***Enhydra lutris* - (Linnaeus, 1758)**

ANIMALIA - CHORDATA - MAMMALIA - CARNIVORA - MUSTELIDAE - *Enhydra* - *lutris*

Common Names:

English: Sea Otter

French: Loutre De Mer

Spanish: Nutria Del Kamtchatka, Nutria Marina

Synonym(s): *Mustela lutra* Linnaeus, 1758

Taxonomic Note:

Three regional subspecies originally described by Wilson *et al.* (1991) have been confirmed by Cronin *et al.* (1996): *E. l. lutris* (Linnaeus, 1758) from Japan in the southwest Pacific throughout the Asian range of the Kuril Islands to the Kamchatka Peninsula and the Commander Islands, *E. l. kenyoni* from the western Aleutian Islands to Prince William Sound, Alaska, USA, along the Pacific coast of Canada and into Oregon state in the continental USA, and *E. l. nereis* (Merriam, 1904) from central to southern California, USA.

Red List Assessment

Assessment Information

Red List Category & Criteria:	Endangered A2abe Ver 3.1
Year Published:	2020
Date Assessed:	21/01/2020
Date Reviewed:	27/02/2020

Assessor(s): NA

Reviewer(s): Hussain, S.A., Duplaix, N.

Contributor(s): NA

Facilitators/Compilers: NA

Justification:

The Sea Otter population suffered a large-scale decline historically and contemporarily. The species is believed to have undergone a decline exceeding 50% in the western part of its range over the past 30 years (four generations). The world-wide population of sea otters decreased to approximately 2,000 animals by the end of the commercial fur trade in 1911 (Kenyon 1969). The population recovered from 11 remnant populations located in Russia (Bering Island, Kamchatka Peninsula, and Kuril Islands) and in the United States (in Alaska [Aleutian Islands, Alaska Peninsula, Kodiak archipelago, and Prince William Sound] and California) (Kenyon 1969, Lensink, 1960). The remnant populations were small and widely dispersed, resulting in low genetic diversity compared to pre-exploitation levels and as measured by both nuclear and mitochondrial genetic markers (Larson *et al.* 2002a, b, and 2012). However, both theoretical models and empirical data suggest populations have retained approximately 70% of pre-exploitation diversity (Ralls *et al.* 1983, Larson *et al.* 2012).

Since the mid-1900s, there has been population recovery for the species (Kenyon 1969). However, in the United States, two subspecies of sea otters are listed as threatened under the Endangered Species Act (1973), a significant population segment in the SW Alaska genetic stock (*E. l. kenyoni)* in Alaska (USFWS 2013a, USFWS 2013b) and *E. l. nereis* in California (USFWS 2003). In Russia, significant sea otter (*E. l. lutris)* population declines are thought to have occurred for the Kamchatka Peninsula and northern Kuril Islands in the past decade (Kornev 2007, Kornev 2010, Bodkin 2015). In Alaska, precipitous population declines occurred in the Aleutian Islands beginning in the late 1980s-2005. By 2000, counts of Sea Otters had decreased by 90% with a declining trend through 2005 and an estimated loss to the population of 62,000-90,000 sea otters (Doroff *et al.* 2003, Estes *et al.* 2005, Burn and Burn *et al.* 2003, Burn and Doroff 2005). The probable cause of the decline was increased predation by killer whales (*Orcinus orca*) (Estes *et al.* 1998). Population counts also remain low for the Alaska Peninsula (Burn and Doroff 2005, U.S. Fish and Wildlife Service Stock Assessment Reports). In the listed population, the Kodiak archipelago and lower Cook Inlet appeared stable or increasing during the same period that population declines were documented in the Aleutian chain west of the Alaska Peninsula. In total five of the six remnant population centers have experienced significant population reductions in the SW sea otter population stock.

The other threatened subspecies, the southern sea otter in CA is recovering to near its threshold for delisting under the Endangered Species Act (1973), however, the present range distribution is only a fraction of the historic distribution (Tinker *et al.* 2019). Population range expansion has been greatly impacted by shark-bite mortality in the northern end of the subspecies range (Hatfield *et al.* 2018). In addition the habitat north of the central California sea otter range, northern California and Oregon in the Pacific Northwest has had major reductions in canopy-forming kelp in the past decade due to the loss of sea stars from sea star wasting disease resulting in an abundance of sea urchins that graze intensively on kelp (Roger-Bennett and Catton 2019). The giant kelp canopy likely afforded sea otters protection from shark predation and it has been hypothesized that the loss of this habitat has been a factor intensifying the predation. Central and southern California thus remains the only location for this subspecies to date and it is one of the extant 11 historical remnant populations.

