SEA OTTER (*Enhydra lutris kenyoni*)
WASHINGTON STOCK

U.S. Fish and Wildlife Service
Lacey, Washington

STOCK DEFINITION AND GEOGRAPHIC RANGE

The northern sea otter, *Enhydra lutris kenyoni*, historically ranged throughout the North Pacific, from Asia along the Aleutian Islands, originally as far north as the Pribilof Islands and in the eastern Pacific Ocean from the Alaska Peninsula south along the coast to Oregon (Wilson et al. 1991). In Washington, areas of sea otter concentration were reported from the Columbia River to along the Olympic Peninsula coast (Scheffer 1940). Sea otters were extirpated from most of their range during the 1700s and 1800s as the species was exploited for its fur. Washington's sea otter population was extirpated by the early 1900s. In 1969 and 1970, a total of 59 sea otters were captured at Amchitka Island, Alaska, and released near Point Grenville and LaPush off Washington's Olympic Peninsula coast (Jameson et al. 1982; Jameson et al. 1986). Washington's current sea otter population originated from the Amchitka Island genotype (*Enhydra lutris kenyoni*).

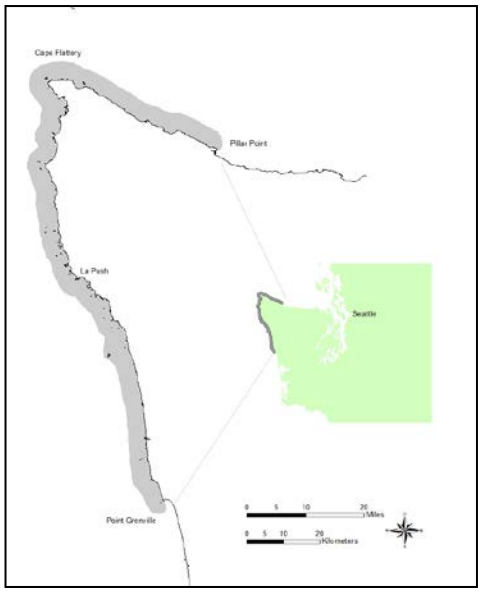

Figure 1. Primary range of Washington sea otter stock.

For management purposes pursuant to the Marine Mammal Protection Act of 1972, as amended (MMPA), the range of the Washington sea otter stock is within the marine waters of the States of Washington and Oregon. However, if the stock expands northward into British Columbia, a revised stock assessment would consider this expanded range.

The distribution of the majority of the Washington sea otter stock ranges from Pillar Point in the Strait of Juan de Fuca, west to Cape Flattery and as far south as Point Grenville on the outer Olympic Peninsula coast (Figure 1). However, scattered individuals (usually one or two individuals at a time) occur outside of this range. For example, repeated sightings have been reported as far south as Newport, Oregon, and into southern Puget Sound around McNeil Island.

In waters to the north of the Washington stock is the British Columbia sea otter population, which originated from animals also translocated from Amchitka Island and additional individuals from Prince William Sound, Alaska (Bigg and MacAskie 1978). British Columbia's sea otter population includes at least 6,754 animals distributed mainly along the west and north coasts of Vancouver Island and along the central mainland coast from Queen Charlotte Strait to Aristizabal Island (DFO 2015). Although most of the British Columbia populations remains north of Clayoquot Sound, small numbers of animals have been reported in Barkley Sound and scattered along the coast of the Strait of Juan de Fuca to Victoria. Genetic sampling of Washington sea otters in 2011 indicated that there has been some limited interchange between the Washington and British Columbia sea otter populations (Dr. Shawn Larson, The Seattle

Aquarium, 2016, pers. comm.). As the Washington and British Columbia populations grow and expand their respective ranges, movement between these populations can be expected, but is not sufficient at this time to consider them to be a single stock.

Sea otters breed and give birth year-round (Riedman and Estes 1990). The pupping period for Washington's sea otter stock is not well defined, with dependent pups observed in all months. However, births in Washington sea otters are believed to occur primarily from March to April, with peak numbers of dependent pups expected to be present from May to September.

POPULATION SIZE

Original Washington Translocation

Fifty-nine sea otters were released off the Washington coast in 1969 and 1970, although almost half of the otters released in 1969 died. Sightings of sea otters were sporadic for several years after the translocations and during surveys through 1976, no more than 10 otters were observed at a time (Jameson et al. 1982). The current Washington sea otter population descended from no more than 43 otters and possibly as few as 10 (Jameson et al. 1982). Reproduction was first documented in 1974 (Jameson et al. 1982) and pups have been observed in all subsequent surveys.

