing vessels to whale-watching tours (Williams et al 2006; NMFS 2008). Within PWS, there are currently no known conflicts with commercial fisheries although historical conflicts and associated injury to killer whales did occur prior to 1986 (Angliss and Outlaw 2007; Matkin et al 2008). According to the Dept of Commercial Fisheries, “Killer whale depredation on hooked sablefish has been a problem in recent years, resulting in the removal of undocumented numbers of sablefish during longline retrieval. Fishermen should note that this problem has typically decreased markedly after the first week of May.” Collisions with vessels may be a limited source of mortality but is likely only an occasional event (Angliss and Outlaw 2007).

A table summarizing the potential threats to killer whales along with their severity, likelihood of occurrence and feasibility of mitigation is provided in the Recovery Plan for the Southern Resident Killer Whale and is reproduced below (NMFS 2008); while developed for a distinct group of killer whales in a geographic location outside PWS the table offers a succinct summary of potential threats and mitigation concerns.

Table 6. Factors considered in listing and potentially affecting recovery of Southern Resident killer whales.

Threat	Listing Factors	Severity	Likelihood	Feasibility of Mitigation
Prey availability	Habitat	High	High	High, many salmon recovery efforts underway
Contaminants	Habitat, Inadequacy of Existing Regulations	High	High	Medium, Puget Sound clean-up efforts underway
Vessel effects (commercial, recreational whale watch)	Habitat, Overutilization, Inadequacy of Existing Regulations	High	High	High, whale watching guidelines and outreach underway, NOAA evaluating regulations and/or protected areas
Vessel effects (other vessel traffic not targeting whales)	Habitat, Inadequacy of Existing Regulations	Medium	High	Medium, safety and security considerations may limit ability to alter shipping lanes, MMPA and ESA mechanisms in place
Sound	Habitat, Inadequacy of Existing Regulations	Medium-High	High	Medium, MMPA and ESA mechanisms in place
Oil spills (pipelines, container and oil tankers)	Other Natural or Human-made Factors	High	Low	High, regulations in place for prevention, response plan for killer whales in development
Oil spills (small chronic sources)	Other Natural or Human-made Factors	Medium	High	Medium, permits and program in place to regulate point and non-point sources
Disease	Disease and predation	High	Low	Low, opportunistic monitoring in place
Small population size	Other Natural or Human-made Factors	Medium-High	Medium	Low, population monitoring in place
Live-captures for aquaria	Overutilization	Low	Low	Live-captures discontinued, but potential population structure effects remain

Guidelines have been developed from several sources in order to limit the potential threat posed by those viewing marine mammals.

Marine Mammal Protection Act (MMPA):

- Federal law prohibits pursuit of marine mammals.
- Remain at least 100 yards from marine mammals.
- Time spent observing individual(s) should be limited to 30 minutes.
- Whales should not be encircled or trapped between boats, or boats and shore.
- If approached by a whale, put the engine in neutral and allow the whale to pass.
- Maintain a 1500-foot minimum altitude when viewing marine mammals from the air.

General guidelines for all marine mammals

1. View marine mammals from no less than 100 yards distance.
2. Approach and depart from marine mammals slowly.
3. Determine behavioral state from a distance greater than 100 yards before approaching marine mammals for viewing. Be responsive to the specific situation.
4. Terminate viewing if behavioral changes are seen.
5. Keep noise levels down around marine mammals. Do not use horns or whistles. Do not shout or race motors.

6. Communicate with other ship's captains to coordinate timing and behavior of vessels around marine mammals. Allow no more than 15 minutes observation time for each vessel when there are multiple vessel and no more than 20 minutes when alone.
7. All vessels observing marine mammals should remain near each other on the same side of the animal(s). Do not box in animals against shorelines or corral animals between boats. Avoid rapid changes in speed or direction. Avoid shifting gears unnecessarily.

Additional viewing guidelines for cetaceans

1. Minimize contact and interference with resting whales.
2. Minimize contact with transient killer whales.
3. Exercise caution around cow and calf pairs.
4. Approach killer whales from the side, not from the front or back.
5. Do not "leap-frog" when viewing whales. Leap-frogging consists of repeatedly running ahead of whales and stopping in their path. During an encounter, each vessel may once move ahead of a group of whales several hundred yards (giving whales a wide berth and shut down engines, allowing whales to determine the closeness of approach.
6. Avoid re-viewing the same group of whales more than once in a trip.
7. Do not approach killer whales, either by sea or on the beach, when they are rubbing.

In addition, the MMPA prohibits the TAKE of all marine mammal species in U.S. waters. Take means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill," and harassment means "any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild; or has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to migration, breathing, nursing, breeding, feeding, sheltering." TAKE includes feeding or attempting to feed a marine mammal in the wild. Some exceptions are made for authorized scientific research and subsistence hunting by Alaska Natives.

Species Protections Summary

<u>EVOS Recovery Status</u>

- Recovering (2006 status report)

<u>US Forest Service Management Plan</u>

- All projects will comply with Marine Mammal Protection Act (3-33); no further recommendations specific to killer whales regarding sensitivity or seasonality.

<u>Federal Protections</u>

- Marine Mammal Protection Act of 1972
- AT1 group of transient killer whales designated as depleted stock 2004; this designation does not currently impose any additional restrictions than those in place in the MMPA.
- The distinct population segment (DPS) of Southern Resident killer whales (*Orcinus orca*) was listed as endangered under the Endangered Species Act (ESA) on November 18,

2005 (70 FR 69903). These whales occur primarily in Washington State and British Columbia in the summer and fall and in coastal waters in the winter (NMFS 2008).

State of Alaska Protections

- Killer whales not included in current iteration of CWCS.
- No specific protections under Alaska state law.

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http://www.fakr.noaa.gov/protectedresources/mmv/guide.htm

Kittlitz's Murrelet (Brachyramphus brevirostris)

A small diving bird related to puffins, murres, and auklets, the Kittlitz's murrelet is one of the rarest seabirds in North America. Most of the world's population occurs in Alaska's waters, migrating between winter offshore and summer inshore regions. Best population estimates range from 9,000 to 25,000 birds with indications of rapid population decline. The main breeding locations for Kittlitz's murrelets are around the lower Kenai Peninsula, Prince William Sound, Glacier Bay, and along the "Lost Coast" between the Bering Glacier and Palma Bay (near Brady Glacier) in Southeast Alaska.

In most of its range, the Kittlitz's murrelet seems to nest in rugged mountains near glaciers or in previously glaciated areas, sometimes up to 75 km inland. The Kittlitz's murrelet differs from the marbled in that it apparently nests exclusively on bare rocky ground. It usually forages near tidewater glaciers and outflows of glacial streams. Kittlitz's murrelets feed on forage fish such as Pacific sand lance, capelin and juvenile herring; and zooplankton, especially euphausiids, (small, shrimp-like crustaceans).

