Lontra canadensis - (Schreber, 1777)

ANIMALIA - CHORDATA - MAMMALIA - CARNIVORA - MUSTELIDAE - Lontra - canadensis

Common Names: North American river otter, Nearctic river otter, Northern river otter, and river otter. (see Melquist et al. 2003 for a list of other common names used for the species)

Synonyms: *Lutra canadensis* Schreber, 1777

Taxonomic Note:
The scientific name North American river otter was formerly *Lutra canadensis*. Although *Lutra* may still occasionally be used in some common literature, *Lontra* is now the accepted genus name for the species (Van Zyll de Jong 1972, 1987; Kellnhauser 1983, Wozencraft2005).

Red List Status
LC - Least Concern (IUCN version 3.1)

Red List Assessment

Assessment Information

Date of Assessment: 09/01/2020

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Assessor(s): Serfass, Thomas, L.

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Assessment Rationale

The North American River Otter had declined substantially throughout large portions of the its historic range due to unregulated trapping, water pollution and habitat degradation, but has recovered in most jurisdictions in which conservation actions are typically defined (i.e., USA states, and Canadian provinces and territories). With the exception of Prince Edward Island, Canada, populations of North American river otters are now stable or expanding among conservation jurisdictions, although diligence is needed to ensure that historical problems encountered by the species do not reoccur. Therefore, the species is listed as Least Concern, based on significant population recovery after undergoing past population declines, which is currently justified and defensible.

Reasons for Change

Reason(s) for Change in Red List Category from the Previous Assessment: No change is recommended.

Distribution

Geographic Range

At the time of the America's first European colonization, the North American river otter was one of the most widely distributed mammalian species in North America, occurring in an area roughly bounded within 25º 08' -

68º 20' N latitude and 55º 30' - 162º 49' W longitude (Anderson 1977, Melquist *et al.* 2003). The species' historic range included a variety of coastal and inland aquatic habitats throughout much of the North American continent, from arctic Alaska and northern Canada to the southern USA (Hall 1981, Melquist *et al.* 2003).

Area of Occupancy (AOO)

By the mid-1950s the North American river otter had undergone severe population declines including local and regional extirpations throughout extensive portions of its historic range, especially in many non-coastal areas of the USA and southern Canada. However, river otters have recovered in many areas and now occupy aquatic habitats in at least portions of its historic range in each USA state (except Hawaii, where the species never occurred), Canadian province or territory, (except Canada's Prince Edward Island where the populations is extirpated, although there is some evidence of individuals recolonizing the province). Recently, there is evidence of a population of North American river otters occupying an area of northern Mexico (Gallo-Reynoso 2019).

Estimated area of occupancy (AOO) - in km2: NA

Continuing decline in area of occupancy (AOO): (No, population is generally growing or stable among regions.)

Extreme fluctuations in area of occupancy (AOO): (Population is growing or stable among most regions. d)

Extent of Occurrence (EOO)

Estimated extent of occurrence (EOO) - in km2: NA

Continuing decline in extent of occurrence (EOO): (No, population is growing or stable areas in most areas of occurrence.)

Extreme fluctuations in extent of occurrence (EOO): (No.)

Locations Information

Number of Locations:

Continuing decline in number of locations: (No, the species is not declining in primary jurisdictions.

Extreme fluctuations in the number of locations: (Areas occupied are generally increasing.)

Very restricted AOO or number of locations (triggers VU D2)

Very restricted in area of occupancy (AOO) and/or # of locations: (No, this is not the case.)

Elevation / Depth / Depth Zones

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

Elevation Upper Limit (in metres above sea level): 3000

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

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

Depth Zone: Shallow photic (0-15 m)

Map Status

Map Status	How the map was created, including data sources/ methods used:	Please state reason for map not available:	Data Sensitive?	Justification	Geographic range this applies to:	Date restriction imposed:
Done	-	-	-	-	-	-