In the western parts of the range the northern Kuril Islands and the Kamchatka Peninsula have declined from approximately 22,000 sea otters to approximately 10,600 since the early 2000s (Kornev 2007, Kornev 2010, Bodkin 2015). This is a long-established region for sea otters and there are no documented reasons for this decline. The Commander Islands is believed to be stable and had one on the longest time-series for population surveys for the species, however this region has not been surveyed since the late 1990s.

Unquantified environmental stressors to all of the subspecies populations will include future ocean conditions becoming warmer, acidifying, and deoxygenating (IPCC 2019). Warmer oceans favor range expansion and prevalence of dinoflagellate phytoplankton species, many of which are toxin producing (IPCC 2019) and will impact sea otter prey in ways that are not yet understood. In California, effects of harmful algal and cyanobaterial blooms may be acute or chronic on sea otters and have resulted in individual health declines and deaths (Kreuder et al. 2003, Miller *et al.* 2010, Miller *et al.* 2017). Recent studies have shown saxitoxins increase in toxicity through biochemical changes associated with lower pH (Roggatz *et al.* 2019), this has the potential to decrease available prey in future scenarios for sea otters. In addition, calcium carbonate shell forming bivalves are thought to decrease with increasing ocean acidification (Waldbusser *et al.* 2015). The effect of changing and decreasing bivalve abundance on sea otter populations is unknown, but it will likely be negative.

Based on large-scale population declines in the past, the species is inferred to have undergone more than 50% decline over the past 45 years (three generations based on Pacifici *et al.* 2013) due to threats such as extensive exploitation, oil spills, habitat degradation, pathogens, and pollution. In view of these, the species is listed as Endangered under the criteria A2abe. Reasons for Change

No change: Same category and criteria

Distribution

Geographic Range

Historically, sea otters occurred across the North Pacific Rim, ranging from Hokkaido, Japan, through the Kuril Islands, the Kamchatka Peninsula, the Commander Islands, the Aleutian Islands, peninsular and south coastal Alaska and south to Baja California, Mexico (Kenyon 1969). In the early 1700s, the worldwide population was estimated to be between 150,000 (Kenyon 1969) and 300,000 individuals (Johnson 1982). Although it appears that First Nations' harvests periodically led to significant local reductions of sea otters (Simenstad *et al.* 1978, Jones *et al.* 2011), the species remained abundant throughout its range until the mid-1700s. Following the arrival in Alaska of Russian explorers in 1741, extensive commercial harvest of sea otters over the next 150 years resulted in the near extirpation of the species throughout the range. When sea otters were afforded protection by the International Fur Seal Treaty in 1911, it is thought that fewer than 2,000 animals remained in 13 remnant colonies (Kenyon 1969). Remnant populations were located in Russia (Kuril Islands, Kamchatka Peninsula, and the Commander Islands) in Alaska (Southwestern Alaska population stock (the Aleutian Islands (2 remnant colonies), Alaska Peninsula (3 remnant colonies), and Kodiak Island (1 remnant colony), the Southcentral population stock (Prince William Sound), in Canada (Queen Charlotte Islands), in central California, and in Mexico (San Benito Islands) (Kenyon 1969, Estes 1980). However, the Queen Charlotte, Canada and San Benito Island, Mexico remnant sea otter populations have presumably died out and likely did not contribute to the recolonization of the species following near extirpation (Kenyon 1969).

In north America, the current sea otter's range is fairly continuous from the Aleutian Islands to Prince William Sound with population gaps along the Gulf of Alaska until Yakutat (which was a translocated population) then another gap in the population's distribution until the outer islands of Southeast Alaska (also a translocated population with sea otters from the Aleutian Islands and Prince William Sound). The next gap in the sea otter population distribution is between Southeast Alaska and British Columbia, Canada. Translocation efforts were successful in Washington State but not in Oregon, thus there is a large population gap between the small sea otter population in Washington and that of central California.

Area of Occupancy (AOO)

Area of occupancy (AOO) - in km2	Justification:

-	-

Continuing decline in area of occupancy (AOO)	Qualification:	Justification:
-	-	-

Extreme fluctuations in area of occupancy (AOO)	Justification:
-	-

Extent of Occurrence (EOO)

Extent of occurrence (EOO)- in km2	Qualification:
-	-

Continuing decline in extent of occurrence (EOO)	Qualification:	Justification:
-	-	-

Extreme fluctuations in extent of occurrence (EOO)	Justification:
-	-

Locations Information

Number of Locations	Justification:
-	-

Continuing decline in number of locations	Qualification:	Justification:
-	-	-

Extreme fluctuations in the number of locations	Justification:
-	-

Very restricted AOO or number locations (D2)

Very restricted in area of occupancy (AOO) and/or # of locations	Justification:
-	-

Elevation / Depth / Depth Zones

Elevation Lower Limit (in metres above sea level): 0

Elevation Upper Limit (in metres above sea level): 0

Depth Lower Limit (in metres below sea level): 60

Depth Upper Limit (in metres below sea level): 0

Depth Zone: Intertidal and sub-littoral regions within the 60 m depth contour (Kenyon, 1969).