In Prince William Sound a 1972 survey estimated the population at approximately 63,000 birds. In 1989, the estimate was about 6,400 birds. A steady decline continued through the most recent survey in 2000, when the estimated population hovered near 1,000 birds (Kuletz et al. 2003a). This represents an 84% decrease since 1989 (when populations were apparently already dramatically depleted), equivalent to 18 % decline per year. Similar declines have been noted in Kenai Fjords, the Malaspina Forelands, and Glacier Bay.

Nearly 76 % of the PWS population is found in just two fjords Harriman and College Fjords, in the northwest, and another 22 % in three other fjords (Kuletz et al. 2003b). With one relatively minor exception, the fjords that contained Kittlitz's murrelets were surrounded by advancing or stable glaciers (Day et al. 2000; Kuletz et al. 2003a). Fjords that no longer had Kittlitz's murrelets had receding glaciers, or no direct glacial input (Kuletz et al. 2003a).

It's possible that murrelets are also affected by marine vessel traffic, or even, perhaps, by helicopter flights in alpine nesting areas. The primary breeding areas for Kittlitz's murrelets - the Kenai Fjords, Prince William Sound, Yakutat and Glacier Bay - are all experiencing increases in tour operations. The preferred habitats of Kittlitz's are also prime destinations for tour and cruise ships, increasing the potential for disturbance or associated forms of impact.

Near shore densities of Kittlitz's murrelets decreased, while diving behavior increased 3-fold and time spent flying increased 30-fold on days with vessel activity (Kuletz et al. 2003b; Agness et al. 2008).

Kittlitz's murrelets are vulnerable to entrapment in commercial fisheries. Observer data from Prince William Sound gillnet fisheries in 1990 and 1991 indicate that Kittlitz's murrelets comprise < 1% of the bycatch (Wynne at al. 1991; Wynne at al. 1992). Two and 10 Kittlitz's

murrelets were observed trapped in Commercial gillnets in Prince William Sound during 1990 and 1991, respectively. (Wynne at al. 1991; Wynne at al. 1992).

Kittlitz's murrelet is a National and Alaska Audubon WatchList Species because of a small, declining population, highly associated with tidewater glaciers (Stenhouse and Senner 2005). It is vulnerable to habitat loss due to climate change and disturbance in foraging areas.

Kittlitz's murrelets are federally protected under the Migratory Bird Treaty Act of 1918 (MTBA). The MBTA (16 U.S.C. 703-712) prohibits the taking of any migratory bird or any part, nest, or egg, except as permitted by regulation. The MBTA was enacted in 1918; a 1972 agreement supplementing one of the bilateral treaties underlying the MBTA had the effect of expanding the scope of the Act to cover bald eagles and other raptors. Implementing regulations define "take" under the MBTA as "pursue, hunt, shoot, wound, kill, trap, capture, possess, or collect.

Species Protections Summary

EVOS Recovery Status

- Recovery unknown

US Forest Service Management Plan

- Management of Fish and Wildlife Habitat - Goal: Maintain habitat to produce viable and sustainable wildlife populations that support the use of fish and wildlife resources for subsistence and sport hunting and fishing, watching wildlife, conservation, and other values.
- General Wildlife Guidelines 1. Design and locate facilities or apply seasonal restrictions on human activities when necessary and appropriate to reduce disturbance in important habitat areas, such as birthing areas, nesting areas and winter ranges (Table 3-5).

Federal Protections

- Candidate species for listing under the Endangered Species Act.

State of Alaska Protections

- No specific recommendations or protections.

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Marbled Murrelet (Brachyramphus marmoratus)

The marbled murrelet is a small seabird that spends most of its life at sea, coming to land only to nest in summer. They breed primarily in old-growth coniferous rainforest along the West Coast of North America from California to Alaska. They may fly up to 70 km inland to nest solitarily on mossy branches of large, old trees (Carter and Morrison 1992). Largely as a result of logging old-growth forests, the U.S. Fish and Wildlife Service listed the murrelet as threatened in California, Oregon, and Washington (Carter and Morrison 1992). It is also listed as threatened in British Columbia (Rodway et al. 1992).

Marbled murrelets nest in forests containing trees with large moss covered limbs or platforms in the upper canopy. Although they are relatively abundant in Alaska populations there have undergone a 71% decline since the early 1990's, dropping from nearly a million birds to about 271,000 today (Piatt et al. 2007).

Greatest threats to marbled murrelets are loss of nesting habitat through logging. Marbled murrelets have lost about 15 percent of their suitable nesting habitat in Southeast Alaska, and 33 to 49 percent in British Columbia, from industrial-scale logging within the past half century (Piatt et al. 2007). Increased predation also may be a threat to murrelet populations, related to fragmentation and edge effects from logging and development, and recent population increases observed for some important murrelet predators, including Bald Eagles (*Haliaeetus*

leucocephalus), Common Ravens (*Corvus corax*), and Steller's Jays (*Cyanocitta stelleri*) (Piatt et al. 2007).

Incidental capture of marbled murrelets in gillnets is the best-documented effect of fisheries on marbled murrelets and has been documented widely in Alaska, British Columbia, Washington, and California (Carter and Sealy, 1984; Carter et al. 1995; Melvin and Parrish, 2001). A 1990–91 study in Prince William Sound estimated that between 450 and 1,470 murrelets were killed in drift gillnets per year (extracted from data in Wynne and others, 1991, 1992). In British Columbia, an estimated 6 percent of the breeding population of marbled murrelets in Barkley Sound was taken annually in gillnets in 1980, although mortality was likely lower in preceding years (Carter and Sealy, 1984; Carter and others, 1995).

Marbled murrelets may also be sensitive to disturbance by boat traffic (Speckman et al. 2004), although this species is much more widely distributed within Prince William Sound than the Kittlitz's murrelet.

With respect to their injury by the Exxon-Valdez oil spill, marbled murrelets do not meet their specific recovery objective of increasing or stable populations. Moreover, their decline could be attributable in part to a decline in a primary food source; high-lipid forage fish, like sand lance and Pacific herring. Based on the available data, a direct link among the decline in forage fish, the effects of the spill, and the decline in marbled murrelets can't be made. Therefore, the EVOS Trustee Council considers the recovery status for marbled murrelets to be unknown.

Marbled murrelet is a National and Alaska Audubon WatchList Species (Stenhouse and Senner 2005). They are listed as Threatened in the Pacific Northwest and are vulnerable to loss of breeding habitat (old-growth forest).

The marbled murrelet is currently a 'featured species' in the Non-Game Conservation Strategy of the Alaska Department of Fish and Game.