Biogeographic Realms

Biogeographic Realm: Nearctic

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
Canada	Extant	Native	-	-
Canada -> Alberta	Extant	Native	-	-
Canada -> British Columbia	Extant	Native	-	-
Canada -> Labrador	Extant	Native	-	-
Canada -> Manitoba	Extant	Native	-	-
Canada -> New Brunswick	Extant	Native	-	-
Canada -> Newfoundland	Extant	Native	-	-
Canada -> Northwest Territories	Extant	Native	-	-
Canada -> Nova Scotia	Extant	Native	-	-
Canada -> Nunavut	Extant	Native	-	-
Canada -> Ontario	Extant	Native	-	-
Canada ->Prince Edward Island	Extirpated, but recent evidence of colonizing individuals.	Native		
Canada -> Québec	Extant	Native	-	-
Canada -> Saskatchewan	Extant	Native	-	-
Canada -> Yukon	Extant	Native	-	-
Mexico	Recent evidence (See Gallo-Reynoso 2019)	Presumed native if present	-	-
United States	Extant	Native	-	-
United States -> Alabama	Extant	Native	-	-
United States -> Alaska	Extant	Native	-	-
United States -> Arizona	Extant	Native	-	-

United States -> Arkansas	Extant	Native	-	-
United States -> California	Extant	Native	-	-
United States -> Colorado	Extant	Native	-	-
United States -> Connecticut	Extant	Native	-	-
United States -> Delaware	Extant	Native	-	-
United States -> District of Columbia	Extant	Native	-	-
United States -> Florida	Extant	Native	-	-
United States -> Georgia	Extant	Native	-	-
United States -> Hawaii	Not present	Non-Native	-	Resident
United States -> Idaho	Extant	Native	-	-
United States -> Illinois	Extant	Native	-	-
United States -> Indiana	Extant	Native	-	-
United States -> Iowa	Extant	Native	-	-
United States -> Kansas	Extant	Native	-	-
United States -> Kentucky	Extant	Native	-	-
United States -> Louisiana	Extant	Native	-	-
United States -> Maine	Extant	Native	-	-
United States -> Maryland	Extant	Native	-	-
United States -> Massachusetts	Extant	Native	-	-
United States -> Michigan	Extant	Native	-	-
United States -> Minnesota	Extant	Native	-	-
United States -> Mississippi	Extant	Native	-	-
United States -> Missouri	Extant	Native	-	-
United States -> Montana	Extant	Native	-	-
United States -> Nebraska	Extant	Native	-	-
United States -> Nevada	Extant	Native	-	-
United States -> New Hampshire	Extant	Native	-	-

United States -> New Jersey	Extant	Native	-	-
United States -> New Mexico	Possibly Extinct	Native	-	-
United States -> New York	Extant	Native	-	-
United States -> North Carolina	Extant	Native	-	-
United States -> North Dakota	Extant	Native	-	-
United States -> Ohio	Extant	Native	-	-
United States -> Oklahoma	Extant	Native	-	-
United States -> Oregon	Extant	Native	-	-
United States -> Pennsylvania	Extant	Native	-	-
United States -> Rhode Island	Extant	Native	-	-
United States -> South Carolina	Extant	Native	-	-
United States -> South Dakota	Extant	Native	-	-
United States -> Tennessee	Extant	Native	-	-
United States -> Texas	Extant	Native	-	-
United States -> Utah	Extant	Native	-	-
United States -> Vermont	Extant	Native	-	-
United States -> Virginia	Extant	Native	-	-
United States -> Washington	Extant	Native	-	-
United States -> West Virginia	Extant	Native	-	-
United States -> Wisconsin	Extant	Native	-	-
United States -> Wyoming	Extant	Native	-	-

Population

By the early to mid-1900s North American river otter populations had experienced extensive declines caused by various human perturbations (e.g., unregulated trapping and water pollution). However, the combined implementation of 22 successful reintroduction projects in the USA, reduced trapping pressure, and implementation of environmental regulations that improved water quality resulted in the recovery and expansion of river otter populations in many areas (Raesly 2001, Bricker *et al. in press*).

Although, historically and currently dispersed over a large geographic area in the USA and Canada, the occurrence and abundance of the river otter ultimately is determined by differences in the availability and productivity of aquatic habitats, with largest populations occurring in coastal habitats (e.g., highly productive