Map Status

Map Status: Done

Biogeographic Realms

Biogeographic Realm: Nearctic, Palearctic

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Canada	Extant	Native	-	Resident
Japan	Extant	Native	-	Unknown
Mexico	Extant	Native	-	Unknown
Russian Federation	Extant	Native	-	Resident
USA	Extant	Native	-	Resident

Large Marine Ecosystems (LME) Occurrence

LargeMarineEcosystems: (Eight: 1.East Bering Sea, 2.Gulf of Alaska, 3.California Current, 50.Sea of Japan, 51.Oyashio Current, 52.Sea of Okhotsk, 53.West Bering Sea)

FAO Area Occurrence

FAO Occurrence: NA

Population

In the early 1700s, the worldwide population was estimated to be between 150,000 (Kenyon 1969) and 300,000 individuals (Johnson 1982), occurring along the North Pacific from northern Japan to the central Baja Peninsula in Mexico. Its abundance was greatly reduced by human exploitation. Although it appears that First Nations harvests periodically led to local reductions of sea otters (Simenstad *et al.* 1978, Jones *et al.* 2011), the species remained abundant throughout its range until the mid-1700s. Following the arrival in Alaska of Russian explorers in 1741, extensive commercial harvest of sea otters over the next 150 years resulted in the near extirpation of the species. When sea otters were afforded protection by the International Fur Seal Treaty in 1911, probably fewer than 2,000 animals remained in 13 remnant colonies (Kenyon 1969): two in the Kuril Islands and Kamchatka; one in the Commander Islands; a total of 10 in the following areas: Aleutian Islands (2) and along the Alaska Peninsula (3); Kodiak Archipelago (1), Prince William Sound (1), the Queen Charlotte Islands (1), central California (1), and San Benito Islands (1). However, the Queen Charlotte, Canada and San Benito Island, Mexico remnant sea otter populations became extinct and likely did not contribute to the recolonization of the species following near extirpation (Kenyon 1969).

Sea Otters currently have established populations in parts of the Kuril Islands, the Russian east coast, throughout coastal Alaska, British Columbia, Washington, and California, and there have been reports of single-animal observations in Mexico and Japan (recent maximum of 20 in the latter). Population estimates and counts made between 2000-2018 give a generalized worldwide estimate of 128,902 sea otters. The biggest change during this time being the decrease in the northern Kuril Islands and the Kamchatka Peninsula which have declined from approximately 22,000 sea otters to approximately 12,100 since the early 2000s (Kornev 2007, Kornev 2010). This is a long-established region for sea otters and there are no documented reasons for this decline. The Commander Islands is believed to be stable and had one on the longest time-series for population surveys for the species – however, this region has not been surveyed since the late 1990s. It is thought that budget restrictions have prevented any current population assessments for the species in this region.

In Alaska, precipitous population declines occurred in the Aleutian Islands beginning in the late 1980s-2005. By 2000, counts of sea otters had decreased by 90% with a declining trend through 2005 and an estimated loss to the population of 62,000-90,000 sea otters (Burn et al. 2003, Doroff et al. 2003, Estes et al. 2005, Burn and Doroff 2005). The probable cause of the decline was increased predation by killer whales (*Orcinus* *orca*) (Estes et al. 1998). To date, there is no indication of further declines in counts and no real indication that the population is showing signs of significant recovery. Population counts also remain low for the Alaska Peninsula (Burn and Doroff 2005, U.S. Fish and Wildlife Service Stock Assessment Reports). In this listed population, the Kodiak archipelago and lower Cook Inlet appeared stable or increasing during the same period that population declines were documented in the Aluetian chain. A generalized estimate of sea otter numbers in Alaska is 98,780.

Between 1969 and 1972, 89 sea otters were translocated from Alaska (66% from Prince William Sound and 33% from Amchitka Island in the Aleutians) to the west coast of Vancouver Island, British Columbia where they established a healthy population. Sea otter range expansion has continued and in 2008 it was documented that they have left Vancouver Island and moved into northern Queen Charlotte Strait and the adjacent British Columbia mainland coast and in some portions of the central British Columbia mainland coast. The most recent population estimate is 6,754 (Nichol et al. 2015).

During 1969 and 1970, 59 sea otters were translocated from the remnant population of Amchitka Island to Washington State. The most recent surveys in 2019 indicate the population is approximately 2785 with an estimated average annual growth rate of 9.8% and continued range expansion is expected (Jefferies et al. 2019).