Minimum Population Estimate

The first comprehensive post-release surveys of Washington's sea otter population were conducted by boat in 1977 and again in 1981 (Jameson et al. 1986). Boat, ground, and aerial surveys for sea otters were conducted biennially from 1981 to 1989. Starting in 1989 and continuing to present, Washington's sea otter population estimate has been developed from a combined aerial and ground survey conducted in late June or early July. Based on the 2016 survey (actual count), the minimum population estimate of the Washington sea otter population is 1,806 individuals (Jeffries et al. 2016). No correction factor for missed animals has been applied to count data to determine a total population estimate from survey counts for Washington.

Current Population Trend

Based on count totals from 1977 to 1989, the Washington sea otter population increased at an annual rate of 20 percent (Jameson and Jeffries 1999). The average rate of increase for this population since 1989 is 9 percent (Jeffries et al. 2016) (Figure 2). Survey data indicate the Washington stock is nearing equilibrium density north of La Push (Jeffries et al. 2016). South of La Push, the stock has been growing at about 22 percent per year since 1989. In 2016, 1,380 otters (76 percent) were counted in

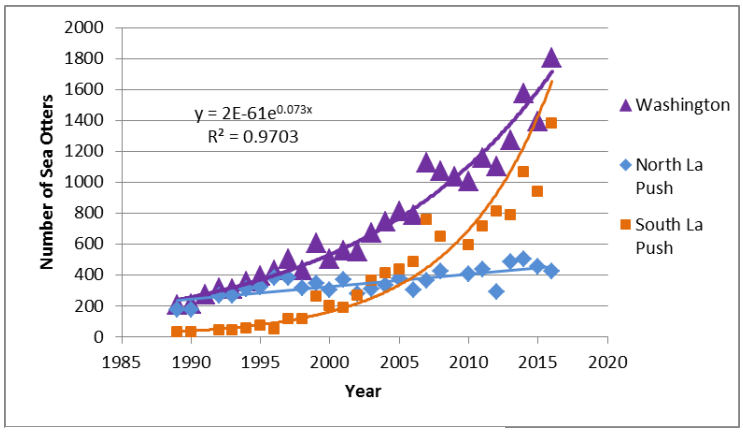

Figure 2. Growth patterns for Washington's sea otter population between 1989 and 2016 (Jeffries et al. 2016).

the survey segment south of LaPush and 426 otters (24 percent) were counted in the survey segment north of LaPush. (Jeffries et al. 2016).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

The maximum annual growth rate (R_{max}) for sea otter populations for which data are available has been reported as 17 to 20 percent (Estes 1990). From 1977 to 1989, the Washington stock grew at 20 percent (Jameson and Jeffries 1999) and appears to be growing at 22 percent in the portion of the range that is south of La Push (Jeffries et al. 2016). However, between 1989 and 2016, the growth rate of the entire Washington sea otter stock was an annual rate of 9 percent (Jeffries et al. 2016).

POTENTIAL BIOLOGICAL REMOVAL

The Potential Biological Removal (PBR) is the product of three elements: the minimum population estimate (N_{min}); one-half the maximum theoretical or estimated net productivity rate ($0.5\ R_{max}$); and a recovery factor (F_r). This can be written as: PBR = (N_{min})(½ of R_{max})(F_r).

For the Washington sea otter stock, N_{min} is 1,806 and R_{max} is 20 percent. A F_r of 0.1 is recommended by Taylor et al. (2003) for endangered species with a population between 1,500 and 7,500 individuals, with an increasing trend, and considered vulnerable. We use a F_r of 0.1 for the Washington sea otter stock because even though it is not federally listed under the Endangered Species Act of 1973, as amended (ESA), it is listed as "endangered" by the State of Washington, has a population estimate just above 1,500, and is considered to be vulnerable because of the restricted range that makes more than 50 percent of the stock vulnerable to a potential catastrophe, such as an oil spill, at any point in time. Therefore, the calculated PBR for the Washington sea otter stock is 18.06 animals (1,806 x 0.5 x 0.2 x 0.1), which when rounded to the nearest whole animal is 18.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fisheries Information

Sea otters are susceptible to drowning in gillnets and have been taken in the Makah Northern Washington Marine Set-gillnet Fishery. Pre-2011 data indicated sea otter mortalities were likely to occur when there was fishing effort in Marine Areas 4 and 4A (Makah Bay); however, since 2011 there has been no fishing effort in these catch areas (Makah Tribe unpublished data). Annual reports submitted for 2011-2015 indicate there was set-net fishing effort in Marine Areas 4b, 5, 6A, and 6C that resulted in the mortality of 2 sea otters in 2011 (Makah Tribe unpublished data). There is no observer coverage of this fishing effort; however, Makah Fisheries regulations require reporting of any take of marine mammals. Only mortalities, not serious injuries, are reflected in Table 1 because the nets set by the Makah fishery do not rise to the surface of the water and any otters that become entangled in the nets will likely drown.