coastal marshes associated with the Gulf of Mexico) and populations largely excluded from regions where permanent water was limited (e.g., permafrost regions of Canada and arid portions of the southwestern United States). Population densities for the species are poorly understood for most regions and habitat conditions in North America. Examples of estimates that have been derived show densities of 1 river otter per 1.25-3.60 km of coastline in Alaska (Testa et al. 1994) to 1 river otter per 3.9 km of riverine habitat in Idaho (Melquist and Hornocker 1983). Population estimates are expensive and difficult to calculate for species that are elusive, highly dispersed, and often occur at low population densities, like the river otter (Kohn *et al.*, 1999). Instead, field-sign surveys (e.g. detecting scats at latrines, but also other signs such as tracks in the snow) have been used in many areas of North America to reliably determine the presence or absence of river otters (e.g. Reid *et al.*, 1987; Shackelford & Whitaker, 1997; Swimley *et al.*, 1998; Melquist *et al.*, 2003; Gallant *et al.*, 2008; 2008; Ben-David, 2010, Stevens *et al.*, 2011; Just *et al.*, 2012). These types of evaluations should be incorporated with studies intended to determine population densities through extracting DNA from scats as a means of enhancing approaches used to monitor overall size and distribution of populations (Fike *et al.* 2004). More recently, Mowry *et al.* (2011) applied the use of genetic technology for a mark-recapture approach in estimating river otter densities along several riverine systems in Missouri, USA. However, the application of this technique must consider natural history aspects of the river otter to account for differences in spraint-marking by individuals based on sex and seasonality (e.g. Olson *et al.*, 2005, 2009; Stevens & Serfass, 2008, Serfass et al. 2019), so as not to violate various assumptions associated with mark-recapture studies.

Trapping for fur constitutes a substantial human-induced form of mortality on river otter populations. Trapping river otters continued during periods of population declines in regions where viable populations persisted (Nilsson 1980, Toweill and Tabor 1982, Melquist et al. 2003). The recovery of river otter populations has coincided with an overall expansion in areas were the species is legally trapped for fur. From 2006–2012, 170,894 ($\bar{x}$ = 24,413; SD = 6,642; range: 17,055–35,128) and 82,698 river otters ($\bar{x}$ = 11,814; SD = 1,283; range: 9,604–13,934) were respectively trapped in the USA and Canada (Bricker et al, *in press*).

Population Information

Current Population Trend: Stable to expanding, depending on conservation jurisdiction.

Number of mature individuals (=population size): (Not known)

Extreme fluctuations? (in # of mature individuals): (No)

Severely fragmented?	Justification
Generally not.	-

Continuing decline in mature individuals? (No)

Continuing decline % in mature individuals within 1 generation or 3 years, whichever is longer (up to max. of 100 years in the future): (No)

Continuing decline % in mature individuals within 2 generations or 5 years, whichever is longer (up to max. of 100 years in the future): (No)

Continuing decline % in mature individuals within 3 generations or 10 years, whichever is longer (up to max. of 100 years in the future): (No)

Extreme fluctuations in the number of subpopulations: (Not known, but many populations are expanding and range expansion has occurred)

Continuing decline in number of subpopulations: (No)

All individuals in one subpopulation: (No)

Number of mature individuals in largest subpopulation: (Not known)

Number of Subpopulations: (Not known.)

Population Reduction - Past

Percent Change in past: (Many extirpations, especially in central USA and southcentral Canada)

Past Population Reduction Basis: (Trapping for fur, water pollution, and disturbance to riparian habitats)

Causes of past reduction reversible? (Yes, those causes have been reversed in many areas)

Causes of past reduction understood? (Yes)

Causes of past reduction ceased? (The intensity and level of past disturbances generally have been mitigated, but not eliminated. The ability to trap otters at sustainable level depends on regulations established by management authorities, and intensity of trapping pressure. Regulations and general reduction in trapping interest generally mitigate any large-scale impacts of fur trapping.

Population Reduction - Future

Percent Change in future: (Range expansion is expected to gradually continue or level, depending on area and associated management practices related to trapping and water quality.)

Future Population Reduction Basis: (Dependent on area and associated management practices related to trapping pressure and water quality.)

Population Reduction - Ongoing

Both: Percent Change 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: (Population is growing or stable in most areas.)

Both Population Reduction Basis: (NA)

Causes of both (past and future) reduction reversible? (NA, past population declines have been reversed.

Causes of both (past and future) reduction understood? (Past causes understood)

Causes of both (past and future) reduction ceased? (Trapping persists, but is regulated and interest and acceptance of the activity is diminishing in some areas.)

Quantitative Analysis

Probability of extinction in the wild within 3 generations or 10 years, whichever is longer, maximum 100 years: (Unlikely, but has not been assessed through population modelling at a large scale.)