California's sea otters are the descendants of a single colony of about 50 southern sea otters discovered near Big Sur in 1938. The southern sea otter population in CA is recovering to near its threshold for delisting under the Endangered Species Act (1973), however, the present distribution is only a fraction of the historic distribution (Tinker et al. 2019). The latest survey results report a three-year average of 2,962 sea otters including the mainland and the San Nicolas Island population representing a less than 1% growth rate per year (Hatfield et al. 2019). Population range expansion has been greatly impacted by shark-bite mortality in the northern end of the subspecies' range (Hatfield et al. 2019). The Pacific Northwest has had major reductions in canopy-forming kelp in the past decade due to the loss of sea stars through a wasting disease and now an abundance of urchins that graze intensively on kelp (Roger-Bennett and Catton 2019). The giant kelp likely afforded sea otters protection from shark predation and the loss of this habitat has been a factor intensifying the predation. On the southern end of the range, at San Nicolas Island, the reintroduced population originally established in the mid-1980s from the Central California population is now well established, numbering over 100 animals, and has an estimated annual growth rate of 10.5% for the past 5 years (Hatfield et al. 2019). Schramm et al. 2014, based on reports of sea otters in Baja California, Mexico, suggested that a higher frequency of sea otters than in the past.

In Japan, small numbers of sea otters (*E. l. lutris*) have been observed regularly on the eastern side of Hokkaido Islands since the 1970s (Hattori et al. 2005). The most recent estimate is 20 individuals, but at present this is not believed to be an established population.

Population Information

Current Population Trend: Variable but decreasing in key locations throughout the species range

Population Size (mature individuals): NA

Extreme fluctuations? (in # of mature individuals)	Justification:
-	-

Severely fragmented?	Justification:
No	-

Continuing decline in mature individuals?	Qualification:	Justification:
-	Observed	-

Population Reduction - Past

Percent Reduction in past	Qualification:	Justification:
70%	Observed	-

Basis?
a) direct observation, b) an index of abundance appropriate for the taxon, e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites)

Reversible?
No

Understood?
Yes

Ceased?
No

Population Reduction - Future

Percent Reduction in future	Qualification:	Justification:
-	-	-

Basis?
-

Reversible?
-

Understood?
-

Ceased?
-

Population Reduction - Ongoing

Both: Percent Reduction over any 10 year or 3 generation period, whichever is longer, and must include both past and future, future can't go beyond 100 years	Number of years for this period	Qualification:	Justification:
70%	-	Observed	-

Basis?
a) direct observation, b) an index of abundance appropriate for the taxon, e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites

Reversible ?
No.

Understood ?
Yes

Ceased ?
No

Habitats and Ecology

Throughout their range, sea otters use a variety of near shore marine environments and 84% of foraging occurs in water ≤ 30m in depth (Bodkin *et al.* 2004) and most of their foraging occurs within a kilometer of the shore. Their classic association is with mixed rocky intertidal substrates supporting kelp beds, but also frequent soft-sediment dominated areas where kelp is absent (Riedman and Estes 1990, DeMaster *et al.* 1996, Burn and Doroff 2005). Kelp canopy is thought to be an important habitat component, used for foraging and resting (Riedman and Estes 1990). They are found most often in areas with protection from the most severe ocean winds and swells, such as rocky coastlines, thick kelp forests, barrier reefs and refuges such as inlets, bays and estuaries. Although they are most strongly associated with rocky substrates, sea otters can also live in areas where the sea floor consists primarily of mud, sand, or silt. Individuals generally occupy a relatively small home range a few to tens of kilometers long and have high site fidelity, remaining there year-round, however, some individuals, primarily males, do make long distance (more than hundreds of kilometers) movements and migrations (Rathbun et al. 2000, Tinker et al. 2008 and 2019). Sea otters forage in rocky and soft-sediment communities on or near the ocean floor. The maximum confirmed depth of dive was 97 m (Newby 1975); however recent studies using time-depth recorders implanted in sea otters indicate average maximum forage depths of 54m for female and 82m for male sea otters (Bodkin *et al.* 2004).

Sea otters are weakly territorial (Kenyon 1969) with fighting and aggression rare (Loughlin 1980). Only adult male sea otters establish territories. Males patrol territorial boundaries and attempt to exclude other adult males from the area. Females move freely between and among male territories. Groups of male and female sea otters generally rest separately. Sea otter annual home ranges can occupy up to 0.8 km² (80 ha) and extend along 16 km of coastline (Kenyon 1969, Loughlin 1980). Typically, female sea otter home ranges are about 1.5-2 times larger than resident adult males during the breeding season; however, females have smaller annual or lifetime home ranges than males (Riedman and Estes 1990). Jameson (1989) found that territorial adult males occupied a mean home range of 40.3 ha during the summer-fall period (when home range size was considered equal to territory size); and mean coastline length was 1.1 km. Winter-spring mean home range size of territorial adult males that remained in female areas was 78.0 ha, with a mean coastline length of 2.16 km.