Marbled murrelets are federally protected under the Migratory Bird Treaty Act of 1918 (MTBA). The MBTA (16 U.S.C. 703-712) prohibits the taking of any migratory bird or any part, nest, or egg, except as permitted by regulation. The MBTA was enacted in 1918; a 1972 agreement supplementing one of the bilateral treaties underlying the MBTA had the effect of expanding the scope of the Act to cover bald eagles and other raptors. Implementing regulations define "take" under the MBTA as "pursue, hunt, shoot, wound, kill, trap, capture, possess, or collect.

The Coastal Zone Management Act protects coastal environments throughout the US, including any coastal habitat that might be used for breeding by marbled murrelets. In Alaska, all major human activities that have the potential to affect the coastal zone must pass a "determination of consistency" with the Coastal Zone Management Act of 1972. The determination is done by multiple state and federal agencies, and coordinated through the Alaska Coastal Management Program.

Species Protections Summary

EVOS Recovery Status

- Recovery unknown

US Forest Service Management Plan

- Management of Fish and Wildlife Habitat - Goal: Maintain habitat to produce viable and sustainable wildlife populations that support the use of fish and wildlife resources for subsistence and sport hunting and fishing, watching wildlife, conservation, and other values.
- General Wildlife Guidelines 1. Design and locate facilities or apply seasonal restrictions on human activities when necessary and appropriate to reduce disturbance in important habitat areas, such as birthing areas, nesting areas and winter ranges (Table 3-5).

Federal Protections

- Threatened under the Endangered Species Act in CA, OR, WA.
- Species of Concern in Alaska under the Endangered Species Act.
- Migratory Bird Treaty Act of 1918.
- Coastal Zone Management Act of 1972.

State of Alaska Protections

- Featured Non-game Species
- No specific recommendations or protections.

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Pacific Herring (*Clupea pallasi*)

Pacific herring are one of 180 species of the herring family. On the Western Coast of North America, herring range from the Baja Peninsula to the Bering Sea. Herring are relatively small silver fish with a blue greenish tint on the back. Most adults are between 4 – 9 inches in length, although some can reach 18 inches. Herring spawn at approximately age 3 – 4, in shallow, near shore, vegetated inter- and sub- tidal areas. This occurs in the spring (April in Prince William Sound). The adhesive eggs stick to vegetation and are fertilized by drifting milt (male sperm). They hatch in approximately 2 weeks, and the larvae then drift and swim in ocean currents until they metamorphose into juvenile herring (about 10 weeks to reach juvenile stage; July in PWS).

Pacific herring are prized as both a commercial fishing resource and as a keystone species in the ocean ecosystem. In recent years, Alaskan statewide herring harvests have averaged 45,000 metric tons, with an approximate annual value of $30 million (http://www.adfg.state.ak.us/pubs/notebook/fish/herring.php). Most of the commercial harvest targets the eggs or “roe” that are stripped directly from the fish or taken off of the vegetation after the fish have spawned. In PWS, the fishery harvested approximately 10,000 tons of roe annually during the early 1990’s, but populations crashed in 1993 and have only been commercially fished on a very limited basis since.

Herring are equally important as a prey species for many other fish, birds, and marine mammals in PWS. During the spawning period herring are accessible to surface feeding seabirds and vulnerable as a prey for foraging fish and marine mammals. In the winter, herring also

congregate in relatively shallow bays, making them available to fish and marine mammals when high quality food might otherwise be scarce. The recent decline in the PWS herring has been mirrored by declines in several seabirds (Mary Anne Bishop, Scientist, Prince William Sound Science Center, personal communication) and Stellar sea lions (Thorne and Thomas 2008).

The PWS herring population was greatly effected by the Exxon Valdez Oil Spill. The timing of the spill could not have been worse for spawning herring. The spill occurred approximately 2 weeks before the main spawning period. It is estimated that half of the egg biomass was deposited during the spill trajectory and 40 – 50% was exposed to oil (Brown et al. 1996). The early life stages of herring were greatly affected, with an estimated 52% reduction in larval production in 1989 (McGurk and Brown 1996). Adult herring were also exposed to oil that was dispersed throughout the water column, up to 25 meters deep, and throughout the summer of 1989. Specimens collected shortly after the spill had physical deformities related to oil exposure (Moles et al. 1993).

Scientists still debate the role of oil in the PWS herring population crash of 1993 and the continued low population levels. The crash was more complex than just recruitment failure from the 1989 cohort. Scientists have examined potential causes such as larval and adult exposure (Brown et al. 1996; McGurk and Brown 1996), prolonged exposure (Thorne and Thomas 2008), natural variability, and disease (Marty et al. 2003). It was likely a result of a combination of some or all of these factors. Others have proposed that walleye pollock (*Theragra chalcogramma*) replaced herring in the PWS ecosystem when populations were depressed in 1993 and the herring are unable to rebound due to competition. Regardless, oil can have severe impacts directly on the species during a spill and it can have prolonged impacts through pollution of shallow water, near shore habitats that this species requires for reproduction. Future spills would not be limited to oil tankers, but could result from accidents of large fishing vessels, cruise ships, ferries, or from the pipeline that crosses streams throughout the PWS and Copper River Delta region.

Other human-influenced threats to the PWS herring population include commercial over harvest and the destruction of spawning and near shore habitat development such as roads and docks. Although a commercial fishery for herring has not occurred recently, it will resume if herring biomass rebounds. In 1997 biomass was estimated at 34,000 metric tons, and commercial fishing was opened on a limited basis in 1998. It is unclear how this season affected the potential recovery of the PWS herring stocks, but biomass has been below a commercial harvest threshold of 22,000 tons ever since. The State of Alaska (Department of Fish and Game, ADFG) monitors the herring population and regulates commercial fishing. The Prince William Sound Herring Management Plan (State of Alaska Statute 5AAC 27.365(b), is the guiding document for the legal regulation of the PWS herring fishery.

Subsistence users in PWS collect herring roe and roe on kelp for food. Adult herring are caught as food and used for bait to catch other fish, such as halibut. Subsistence communities that harvest herring include Cordova, Chenega, Tatitlik, Port Gravina, and Valdez. In 2003 the percentage of households utilizing herring as a subsistence item ranged from 24% in Cordova to 92% in Tatitlek (ADF&G CSIS Database: http://subsistence.adfg.state.ak.us/CSIS/index.cfm/FA/harvInfo.resourceRegionData).

Subsistence harvest is relatively small compared to commercial harvests, with 2,371 gallons of herring reported for the PWS communities in 2003 (ADF&G CSIS Database).