Probability of extinction in the wild within 5 generations or 20 years, whichever is longer, maximum 100 years: (Unlikely, but has not assessed through population modelling at a large scale.)

Probability of extinction in the wild within 100 years: (Unlikely, but has not been assessed through population modelling at a large scale.)

Habitats and Ecology

Adult North American river otters weigh from about 5 to 15 kg (Melquist et al. 2003). Size varies among geographic areas, with males typically larger than females. River otters display delayed implantation, resulting in a period of almost one year from time of breeding until giving birth. Young generally are born in February and March, and breeding occurs shortly thereafter, well before the young are independent (Liers 1951, Hamilton and Eadie 1964). Males and females are sexually mature at two years of age, but variation in the reproductive age has been reported (Hamilton and Eadie 1964, Docktor *et al.* 1987). Litters typically are comprised of 1 to 3 young (Hamilton and Eadie 1964, Tabor and Wight 1977, Docktor *et al.* 1987). Maximum life expectancy is typically about 10 years of age in the wild and up to 20 years of age in captivity (Stephenson 1977, Melquist *et al.* 2003). The North American river otter is an aquatic-habitat generalist, capable of exploiting virtually all freshwater systems, estuaries, and some coastal and marine areas depending on the availability of adequate prey and riparian cover (Melquis*t et al.* 2003). The diet of the river otter is comprised mostly of fish, but amphibians

(mostly frogs), crustaceans (mainly crayfish), and birds may also be eaten depending on the region and season (Sheldon and Toll 1964, Knudsen and Hale 1968, Stenson *et al.* 1984, Serfass *et al.* 1990, Reid *et al.* 1994, Stearns *et al.* 2011). Typically, the slowest moving and most abundant fish (e.g., members of the sucker and minnow families) species are preyed upon most (Serfass *et al.* 1990, Stearns *et al.* 2011). Depending on availability, crayfish in some areas exceed the importance of fish in the river otter diet (Serfass *et al.* 1990). River otters prefer undisturbed riparian with adequate cover to serve as denning and resting sites (Swimley *et al.* 1998, Stevens *et al.* 2011). Both diet and riparian habitat use vary based on regional differences in aquatic systems and associated conditions.

Ultimately, river otter populations are limited by the distribution of suitable aquatic and riparian habitats. Consequently, any factors that reduce the quantity or degrade the quality of aquatic environments will adversely affect populations. River otters are often associated with aquatic habitats modified by the construction of dams and lodges by the American beaver (*Castor canadensis*) (Reid et al. 1994, Swimley et al. 1998, 1999). River otters are otherwise most active during nocturnal and crepuscular periods (Melquist and Hornocker 1983, Stevens and Serfass 2008). The extent of travel is influenced by sex, age class, region, season, and habitat conditions (Spinola et al. 2008). Males occupy larger home ranges than females (Melquist and Hornocker 1983, Reid et al. 1994, Melquist *et al.* 2003, Spinola *et al.* 2008). Home ranges for river otters occupying riverine habitats in Idaho ranged from 8 to 78 km^2 (Melquist and Hornocker 1983). River otters generally maintain low population densities (e.g., about 1 otter per 3.58 km of riparian habitat in Idaho; Melquist and Hornocker 1983), apparently without the need for overt (aggressive) displays of territoriality. Although considered to be territorial, home ranges of adjacent individuals may overlap to varying degrees based on gender and season (Melquist and Hornocker 1983, Spinola *et al.* 2008). River otters likely avoid aggressive interactions by practicing mutual avoidance through olfactory communication facilitated by scent marking at latrines. Predation on river otters has been reported, but is generally considered rare. River otters are presumably most vulnerable to being attacked and killed by larger predators when travelling overland or visiting latrine sites (e.g., gray wolves [*Canis lupus*], bobcats [*Lynx rufus*], coyotes [*Canis latrans*], domestic dogs [*Canis familiaris*] (Gable et al. (2017), and mountain lions [*Puma concolor*]; see Melquist et al. [2003] for a review of these and other reported examples of predation). However, there are isolated reports of river otters being preyed on in water (e.g., by the American alligator (*Alligator mississippiensis*); (*Crocodylus acutus*) (see Lariviere and Walton 1998). Trapping river otters for fur is an important human-induced mortality factor in many conservation jurisdictions in the USA and Canada (Bricker et al., in press).