The diet of sea otter consists almost exclusively of marine invertebrates, including sea urchins, a variety of bivalves such as clams and mussels, abalone, other molluscs, crustaceans, and snails. Its prey ranges in size from tiny limpets and snails, to kelp and cancer crabs, to giant Pacific octopuses (Estes 1980). Sea urchins, abalones and rock crabs are the principal prey of sea otters in newly reoccupied habitats of central California (Vandevere, 1969), whereas, clams and crab make up the majority of the diet in soft-sediment habitats (Kvitek *et al.* 1992, Doroff and DeGange 1994). Where prey such as sea urchins, clams, and abalone are present in a range of sizes, sea otters tend to select larger prey over smaller ones of similar type (Kvitek *et al.* 1992). In California, it has been noted that sea otters ignore Pismo clams smaller than 3 inches (7 cm) across. One exception is in the Aleutian archipelago were sea otters were observed to regularly eat fish, which could comprise up to 50% of their diet in some seasons. The fish species eaten were usually bottom dwelling and sedentary or sluggish forms, such as the Red Irish Lord and Globefish (Estes 1980). They also consume crab, clam, mussels, turban snails, sea cucumbers, squid, octopus, chitons, tubeworms, large barnacles, scallops, and sea stars (Wild and Ames 1974, Riedman and Estes 1990). Burrowing bivalve molluscs such as clams are excavated by digging in sand or mud bottoms and are the most common prey in soft-sediment communities (Calkins 1978, Kvitek *et al.* 1992, Doroff and DeGange 1994).

Male sea otters reach sexual maturity around age five or six, but probably do not become territorial or reproductively successful for two or three subsequent years (Riedman and Estes 1990). Most female sea otters are sexually mature at age four or five though some are mature as early as 2.5 years (Kenyon 1969, Jameson and Johnson 1993, Monson *et al.* 2000, Monson and DeGange 1995, von Biela 2007). Thus, it is thought that sea otter generation length is approximately seven years (Gange *et al.* 2019). Sea otters apparently are polygynous, although the exact nature of the mating system may vary. Females normally give birth to a single pup that weighs 1.4 to 2.3 kg at birth (Riedman and Estes 1990). Gestation has been documented to be approximately six months with an obligatory two to three-month delayed implantation phase and a four-month implanted phase when fetal growth occurs (Riedman and Estes 1990). Twinning has been documented in sea otters (Williams *et al.* 1980); however, litters larger than one are rare, and when they occur, neither pup is likely to survive (Jameson and Bodkin 1986). Pups are precocial and remain dependent upon their mothers for about six months (Jameson and Johnson 1993). Longevity in sea otters is estimated to be 15 to 20 years for females and 10 to 15 years for males (Riedman and Estes 1990).

IUCN Habitats Classification Scheme

Habitat	Suitability	Major Importance?
Marine Neritic -> Marine Neritic - Estuaries	Suitable	-
Marine Neritic -> Marine Neritic - Macroalgal/Kelp	Suitable	Yes
Marine Neritic -> Marine Neritic - Subtidal Loose Rock/pebble/gravel	Suitable	-Yes
Marine Neritic -> Marine Neritic - Subtidal Muddy	Marginal	-
Marine Neritic -> Marine Neritic - Subtidal Rock and Rocky Reefs	Suitable	Yes
Marine Neritic -> Marine Neritic - Subtidal Sandy	Marginal	-
Marine Neritic -> Marine Neritic - Subtidal Sandy-Mud	Marginal	-
Marine Oceanic -> Marine Oceanic - Epipelagic (0-200m)	Suitable	Yes

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat?	Qualification:	Justification:
-	-	-

Life History

Generation Length	Justification:
7 years	-

Age at Maturity: Female
- 2.5-5 years

Age at Maturity: Male
- 5-6 years

Size at Maturity (in cms): Female
-90 -100 cm

Size at Maturity (in cms): Male
-100-110

Longevity
- (10-20 years)

Average Reproductive Age
- (3-7 years)

Maximum Size (in cms)
-122 180 cm

Size at Birth (in cms)
-

Gestation Time (in days)
- 180 days

Reproductive Periodicity
-

Average Annual Fecundity or Litter Size
- 11

Annual Rate of Population Increase
-

Natural Mortality
-

Breeding Strategy

Does the species lay eggs?
False / No

Does the species give birth to live young
True

Does the species exhibit parthenogenesis
False / No

Does the species have a free-living larval stage?
False / No

Does the species require water for breeding?
False / No

Movement Patterns

Movement Patterns: Not migratory

Systems

System: Terrestrial, Marine

Plant Specific

Wild relative of a crop? NA

Plant Growth Forms: NA

Use and Trade

Information pertaining to sea otter trade has been taken from http://www.answers.com/topic/ sea-otter-trade. Europeans and Americans first ventured to the North Pacific coast of America in the late eighteenth century in pursuit of sea otter skins. As the Pacific counterpart to the Atlantic beaver trade, the sea otter trade led trappers into the North Pacific, where they established bases from the Aleutian Islands to Baja California. In China, sea otter furs were exchanged at good profit for prized oriental goods.