Federal protections for herring and herring habitat include the Magnuson-Stevens Act, The Clean Water Act of 1972, and the Coastal Zone Management Act of 1972. The Magnuson-Stevens Act, which as amended in 1996 (Sustainable Fisheries Act), mandates the conservation of all Essential Fish Habitat (EFH). EFH is described by the National Marine Fisheries Service (NMFS) as follows:

> "Essential fish habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (Magnuson-Stevens Act, 16 U.S.C. 1801 et seq). For the purpose of interpreting the definition of essential fish habitat: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and spawning, breeding, feeding, or growth to maturity covers a species' full life cycle (EFH Interim Final Rule, 62 FR 66531)."

If a project, activity, or land use has the potential to impact EFH, the agencies or individuals involved must consult with NMFS and take the appropriate mitigation measures to prevent degradation of fish habitat. Mitigation measures will be determined by NMFS and agreed upon by the parties involved during the consultation/permitting process.

The Clean Water Act makes it illegal to knowingly or accidentally spill oil or other toxic pollutants into the waters of the US. The Coastal Zone Management Act protects coastal environments throughout the US. In Alaska, all major human activities that have the potential to affect the coastal zone must pass a "determination of consistency" with the Coastal Zone Management Act of 1972. The determination is done by multiple state and federal agencies, and coordinated through the Alaska Coastal Management Program.

Species Protections Summary

<u>EVOS Recovery Status</u>

- Not Recovering

<u>US Forest Service Management Plan</u>

- Management of Fish and Wildlife Habitat - Goal: Maintain habitat to produce viable and sustainable wildlife populations that support the use of fish and wildlife resources for subsistence and sport hunting and fishing, watching wildlife, conservation, and other values.

Federal Protections

- Magnuson-Stevens Act and Sustainable Fisheries Act of 1996 – Essential Fish Habitat
- Coastal Zone Management Act of 1972
- Clean Water Act of 1972

State of Alaska Protections

- Alaska Coastal Management Program (ACMP, Department of Natural Resources)
- The Prince William Sound Herring Management Plan (State of Alaska Statute 5AAC 27.365(b)

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Pigeon Guillemot (*Cepphus Columba*)

Pigeon Guillemots are dark brown seabirds with white wing patches and bright fire-engine-red feet. This species inhabits near shore environments along the Pacific coast of North America. Pigeon guillemots range from California to Alaska and around the Bering Sea west along the north Russia Pacific shore (Ewins 1993). There are an estimated 235,000 pigeon guillemots

worldwide and 50 – 80% of them breed in Alaska.

Pigeon Guillemots dive under water to feed on benthic invertebrates and fish that inhabit rocky coastal seafloors. They use their wings to propel themselves or "fly" through the water in a zigzag-like manner in order to forage for prey, typically in water 3 – 100 feet deep. Pigeon Guillemots live and feed offshore except during April through September when they return to land to breed. During those months they usually come back to their natal breeding grounds along steep rocky or sandy cliffs or predator-free islets. The birds select rock cavities or carved out burrows for nesting.

There has been a 67% decline in the pigeon guillemot population in Prince William Sound (PWS) since the 1970s (Agler et al. 1994). Although the declines appear to have begun before the Exxon Valdez Oil Spill (EVOS), this incident clearly affected the population (Oakley and Kuletz 1996). On Naked Island, an important breeding area in PWS, researchers counted only ½ the number of birds after the spill compared to pre-spill surveys (Oakley and Kuletz 1996). Pigeon guillemots were especially susceptible to the oil pollution because of their reliance on nearshore habitats for feeding and breeding (King and Sanger 1979). At some important breeding locations oil persisted in rocky coastal habitats at least through 1990 (Oakley and Kuletz 1996) and a comparison of pigeon guillemot densities (pre vs. post spill) indicated populations were still depressed in oiled habitats as late as 1998 (Irons et al. 2000). Pigeon guillemots have likely experienced long term exposure to the oil by ingesting contaminated prey, preening in oiled pools, and nesting on coastlines with lingering oil (EVOSTC 2006; Integral Consulting Inc. 2006).

Pigeon guillemots in PWS may be susceptible to mortality from incidental capture in commercial drift and gillnet fisheries (Wynn et al. 1992). Inshore gillnet fisheries can cause local mortality particularly because Pigeon Guillemots tend to forage near their colonies. On Kodiak Island in 2002, the bycatch of guillemots in the set gillnet fishery was estimated at 76 individuals. While these species comprise <1% of all colonial birds on Kodiak Island; they comprised 14% of the total seabird bycatch. In Prince William Sound the mortality of pigeon guillemots from gillnet fisheries is not known.

Pigeon guillemots can also be affected by climate change, or changes in ocean conditions that affect food quality or availability. One potential reason for the continued decline in abundance of pigeon guillemots may be due to a shift in prey type and fish abundance in the Gulf of Alaska ecosystem starting in the 1980's (Piatt and Anderson 1996). During this time, guillemots have exhibited a shift in diet from predominately high-energy forage fish (herring, sand lance) to lower energy species such as cod, sculpin, and blennies (Hayes and Kuletz 1990). A shift in abundance or availability of certain prey species in the oceans can lead to reduced growth and health of individuals, and potentially population declines (Ramano et al. 2006).

Human disturbance by recreational use or boat traffic is not a major conservation concern for pigeon guillemots due to the remote and inaccessible nature of their nesting grounds.

Pigeon Gillemonts are federally protected under the Migratory Bird Treaty Act of 1918 (MTBA). The MBTA (16 U.S.C. 703-712) prohibits the taking of any migratory bird or any part, nest, or

egg, except as permitted by regulation. The MBTA was enacted in 1918; a 1972 agreement supplementing one of the bilateral treaties underlying the MBTA had the effect of expanding the scope of the Act to cover bald eagles and other raptors. Implementing regulations define "take" under the MBTA as "pursue, hunt, shoot, wound, kill, trap, capture, possess, or collect.

The Coastal Zone Management Act protects coastal environments throughout the US, including any coastal habitats that are used for feeding and breeding by pigeon guillemots. In Alaska, all major human activities that have the potential to affect the coastal zone must pass a "determination of consistency" with the Coastal Zone Management Act of 1972. The determination is done by multiple state and federal agencies, and coordinated through the Alaska Coastal Management Program.

Species Protections Summary

EVOS Recovery Status

- Not recovering

US Forest Service Management Plan

- Management of Fish and Wildlife Habitat - Goal: Maintain habitat to produce viable and sustainable wildlife populations that support the use of fish and wildlife resources for subsistence and sport hunting and fishing, watching wildlife, conservation, and other values.
- General Wildlife Guidelines 1. Design and locate facilities or apply seasonal restrictions on human activities when necessary and appropriate to reduce disturbance in important habitat areas, such as birthing areas, nesting areas and winter ranges (Table 3-5).