Table 1. Summary of sea otter incidental mortality in the Makah Tribe's Northern Washington Marine Set-Gillnet Fishery. (Source: Makah Tribe)

Fishery Name	Years	Data Type	Observed/ Reported Mortality	Estimated Mortality	Mean Annual Mortality
Northern WA Marine Set Gillnet Areas 4/4A	2011-2015	No active fishery	n/a	n/a	n/a
Northern WA Marine Set Gillnet Areas 4B/5/6A/6C	2011 2012-2015	Fisherman self-reports	2 0	n/a n/a	≥ 0.4

Available information on incidental mortality and serious injury of Washington sea otters in other commercial fisheries is very limited. There are other commercial fisheries that have the potential to interact with the Washington sea otter stock, including Treaty and non-treaty fisheries. A variety of gear types, such as drift gillnets, set gillnets, purse seines, and pots (primarily dungeness crab) are used in fisheries along the outer coasts of Washington and northern Oregon, including Grays Harbor, the Straits of Juan de Fuca, and Puget Sound. There are no observer programs associated with these fisheries, rather, incidental takings of marine mammals in the non-treaty fisheries are reported to the National Marine Fisheries Service (NMFS) through self-reporting. To date, neither the U.S. Fish and Wildlife Service (USFWS) or NMFS have received any voluntary or observer reports of sea otters killed or seriously injured in these fisheries. Due to the lack of observer coverage and other data, a reasonable, science-based estimate of the annual rate of mortality and serious injury cannot be determined for these fisheries.

The potential exists for sea otters to drown in traps set for crabs and finfish, but only limited documentation of mortalities is available and none are documented in Washington. Hatfield et al. (2011) summarize records of 21 sea otter mortalities in trap gear, 17 in Alaska and 4 in California. Controlled experiments conducted by the U.S. Geological Survey (USGS) and the Monterey Bay Aquarium demonstrated that sea otters would enter a baited commercial finfish trap with inner trap funnel openings of 5.5 inches in diameter (Hatfield and Estes 2000). Hatfield et al. (2011) confirmed that some California sea otters exposed to finfish, lobster, and mock Dungeness crab traps in a captive setting would succeed in entering them. Based on experiments with carcasses and live sea otters, they concluded that sea otters up to about 43 inches in length could get into finfish traps with 6-inch-diameter circular openings and Dungeness crab pots with rectangular openings 4 inches high. Reducing the fyke-opening height of Dungeness crab traps by one inch (to 3 inches) would exclude nearly all diving sea otters while not significantly affecting the number or size of harvested crabs (Hatfield et al. 2011). Finfish pots/traps do not appear to be used in Washington State waters (within 3 miles of shore) where the likelihood for sea otters entrapment would be the greatest. However, there is a significant crab fishery, both Treaty and non-treaty commercial, as well as recreational, operating in coastal Washington and Puget Sound. The Washington State regulations require

two escape ring openings that have a minimum size of 4¼ inches or larger (WAC 220-52-043) be placed in the upper half of the pot to allow small undersize crab to escape. These escape rings have no barrier to deter sea otter entry; however, if the opening is below 6 inches in diameter, most sea otters will not be able to enter the trap through the escape ring. There are no regulations regarding the size of the entry port(s), which are generally 9 inches wide by 4 inches high, but can be larger, to allow for the entry of the largest crabs. The entry ports have a closure to deter crabs from exiting the pot; these closures may or may not be enough to deter a sea otter from entering the trap. Therefore, entrapment of small (likely juvenile/sub-adult) sea otters may be occurring in the crab fisheries. As with other commercial/recreational fisheries, there are no observer programs, and we are reliant on self-reporting to document mortalities or serious injuries. To date, neither the USFWS, NMFS, or Washington Department of Fish and Wildlife have received any voluntary or observer reports of sea otters killed or seriously injured in these fisheries. However, the potential for entrapment to occur may be increasing as the population, in particular female groups, expand into the areas south of La Push where there are more crab pots. Due to the lack of observer coverage and other data, a reasonable, science-based estimate of the annual rate of mortality and serious injury cannot be determined for these fisheries.

Other Human-Caused Mortality and Serious Injury

Other sources of human-caused mortality and serious injury affecting the Washington sea otter population are not well documented. An effort to document sea otter strandings (live and dead sea otters that wash ashore) has been underway since 2002. Due to the nature of the Washington coastline and low human activity throughout much of the year, the ability to recover carcasses and determine cause of death is limited and likely do not represent an unbiased sample with respect to cause of death because carcass deposition and retrieval are dependent on carcass size, location, wind, currents and other factors, including the cause of death itself. Between 2002 and 2015, 333 dead or moribund sea otters were reported; of these, 93 were necropsied (USGS National Wildlife Health Center and USFWS unpublished data). Infectious disease was the primary cause of death. Three mortalities were specifically attributed to non-fishery-related anthropogenic causes: one boat strike (2012, based on the type of injuries observed during necropsy) and two gunshot wounds (2012 and 2013). There were also six cases of trauma from unknown causes.