Russia and Spain were the pioneer nations to engage in the sea otter trade. After Vitus Bering's expeditions in the early eighteenth century, promyshlenniki (fur traders) pushed eastward, and in 1784 they established the first permanent Russian settlement in America, on Kodiak Island. In the same year, Spain organized a sea otter trade between California and China. At the opening of the nineteenth century, American and Russian traders entered the California sea otter fields, where in the face of strong opposition they poached throughout the Spanish period. After 1821, the liberal commercial policy of independent Mexico stimulated the California sea otter trade, and many Americans became Mexican citizens to participate in the business. Between 1804 and 1807 it is estimated that almost 60,000 pelts were taken by American vessels, while the period 1808–1812 yielded nearly 50,000.

The sea otter trade ended once commercial hunting was no longer viable and nearly exterminated the species. In general, the fur trade areas were exhausted in the order they were opened. Kamchatka and the Aleutians were depleted by 1790, Kodiak by 1805, Sitka to Nootka Sound by 1820, and California by 1840. A treaty signed in 1911 by the United States, Great Britain, Russia, and Japan banned the hunting of sea otters. However, sea otter trade still exists. Sea otter pelts are also being sold in Russia, with at least 300 skins being sold in the black market in Moscow in summer 2005. Most of these were obtained illegally from the Commander Islands Biosphere Nature Reserve. Since then we have been informed that a further 300 sea otter skins were being sold openly in the black market at Petropavlovsk-Kamchatskiy, with 200 of them from the Commander Islands. Most of these skins will be sold on to the markets in China (IOSF 2006).

General Use and Trade Information

Species not utilized: False

No use/trade information for this species: False

Use Trade Documentation: In Alaska the Marine Mammal Protection Act allows for coastal Native people to hunt northern sea otters for subsistence use (personal uses and barter or trade of unaltered pelts with other Native people), and for creating and selling authentic handicrafts or clothing provided the taking was not wasteful; there is no other legal harvest of sea otters. The harvest of sea otters is monitored by the U. S. Fish and Wildlife Service’s Marking, Tagging and Reporting program and all pelts are required to be tagged within 30 days of the hunt. The average annual subsistence harvest of northern sea otters in Alaska for years 2006-2010 was 76, 293, 322 in the Southwest, Southcentral, and Southeast population stocks, respectively (https://www.fws.gov/ecological-services/species/stock-assessment-reports.html) from information based on the U.S. Fish and Wildlife Service Marking, Tagging, and Reporting Program.

Detailed Use and Trade Information

Purpose	Source	Form Removed	Subsistence	National	International	Harvest Level	Units	Possible Threat	Notes and Justification
Construction/ structural materials	Wild	Whole animal/ plant	True	False	False	(Not specified)	Volume (cubic metres)	False	(Not specified)
Wearing apparel, accessories	Wild	Whole animal/ plant	True	False	False	(Not specified)	Volume (cubic metres)	False	(Not specified)

Non- Consumptive Use

Non-consumptive use of the species? Yes.

Explanation of non-consumptive use: Is major attraction for tourists when displayed in aquarium for conservation education and research. Can and has been promoted in ecotourism in California, Alaska and British Columbia. A symbol of coastal ecosystem health.

Offtake trends

Trend in level of total offtake from wild sources: Decreasing

Trend in level of total offtake from domesticated sources: NA

Livelihoods

No information for this species	Number selected.
False	0 selected.

Threats

Oil spills are the greatest anthropogenic threat to sea otter (Geraci and Williams 1990). Sea otters become hypothermic when oiled because oiled Sea Otter fur loses its insulative property and sea otters have no blubber layer. Oil can be ingested while grooming, leading to gastrointestinal disorders, other ailments and death. Thevolatile components of oil inhaled by sea otters can cause lung damage. Estimates of sea otter mortality following the Exxon Valdez spill in Prince William Sound ranged from 2,650 (Garrott *et al*. 1993) to 3,905 (DeGange *et al*. 1994).