Federal Protections

- Migratory Bird Treaty Act of 1918
- Clean Water Act of 1972
- Coastal Zone Management Act of 1972

State of Alaska Protections

- ACMP – Alaska Coastal Management Program
- No specific recommendations or protections.

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Salmon: Pink, Sockeye, and Coho (*Oncorhynchus spp*)

Pink salmon (*Oncorhynchus gorbuscha*), sockeye salmon (*Oncorhynchus nerka*), and coho salmon (*Oncorhynchus kisutch*) inhabit many of the streams that flow into Prince William Sound (PWS). Each of these species is hatched in freshwater streams and spends some time in that freshwater stream before migrating to the ocean as smolts. These species then spend a varying period of time feeding and growing in the ocean before returning to their birth stream to lay eggs in the streambed gravel and then die. This life strategy of being hatched in freshwater, migrating to salt water, and returning to freshwater to spawn (breed) is called anadromy. That the salmon die after spawning is a rather unusual reproductive strategy for fish, and it is known as semelparity.

For each species the timing of these life events is different. Pink and Sockeye salmon generally spawn in July through September. Coho salmon spawn September through December. The eggs of all three species remain in the gravel from the time of spawning until the following March or April. One of the greatest differences between these species is the time spent as fry in fresh waters and the time spent rearing in the ocean. Pink salmon migrate out to the ocean immediately after immergence from the gravel and return in 2 years. Coho salmon remain in the freshwater system for 1-2 years and then spend 1-2 years in the ocean before they return. Sockeye salmon migrate to a lake within the system as fry and remain there for 1-2 years before migrating to the ocean for 1-3 years.

The greatest human impacts to PWS salmon populations would be through commercial salmon harvest, which is regulated by the Alaska Department of Fish and Game (ADF&G). Over 70 million salmon (63.5 million pink salmon, 3.2 million sockeye salmon, and 328,980 coho salmon) were commercially harvested in the PWS management area in 2007 (Lewis et al. 2008). The salmon resources of PWS are the economic engine of most communities in the region and proper management of these resources is crucial in order to sustain both the economic and ecological integrity of PWS. The ADF&G closely monitors commercial harvest and the escapement of salmon to their spawning streams during the season. This in-season management approach ensures that enough fish are able to spawn in the streams and keep populations of salmon at sustainable levels (Fried 1994). The commercial fishing regulations for PWS are found in the Alaska State Statute, AS 16.05 and the Alaska Administrative Codes 5 AAC 24.001 –24.990.

Sport and subsistence salmon harvests are much less than the commercial harvest. In 2007, the sport harvest for salmon in the PWS region was estimated at 51,000 fish (Alaska Sport Fishing Survey Database 2010). The sport harvest of salmon is managed by the ADF&G and, in general, anglers can keep 6 pink or sockeye salmon per day while fishing and no more than 12 fish in possession. Coho salmon generally have a 3 fish per day and 3 fish in possession limit. The State fishing regulations can be found online at: http://www.sf.adfg.state.ak.us/Static/Statewide/regulations/southcentral/SCpws.pdf . Salmon are an important subsistence food in the PWS region. Data indicates that in some communities 90 – 100% of households use salmon resources for subsistence (CSIS Database 2010). Subsistence harvests are managed by Federal Subsistence Regulations.

The three salmon species can also be affected by oil pollution from spills. During the Exxon Valdez Oil Spill (EVOS), pink salmon populations were greatly affected. Most wild pink salmon in PWS spawn in the intertidal portions of streams. Thus their eggs and developing embryos were chronically exposed to hydrocarbon contamination from the water column and from leaching oil deposits on adjacent beaches. Additionally, juvenile pink salmon spend several weeks foraging for food in nearshore coastal habitats and were likely exposed to oil as they swam through contaminated waters and fed along oiled beaches. Lower growth rates of fry and high embryo mortality were documented for pink salmon following the spill (Bue et al. 1996; Werthheimer and Celewycz 1996). The wild pink salmon population in PWS crashed for several years due to long term and delayed effects of the oiled spawning and rearing habitats (Bue et al. 1998; Heintz et al. 2000).

These salmon populations could be at risk from future spills resulting in accidents of oil tankers, large fishing vessels, cruise ships, ferries, or from the pipeline that crosses spawning and rearing habitat in streams throughout the PWS and Copper River Delta region.

Other human impacts to these species could occur on their spawning grounds. Sport fishing activity in popular and accessible salmon spawning streams in Prince William Sound could lead to de-vegetation and bank erosion. Trampling of eggs in gravel is possible but not a likely threat and would require very heavy and concentrated use to effect salmon reproduction. Studies of jet boat impacts to spawning salmon indicated that eggs could be affected in waters less than 23 cm deep (Horton 1994). Disturbance of spawning salmon by low-level jet boat activity was minimal.

Another potential threat for salmon would include the introduction of exotic species such as northern pike (*Esox lucius*) to freshwater systems. Pike are voracious predators and can decimate juvenile populations rearing in lakes or ponds. Salmon from commercial hatcheries could pose another problem by competing with wild stocks for food at sea and also have the potential to dilute genetics in specific spawning streams.

In addition to species-specific regulatory protections, all anadromous fish (those that spawn in freshwater but spend some time in ocean waters) receive both state and federal protections. Alaska's Anadromous Fish Act (Statute 16.05.871) and the Fishway Act (Statute 16.05.841) provide protection to fish habitat and insure that streams remain passable to migrating fish. All land management or land use projects that may affect anadromous fish habitat must obtain a permit from the State of Alaska's Habitat Division of Sportfish (Title 16 Permit).

Federal protection includes the Magnuson-Stevens Act, which as amended in 1996 (Sustainable Fisheries Act), mandates the conservation of all Essential Fish Habitat (EFH). EFH is described by the National Marine Fisheries Service (NMFS) as follows:

> "Essential fish habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (Magnuson-Stevens Act, 16 U.S.C. 1801 et seq). For the purpose of interpreting the definition of essential fish habitat: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by

fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and spawning, breeding, feeding, or growth to maturity covers a species' full life cycle (EFH Interim Final Rule, 62 FR 66531)."

If a project, activity, or land use has the potential to impact EFH, the agencies or individuals involved must consult with NMFS and take the appropriate mitigation measures to prevent degradation of fish habitat. The Clean Water Act of 1972 makes is illegal to knowingly or accidentally spill oil into the waters of the US.

Species Protections Summary

EVOS Recovery Status

- Pink Salmon: Recovered
- Sockeye Salmon: Recovered
- Coho Salmon: Not injured

US Forest Service Management Plan

- Coho Salmon are a Management Indicator Species (MIS) in the 2002 Chugach National Forest Land Management Plan
- Management of Fish and Wildlife Habitat - Goal: Maintain habitat to produce viable and sustainable wildlife populations that support the use of fish and wildlife resources for subsistence and sport hunting and fishing, watching wildlife, conservation, and other values.
- Water, Wetland and Riparian Areas – Goal: Provide for the proper functioning of streams, riparian areas, lakes, and wetlands.