In the past, a number of oil spills have occurred within the range of Washington's sea otter population, with one documented oil related sea otter death recorded during one of these spills (Jameson 1996). Additionally, with the increasing volume of shipping traffic into and out of the Strait of Juan de Fuca, the potential for a catastrophic spill exists and most, if not all, of the Washington sea otter population and range is vulnerable to the effects of such a spill. Significant oil-related mortalities and habitat damage would be expected to occur if an oil spill of this nature were to happen and impinge directly on sea otter habitat along Washington's Olympic Peninsula and Strait of Juan de Fuca coastlines.

Total observed other, i.e., non-fisheries, human-caused mortality and serious injury for 2011-2015 is 3.0, yielding an estimated mortality of ≥ 3.0 and a mean annual mortality of ≥ 0.6. This is a minimum estimate because it is based on beach-cast carcasses and it is unknown to what extent the levels of human-caused mortality documented in beach-cast carcasses are representative of the relative contributions of known causes or of human-caused mortality as a whole; therefore, we are unable to give upper bounds for these estimates. Disease is an

important proximate cause of death in sea otters, but due to several complicating factors (including the complexity of the pathways by which sea otters are being exposed to land-borne pathogens, the synergistic relationship between sea otter susceptibility to disease, and other factors); the anthropogenic contribution to disease-related mortality in sea otters is not well understood. Therefore, animals that died of disease are not included in the anthropogenic mortalities reported here.

Harvest by Northwest treaty Indian tribes

A number of Native American tribes of the Pacific Northwest have treaty rights to harvest various fish and wildlife resources in Washington State. Currently there is no authorization for harvest of sea otters by Native Americans. As affirmed by the Court of Appeals for the Ninth Circuit in Anderson v. Evans (9th Cir. June 7, 2004), any take of sea otters by Native Americans other than Alaskan natives residing in Alaska has to be authorized under the MMPA.

STATUS OF STOCK

The Washington sea otter stock is not considered "depleted" under the MMPA nor listed as "threatened" or "endangered" under the ESA. Sea otters are listed by the State of Washington as "State endangered" under Revised Code of Washington 77.12.020 and Washington Administrative Code (WAC) 232.12.014 due to small population size, restricted distribution, and vulnerability (Lance et al. 2004). The WDFW finalized their sea otter recovery plan in 2004 (Lance et al. 2004).

This stock is not classified as strategic because the level of direct human-caused mortality does not exceed the PBR, the population is not declining, and it is not designated as "depleted" under the MMPA or listed as "threatened" or "endangered" under the ESA.

The status of the Washington sea otter stock in relation to its optimum sustainable population (OSP) level has not been formally determined. Laidre et al. (2011) provided a total carrying capacity (K) estimate of 1,854 sea otters (95 percent CI 1,499-2,208) for Washington's sea otter stock to reoccupy most of their historic habitat along the outer Washington coast (excluding reoccupation of the Columbia River, Willapa Bay, and Grays Harbor estuaries due to significant human alterations and use) and eastward into the Strait of Juan de Fuca as far as Protection Island. The 2016 population estimate of 1,806 sea otters is very close to reaching the estimated carrying capacity for Washington reported in Laidre et al. (2011). However, the rate at which the Washington sea otter population is increasing, which is an overall rate of 9 percent per year and 22 percent within about half of the range, does not seem to indicate that the population is approaching carrying capacity. Therefore, the carrying capacity estimate in Laidre et al. (2011) may not be a good representation of current habitat capabilities in Washington. The lower end of the OSP range is assumed to occur at approximately 60 percent of the maximum population size the environment will support (i.e., carrying capacity) (DeMaster et al. 1996). The Washington sea otter population may be above this lower bound of OSP, but in the absence of a reliable carrying capacity estimate, this stock's status relative to OSP is unknown.

Based on the currently available data, the minimum level of human caused mortality and serious injury is ≥ 1 sea otter per year (0.4 from fishery sources in Table $1 + \geq 0.6$ from other human caused serious injury and mortality). The known mortality is thus less than PBR.

However, due to the lack of observer data for commercial fisheries that may interact with sea otters, it is not possible to make a science-based estimate of the annual mortality and serious injury associated with fisheries and other sources of human-caused mortality and serious injury. Therefore, it is not possible to make a science-based determination of whether the total mortality and serious injury of sea otters due to human-caused mortalities and serious injuries is insignificant and approaching a zero mortality and serious injury rate.

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