Significant numbers of Sea Otters drowned in gill and trammel nets in California from the mid-1970s to the early 1980s (Estes 1990). Population declines in California's sea otters may be incidental to summer commercial fisheries. Estes *et al.* (2003) found that Sea Otter mortality was elevated in the summer months and that commercial fin fish landings in the coastal live trap fishery increased.

An ongoing and long-term study of sea otter health, body condition, and causes death for the southern sea otter indicate that shark bite mortality is the most common primary cause of death followed by acanthocephalan peritonitis, probable domoic acid intoxication, cardomyopathy, end-of-lactation-syndrome, and primary bacterial infection (Miller et al. 2017, Hatfield *et al*. 2019). In Alaska, Streptococcal endocarditis, encephalitis and/or septicemia, referred to as Strep. syndrome has been identified in northern sea otters as well as trauma from boat strikes. Goldstein et al. (2009) found northern sea otters from the Alaska Peninsula, Kodiak and Kachemak Bay area infected with phocine distemper.

Killer Whales (*Orcinus orca*), Great White Sharks (*Carcharodon carcharias*), Bald Eagles (*Haliaeetus leucocephalus*), Coyotes (*Canis latrans*), wolves (*Canis lupus*), and Brown Bears (*Ursus arctos*) have been documented as predators of sea otters (Riedman and Estes 1990). Predation by Killer Whales is one factor believed to have caused Sea Otter population declines across the Western Gulf of Alaska and Aleutian Islands (Doroff et al. 2003, Estes et al. 1998, Hatfield et al. 1998). Significant declines in preferred prey species populations - Northern Fur Seals (*Callorhinus ursinus*), Harbour Seals (*Phoca vitulina*), and Steller Sea

Lions (*Eumetopias jubatus*) are believed to have caused Killer Whales to prey switch and consume sea otters, a less preferred prey because of their lack of blubber layer (Estes et al. 1998).

Unquantified environmental stressors to all of the subspecies populations may include future ocean conditions becoming warmer, acidifying, and deoxygenating (IPCC 2019). Warmer oceans favor the range expansion and prevalence of dinoflagellate phytoplankton, many of which are toxin producing and will impact sea otter prey in ways that are not yet understood. In California, effects of harmful algal and cyanobacterial blooms may be acute or chronic on sea otters (Kreuder et al. 2003, Miller et al. 2010, Miller et al. 2017). Ongoing studies are looking at the living population and data from necropsies to elucidate the complex relationship between cardiomyopathy and domoic acid exposure (Moriarty et al. 2019). Work in Alaska suggests that sea otters can detect and avoid consuming clams with low levels of saxitoxin or paralytic shellfish poisoning (PSP) that is accumulated in butter clams *Saxidomus gigantea* (Kvitek et al. 1991; Kvitek and Bretz 2004). Recent studies have shown saxitoxins increase in toxicity through biochemical changes associated with lower pH (Roggatz et al. 2019), this has the potential to decrease available prey in future scenarios for sea otters. Bivalves are an important prey species for sea otters living in soft-sediment habitat regions, like the Kodiak archipelago, where butter clams constitute >50% of the sea otter diet. In addition, calcium carbonate shell forming bivalves are thought to decrease with increasing ocean acidification (Waldbusser et al. 2015). The effect that changing and decreasing bivalve abundance will have on sea otter populations is unprecedented, is likely to be negative.

Studies in Alaska, and Washington have shown that sea otter predation on sea urchins may indirectly enhance the growth of kelp and kelp-associated marine communities. Shellfish are important to commercial, recreational, and tribal fisheries throughout the species range and predation by sea otters can be significant and result in localized depletion of commercial and subsistence shell fisheries. Emerging studies are looking at the benefits of kelp-dominated ecosystems such as increasing fin fish populations and ecosystem stability in the face of climate change (Markel and Shurin 2015).

Toxoplasmosis, a disease caused by *Toxoplasma gondii*, is a major cause of mortality and contributor to the slow rate of population recovery for southern sea otters in California (Conrad *et al.* 2005). Thomas and Cole (1996) reported that mortality from infectious diseases, such as peritonitis, protozoal encephalitis, toxoplasmosis, etc. were occurring at a high rate, wherein, some diseases appeared to be on the rise while others were newly reported. Several of the diseases were predominately affecting prime age, breeding adults.