Federal Protections

- Magnuson-Stevens Act and Sustainable Fisheries Act of 1996 – Essential Fish Habitat
- Clean Water Act of 1972
- Coastal Zone Management Act of 1972

State of Alaska Protections

- Anadromous Fish Act and Fishway Act (Title 16 Permit)
- ADF&G sport harvest and possession limits (general): 6 fish and 12 in possession (Sockeye and Pink); 3 fish and 3 in possession (Coho).
- Subsistence harvest limits of 30 salmon per household (all species combined).

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Seabird Colonies

Seabirds are birds that spend almost all their time on or near the sea. The various species of seabirds come to land to nest and raise young birds each summer. They nest on protected cliffs or islands, often in dense groups called colonies. About 50 million seabirds nest on Alaska's coastline each summer, which is 87% of all the seabirds in the United States. Alaska's seabirds nest in more than 1600 seabird colonies around the coast. Alaska’s extensive coastline (30,000 miles), with many cliffs and islands, provides a vast array of habitat for nesting seabirds. Seabirds eat small fish, crustaceans, and other invertebrates that thrive in Alaska’s nutrient rich ocean waters (the Arctic Ocean, Bering Sea, Gulf of Alaska, and north Pacific Ocean).

Nesting Seabirds in Alaska (USFWS webpage: http://alaska.fws.gov/mbsp/mbm/seabirds/species_list)

Tubenose Birds: Northern Fulmar (*Fulmarus glacialis*); Fork-tailed Storm-Petrel (*Oceanodroma furcata*); Leach's Storm-Petrel (*Oceanodroma leucorhoa*).

Cormorants: Double-crested Cormorant *(Phalacrocorax auritus);* Pelagic Cormorant *(Phalacrocorax pelagicus);* Red-faced Cormorant *(Phalacrocorax axurile);* Brandt's Cormorant *(Phalacrocorax penicillatus).*

Jaegers, Gulls, and Terns: Pomarine Jaeger *(Stercorarius pomarinus);* Parasitic Jaeger (*Stercorarius parasiticus);* Long-tailed Jaeger *(Stercorarius longicaudus);* Bonaparte's Gull *(Larus philadelphia);* Mew Gull *(Larus canus);* Herring Gull *(Larus argentatus);* Slaty-backed Gull *(Larus schistasagus);* Glaucous-winged Gull *(Larus glaucescens);* Glaucous Gull *(Larus hyperboreus);* Sabine's Gull *(Xema sabini);* Black-legged Kittiwake *(Rissa tridactyla);* Red-legged Kittiwake *(Rissa brevirostris);* Caspian Tern *(Hydroprogne caspia);* Arctic Tern *(Sterna paradisaea);* Aleutian Tern *(Onychoprion aleutica).*

Alcids: Dovkie *(Alle alle);* Common Murre *(Uria aalge);* Thick-billed Murre *(Uria lomvia);* Black Guillemot *(Cepphus grylle);* Pigeon Guillemot *(Cepphus columba);* Marbled Murrelet *(Brachyramphus marmoratus);* Kittlitz's Murrelet *(Brachyramphus brevirostris);* Ancient Murrelet *(Synthliboramphus antiquus);* Cassin's Auklet *(Ptychoramphus aleuticus);* Parakeet Auklet *(Aethia psittacula);* Least Auklet *(Aethia pusilla);* Whiskered Auklet *(Aethia pygmaea);* Crested Auklet *(Aethia cristatella);* Rhinoceros Auklet *(Cerorhinca monocerata);* Horned Puffin *(Fratercula corniculata);* Tufted Puffin *(Fratercula cirrhata).*

In Prince William Sound, some of the more important and most studied of the seabirds include the common murre, pigeon guillemot, marble murrelet, Kittlitz's murrelet, black-legged kittiwake, and arctic tern. These species are identified as seabird indicator species in Alaska's Comprehensive Wildlife Conservation Strategy (ADF&G 2006). This strategic document gives detailed information on these birds, their colonies, and provides conservation actions designed to protect the birds and their habitats (ADF&G 2006).

Seabirds are vulnerable to coastal oil spills because many of them feed in nearshore waters and they often exist in dense concentrations in coastal habitats when nesting. During the Exxon Valdez Oil Spill (EVOS), over 30,000 seabird carcasses were recovered from the waters of Prince William Sound (Piatt et al. 1990). Many more seabirds actually perished in the disaster, with some estimates of mortality at 300,000 – 5000,000 birds (Piatt et al. 1990). Some seabird species, like the pigeon guillemot, are still in decline, while others, such as the common murre, have recovered completely since the spill (EVOSTC 2006). However, Lance et al. (2001) found that most marine bird species that utilize shoreline and nearshore habitats showed evidence of slow recovery, lack of recovery, and divergent population trends; this result was likely due to the effects of lingering oil in coastal areas.

Some seabird species may be susceptible to climate change, or changes in ocean conditions that would affect food quality or availability. For example, common murres have high energetic and therefore food requirements. An adult murre eats 10-30% of its body mass daily and they

continue to feed chicks for up to 12 months after they leave the nesting area (Ainley 2002). A shift in abundance or availability of certain prey species in the oceans can lead to reduced growth and health of individuals, and possibly populations (Piatt and Anderson 1996; Ramano et al. 2006). It is unknown how all seabirds would respond to such changes, but a shift in prey species type and abundance may have resulted in declines of the pigeon guillemot population in PWS (Hayes and Kuletz 1997).

Commercial fisheries in PWS could negatively affect seabirds through boat disturbance, fisheries bycatch, and net entanglement. In Alaska, bycatch is monitored and recorded by the National Marine Fisheries Service, Alaska Marine Mammal Observer Program. In PWS, incidental mortality of several seabirds has been recorded in various types of commercial fisheries with the main source being in gillnet fisheries. Observers reported that approximately 433 seabirds were found dead or seriously injured in Prince William Sound salmon gillnets in 1991 (Wynn et al. 1992).

In offshore longline fisheries, the presence of "free" food in the form of offal and bait attracts many birds to fishing operations. During the past 3 years in Alaska, an estimated 4 – 19 thousand seabirds were hooked by fishing gear in each year. Most birds taken during longline operations are attracted to the baited hooks when the gear is being set and 75 % of total number of birds hooked are northern fulmars and gulls (NOAA 2010). Federal and State regulations have been enacted to limit the bycatch of seabirds associated with the hook-and-line fisheries of Alaska. Currently, regulations apply only to vessels over 26 feet, fishing in specific areas, and in specific fisheries (PWS is not required to use seabird avoidance gear, see regulations for details: 50 CFR Part 679 and Alaska State Statute 5 AAC28.055).

Human activity such as boat and pedestrian traffic can disturb seabirds, especially during nesting. The dense clustering of individuals during breeding makes these species particularly vulnerable to human disturbance (Rodgers and Smith 1995). Even trained researchers can have an effect on nesting success when studying bird colonies (Sandvik and Barrett 2001). Rodgers and Smith (1995) recommend a 328 – 590 foot setback from colonies for pedestrians and motorboats. However other studies suggest that setbacks should be commensurate with the number of people in a party (Beale and Monaghan 2004). Larger parties and/or types of disturbances might require a greater setback distance in order to prevent harm to seabird colonies. Effects may also depend on species and on predators that are near the colonies (Sandvik and Barrett 2001; Bolduc and Guillemette 2003)

Seabirds and seabird eggs can be traditional subsistence foods in some parts of Alaska, but their use in the Prince William Sound region is uncommon (CSIS Database 2010).

Seabirds are federally protected under the Migratory Bird Treaty Act of 1918 (MTBA). The MBTA (16 U.S.C. 703-712) prohibits the taking of any migratory bird or any part, nest, or egg, except as permitted by regulation. The MBTA was enacted in 1918; a 1972 agreement supplementing one of the bilateral treaties underlying the MBTA had the effect of expanding the scope of the Act to cover bald eagles and other raptors. Implementing regulations define “take” under the MBTA as “pursue, hunt, shoot, wound, kill, trap, capture, possess, or collect.

The Coastal Zone Management Act protects coastal environments throughout the US, including any coastal habitats that are used for feeding and breeding by seabirds. In Alaska, all major human activities that have the potential to affect the coastal zone must pass a "determination of consistency" with the Coastal Zone Management Act of 1972. The determination is done by multiple state and federal agencies, and coordinated through the Alaska Coastal Management Program.

Species Protections Summary

EVOS Recovery Status

- Colonies of multiple species were not listed.

US Forest Service Management Plan

- Human activities may be restricted from known seabird colonies consistent with the Migratory Bird Treaty Act during the sensitive seasons (Mid-April through October). Specific requirements will be determined in cooperation with the U.S. Fish and Wildlife Service during project analysis.
- Management of Fish and Wildlife Habitat - Goal: Maintain habitat to produce viable and sustainable wildlife populations that support the use of fish and wildlife resources for subsistence and sport hunting and fishing, watching wildlife, conservation, and other values.
- General Wildlife Guidelines - Design and locate facilities or apply seasonal restrictions on human activities when necessary and appropriate to reduce disturbance in important habitat areas, such as birthing areas, nesting areas and winter ranges (Table 3-5).

Federal Protections

- Migratory Bird Treaty Act of 1918
- 50 CFR Part 679, Federal Seabird Avoidance Regulations for Commercial Hook-and-Line Halibut and Groundfish Fisheries in Alaska.
- Clean Water Act of 1972
- Coastal Zone Management Act of 1972

State of Alaska Protections

- Statute 5 AAC 28.055, Alaska Seabird Avoidance Regulations for Commercial Hook-and-Line Halibut and Groundfish Fisheries.
- Alaska Coastal Management Program (ACMP, Dept of Natural Resources).
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Sea Otters (Enhydra lutris)

Sea otters are unique among marine mammals in their dependence on dense fur rather than blubber for warmth. Sea otters have made a recovery from near-extinction in the early 1900s due to overharvest; while they do not currently occupy all of their historic range, they are present in localized areas throughout their former range. Sea otters range from the Kuril Islands north Japan across the Russian Coast, Aleutian Islands, Gulf of Alaska down the western coast of North America.

The great majority of the world's population of sea otters is found in Alaskan waters. Sea otters in Alaska are comprised of three population stocks: the Southwest Alaska stock ranges from the Aleutian Island chain to Cook Inlet; the Southcentral Alaska stock ranges from Cook Inlet through Cape Yakataga including Prince William Sound and Kachemak Bay; and the Southeast Alaska stock ranges from Cape Yakatage through the Dixon Entrance.

The Marine Mammal Protection Act (MMPA) of 1972 gave the National Marine Fisheries Service (NMFS) responsibility for the management and conservation marine mammals in Alaska with the exception of sea otters, walrus and polar bears; these three species are the management responsibility of the U.S. Fish and Wildlife Service.

In 2005, the Southwest Alaska stock of sea otters was designated as Threatened under the Endangered Species Act of 1973, as amended. This designation was a response to population declines documented in the population beginning in the early 1990s (Evans et al. 1997) and continuing through the most recent year of widespread surveys in 2002 (Angliss and Outlaw 2008).

The greatest potential human-influenced threat to sea otter populations is oil spills. Sea otters are particularly vulnerable to the damaging effects of exposure to oil due to their reliance on clean fur to stay warm. Jim Bodkin, one of the primary researchers of EVOS effects to sea otters, has suggested adequate scientific baseline data for sea otters may aid in evaluating effects of and recovery from any future spills. In addition to direct mortality due to oiling, sea otters may be at increased risk for lingering effects of oil spills because many of their foraging sites and prey items occur in habitats still harboring oil. The Clean Water Act makes it illegal to knowingly or accidentally spill oil or other toxic pollutants into the waters of the US.

Entanglement risk has been identified for certain commercial fisheries; the fishery occurring in PWS that may potentially entangle sea otters is the gillnet salmon fishery. Documented instances of entanglement in gillnet fisheries is low and unlikely to have any population impacts to sea otters (Funk 2003; Angliss and Outlaw 2008).

Predation by killer whales has been suggested as one possible reason for the decline in sea otter populations in the southwestern stock (Estes et al. 1998). One explanation for the sudden increase in killer whale predation on sea otters may be the recent collapse of populations of Steller sea lions (*Eumetopias jubatus*) and harbor seals (*Phoca vitulina*) across the western North Pacific (Estes et al. 1998). Both of these marine mammal species are known to be prey species of the killer whale. Sea otter remains were found in the stomach of a dead killer whale from the AT1 transient group that inhabits PWS (Vos et al 2006). Researchers have not suggested that killer whale predation poses a population-level threat to the Southcentral Alaska sea otter stock.

Alaska natives can legally harvest sea otters for subsistence uses or for creating and selling authentic handicrafts and clothing. In Prince William Sound, the communities of Cordova, Tatitlek, Chenega and Valdez have reported harvesting sea otters in recent years, but the annual harvest for these communities is small (http://subsistence.adfg.state.ak.us/CSIS/index.cfm/FA/harvInfo.resourceRegionData). The exception being in 1993 when Valdez reported a harvest of 1,077 otters.