Threats Classification Scheme

No past, ongoing, or future threats exist to this species. False

The threats to this species are unknown. False

Threat	Timing	Timing score	Scope	Severity	Impact Score	Impact category
5. Biological resource use -> 5.1. Hunting & trapping terrestrial animals -> 5.1.1. Intentional use (species is the target)	Ongoing	3	3	3	9	High
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality					
5. Biological resource use -> 5.1. Hunting & trapping terrestrial animals -> 5.1.2. Unintentional effects (species being assessed is not the target)	Ongoing	3	2	3	8	High
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality					
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.4. Unintentional effects: (large scale)	Ongoing	3	2	3	8	High
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality 2. Species stresses -> 2.3. Indirect species effects -> 2.3.2. Competition					

5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.5. Persecution/ control	Ongoing	3	2	3	8	High
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality					
6. Human intrusions & disturbance -> 6.1. Recreational activities	Ongoing	3	2	2	7	Medium
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.1. Species mortality					
8. Invasive & Other Problematic Species, Genes & Diseases ->8.1. Invasive Non-Native/Alien Species/Diseases -> 8.1.2 *Toxoplasma gondii, Sarcocystis neurona, Salmonella, Escherichia coli, Coccidioides immitis*	Ongoing	3	1	2	6	Medium
Stresses:	2. Species Stresses -> 2.1. Species mortality					
9. Pollution -> 9.2. Industrial & military effluents -> 9.2.1. Oil spills	Ongoing	3	2	3	8	High
Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.1. Species mortality					
11. Climate change & severe weather -> 11.4. Storms & flooding	Future	1	3	3	7	Medium
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality					
11. Climate change & severe weather -> 11.3. Temperature extremes	Future	1	3	3	7	Medium
Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation					

Conservation

Enhydra lutris nereis is listed on CITES Appendix I. All other populations are included in CITES Appendix II. In Canada, sea otters are protected and managed under the Species at Risk Act (SARA). In the United States, Sea Otters are protected by the Marine Mammal Protection Act of 1972 (MMPA) and in Southwest Alaska and California, the Endangered Species Act of 1973 (ESA). The US Fish and Wildlife Service (Service) is the federal agency responsible for their conservation and management. The ESA also makes it illegal to buy, sell or possess any part of endangered species or items made from them. However, both the ESA and the MMPA allow for coastal Native people in Alaska to harvest Sea Otters for personal use, trade, barter, and the development of cottage industry. Native subsistence harvest of sea otters is monitored by the Service through a Marking, Tagging and Reporting program. The Service and Native organizations conduct joint population surveys and dialog on important conservations issues. The MMPA also mandates that efforts must be made to recover the species, which means creating and implementing a plan for returning them to healthy population levels.

Research Needed

Monitoring -> Monitoring Population trends. Defining sea otter populations at smaller spatial scales that reflect this species' life history and dispersal patterns. Making sea otter monitoring programs comparable across geo-political boundaries through international collaboration to optimize survey efforts. Understanding factors that regulate sea otter population density with a focus on index sites that are representative of the variety of littoral habitats occupied by sea otters	-
Research -> First Nations Harvest, use & livelihoods on sea otter populations. Quantifying the effects of sea otters on the littoral community with a focus on how food availability limits population and ecosystem recovery. Predicting the effect of sea otter reoccupation on commercially valuable invertebrates. Evaluating the conservation benefits of sea otter reintroductions into historical habitat Managing and documenting recovery of genetic diversity. Managing and monitroing sea otter populations affected by higher level predators. Defining socieconomic impact of sea otters in nearshore ecosystems by tourism and ecosystem recovery and resilience. Monitoring the effects of climate change on sea otter populations. Monitoring prey species populations and their interactions and effects on sea otter abundance and densities. Disease monitoring among sea otter populations.	-

Conservation Actions Needed

Land/water management -> Habitat & natural process restoration	-
Land/water management -> Site/area management	-
Land/water protection -> Site/area protection	-
Species management -> Species recovery	-

Conservation Actions In- Place

Action Recovery Plan		Systematic monitoring scheme	
Yes	Migrated from Conservation Measures 5.4 Species-based actions->Recovery Management: in-place	-	-

Conservation sites identified			Occur in at least one PA		Percentage of population protected by PAs (0-100)		Area based regional management plan		Invasive species control or prevention	
Yes	-	Migrated from Conservation Measures 4.4.2 Habitat and Site-based actions -> Protected Areas->Establishment: in-place	-		-	-	-	-	-	-

Harvest management plan		Successfully reintroduced or introduced benignly		Subject to ex-situ conservation	
-	-	Yes	Migrated from Conservation Measures 5.2 Species-based actions->Benign introductions: in-place	-	-

Subject to recent education and awareness programmes		Included in international legislation		Subject to any international management/trade controls	
Yes	Migrated from Conservation Measures 2.3 Communication and Education->Capacity-building/ Training: in-place	Yes	CITES Appendix I (as *Enhydra lutris nereis*) and Appendix II (all other populations)	Yes	-

Ecosystem Services

Ecosystem Services Provided by the Species

Insufficient Information Available
False

Species provides no ecosystem services: False

Ecosystem Services: Maintain coastal habitat as keystone species through food chain (control of sea urchin population). Have great tourism and recreational value particularly use in aquarium for public education and research.

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