Sea otters are listed as a Species of Special Concern by the State of Alaska because of the past and recent fluctuations in sea otter populations. The state defines this as "any species or subspecies of fish or wildlife or population of mammal or bird native to Alaska that has entered a long-term decline in abundance or is vulnerable to a significant decline due to low numbers, restricted distribution, dependence on limited habitat resources, or sensitivity to environmental disturbance."

Species Protections Summary

EVOS Recovery Status

- Recovering

US Forest Service Management Plan

- Identified sensitivity in intertidal habitat during pupping and feeding; year-round but peaking in April through June (Table 3-5 on page 3-28 of the Plan).
- All projects will comply with requirements of Marine Mammal Protection Act.
- No specific designations or additional management recommendations.

Federal Protections

- Marine Mammal Protection Act of 1972
- Endangered Species Act; Southwest Alaska Distinct Population Segment designated as Threatened in 2006 (Burn 2005); does not impact PWS sea otter population.
- Clean Water Act of 1972

State of Alaska Protections

- Identified as a "featured species" in the ADFG Comprehensive Wildlife Conservation Strategy (Appendix 4Q).
- Species of Special Concern
- No additional specific management recommendations or regulations.

Literature Cited

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Related References

ADFG Comprehensive Wildlife Conservation Strategy
http://www.sf.adfg.state.ak.us/statewide/ngplan/NG_outline.cfm

Federal Register Final Rule on Sea Otters
http://ecos.fws.gov/docs/federal_register/fr4423.pdf
http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=2006_register&docid=fr15au06-6

Review of EVOS Studies http://www.absc.usgs.gov/research/sea_otters/lessons_learned.htm

Steller Sea Lion (*Eumatopias jubatus*)

Steller sea lions occur throughout the North Pacific rim from Japan to Southern California. Steller sea lions prefer isolated offshore rocks to breed and rest. Although rookeries and resting (haulout) sites occur in many areas, the locations used are specific and change little from year to year. Births take place at rookeries in late May and continue through early July. Three seasonal

haulout sites and two year-round haulout sites are found within Prince William Sound (PWS). One rookery occurs at the entrance to PWS (Seal Rocks).

Steller sea lion population declines have been reported throughout most of the species' range (Loughlin et al. 1992), including southern and central California, the Gulf of Alaska, the Aleutian Islands, the central Bering Sea and Russia (National Marine Fisheries Service 1992). Populations in Oregon, Washington, British Columbia and southeastern Alaska appear stable. Precipitous declines in the Gulf of Alaska and Aleutian Islands were detected during a 1989 range-wide survey (Loughlin et al. 1992) resulting in the National Marine Fisheries Service (NMFS) listing the species as threatened under the U.S. Endangered Species Act and depleted under the Marine Mammal Protection Act in November 1990.

Steller sea lions are sensitive to human encroachment at haulout and rookery sites, and will generally all flush into the water. Research where humans landed at a sea lion haulout, resulted in all seals flushing into the water and never fully recovering to pre-disturbance levels at 2 study sites. At the remaining six study sites, the daily mean numbers of sea lions took 1.1 days to reach 50% of the pre-disturbance grand mean, 2.1 days to reach 75%, and 4.3 days to reach 100% recovery (Kucey 2005).

Steller sea lions appear to be more tolerant to approaches by boats than landings by humans. Tour boats approaching colonies had a relatively small effect on fur seals in New South Whales, Australia; few or none of them ran to the sea, although there was a correlation between boat distance and increased movement of seals (Shaughnessy et al. 2008). Based on results from this study they recommended that the minimum approach distance of tour boats to the fur seal colonies should be 40 m. Although they studied an entirely different species, Steller sea lions behave in a generally similar manner, in contrast to harbor seals which are more like to enter the water when approached.

Regulations are in place and guidelines have been developed in order to limit the potential threat posed by those viewing marine mammals.

Marine Mammal Protection Act (MMPA):

- Federal law prohibits pursuit of marine mammals.
- Remain at least 100 yards from marine mammals.
- Time spent observing individual(s) should be limited to 30 minutes.
- Whales should not be encircled or trapped between boats, or boats and shore.
- If approached by a whale, put the engine in neutral and allow the whale to pass.
- Maintain a 1500-foot minimum altitude when viewing marine mammals from the air.

General guidelines for all marine mammals:

1. View marine mammals from no less than 100 yards distance.
2. Approach and depart from marine mammals slowly.
3. Determine behavioral state from a distance greater than 100 yards before approaching marine mammals for viewing. Be responsive to the specific situation.
4. Terminate viewing if behavioral changes are seen.

5. Keep noise levels down around marine mammals. Do not use horns or whistles. Do not shout or race motors.
6. Communicate with other ship's captains to coordinate timing and behavior of vessels around marine mammals. Allow no more than 15 minutes observation time for each vessel when there are multiple vessel and no more than 20 minutes when alone.
7. All vessels observing marine mammals should remain near each other on the same side of the animal(s). Do not box in animals against shorelines or corral animals between boats. Avoid rapid changes in speed or direction. Avoid shifting gears unnecessarily.

In addition, the MMPA prohibits the TAKE of all marine mammal species in U.S. waters. Take means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill," and harassment means "any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild; or has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to migration, breathing, nursing, breeding, feeding, sheltering." TAKE includes feeding or attempting to feed a marine mammal in the wild. Some exceptions are made for authorized scientific research and subsistence hunting by Alaska Natives.

Steller Sea lions are hunted by Alaska natives through cooperative agreements between NOAA and individual tribes. Approximately 186 harbor seals were taken in 2006 with 25 taken in Lower Cook Inlet and Prince William Sound.

Steller sea lions are listed as a Species of Special Concern by the State of Alaska. The state defines this as “any species or subspecies of fish or wildlife or population of mammal or bird native to Alaska that has entered a long-term decline in abundance or is vulnerable to a significant decline due to low numbers, restricted distribution, dependence on limited habitat resources, or sensitivity to environmental disturbance.”

Species Protections Summary

<u>EVOS Recovery Status</u>

- No conclusive evidence that Steller sea lions were injured (Caulkins et al. 1994)

<u>US Forest Service Management Plan</u>

- “All projects will comply with requirements of the Endangered Species Act, Marine Mammal Protection Act and their implementing regulations as well as other applicable federal and state laws and Forest Service Policy (FSM 2670); Manage human activities within 750 feel of any hauled-out sea lion or seal on land areas to avoid disturbance.” (Forest Plan page 3-33, under heading Threatened and Endangered Species).

- Known sensitivity of haulout sites during breeding and pupping (mid-May through June) (Table 3-5, page 3-28 of Forest Plan).

<u>Federal Protections</u>

- Marine Mammal Protection Act of 1972

State of Alaska Protections

- Species of Special Concern.

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