IUCN Habitats Classification Scheme

Habitat	Season	Suitability	Major Importance?
5.1. Wetlands (inland) -> Wetlands (inland) - Permanent Rivers/ Streams/Creeks (including waterfalls)	Resident	Suitable	Yes
5.2. Wetlands (inland) -> Wetlands (inland) - Seasonal/ Intermittent/Irregular Rivers/Streams/Creeks	-	Marginal	-
5.3. Wetlands (inland) -> Wetlands (inland) - Shrub Dominated Wetlands	Resident	Suitable	Yes
5.4. Wetlands (inland) -> Wetlands (inland) - Bogs, Marshes, Swamps, Fens, Peatlands	Resident	Suitable	Yes
5.5. Wetlands (inland) -> Wetlands (inland) - Permanent Freshwater Lakes (over 8ha)	Resident	Suitable	Yes
5.6. Wetlands (inland) -> Wetlands (inland) - Seasonal/Intermittent Freshwater Lakes (over 8ha)	-	Marginal	-
5.7. Wetlands (inland) -> Wetlands (inland) - Permanent Freshwater Marshes/Pools (under 8ha)	Resident	Suitable	Yes
5.8. Wetlands (inland) -> Wetlands (inland) - Seasonal/Intermittent Freshwater Marshes/Pools (under 8ha)	-	Marginal	-
5.9. Wetlands (inland) -> Wetlands (inland) - Freshwater Springs and Oases	-	Unknown	-
5.10. Wetlands (inland) -> Wetlands (inland) - Tundra Wetlands (incl. pools and temporary waters from snowmelt)	-	Marginal	-

5.11. Wetlands (inland) -> Wetlands (inland) - Alpine Wetlands (includes temporary waters from snowmelt)	-	Marginal	-
5.13. Wetlands (inland) -> Wetlands (inland) - Permanent Inland Deltas	Resident	Suitable	Yes
5.14. Wetlands (inland) -> Wetlands (inland) - Permanent Saline, Brackish or Alkaline Lakes	-	Marginal	-
5.15. Wetlands (inland) -> Wetlands (inland) - Seasonal/Intermittent Saline, Brackish or Alkaline Lakes and Flats	-	Marginal	-
5.16. Wetlands (inland) -> Wetlands (inland) - Permanent Saline, Brackish or Alkaline Marshes/Pools	-	Marginal	-
5.17. Wetlands (inland) -> Wetlands (inland) - Seasonal/Intermittent Saline, Brackish or Alkaline Marshes/Pools	-	Marginal	-
9.10. Marine Neritic -> Marine Neritic – Estuaries	Resident	Suitable	Yes
12.5. Marine Intertidal -> Marine Intertidal - Salt Marshes (Emergent Grasses)	Resident	Suitable	No
13.4. Marine Coastal/Supratidal -> Marine Coastal/Supratidal - Coastal Brackish/Saline Lagoons/Marine Lakes	Resident	Suitable	Yes
13.5. Marine Coastal/Supratidal -> Marine Coastal/Supratidal - Coastal Freshwater Lakes	Resident	Suitable	Yes
15.1. Artificial/Aquatic & Marine -> Artificial/Aquatic - Water Storage Areas (over 8ha)	-	Marginal	-
15.2. Artificial/Aquatic & Marine -> Artificial/Aquatic - Ponds (below 8ha)	-	Suitable	No
15.3. Artificial/Aquatic & Marine -> Artificial/Aquatic - Aquaculture Ponds	-	Marginal	-
15.9. Artificial/Aquatic & Marine -> Artificial/Aquatic - Canals and Drainage Channels, Ditches	-	Marginal	-

Continuing Decline in Habitat

Continuing decline in area, extent and/or quality of habitat? (Dependent on enforcement of regulations. Considerable progress has been made since 1970s, but vigilance is needed to ensure regulations and enforcement remain in place and are enhanced where needed.)

Life History

Generation Length: NA

Movement Patterns

Movement Patterns: NA

Congregatory: NA

Systems

System: Terrestrial, Freshwater (=Inland waters), Marine

Use and Trade

General Use and Trade Information

Species not utilized: False. (Species is trapped for fur.)

No use/trade information for this species: (CITES maintain export data.)

For Use and Trade information see under Threats.

Subsistence:	Rationale:	Local Commercial:	Further detail including information on economic value if available:
Yes	-	Yes	-

National Commercial Value: Yes

International Commercial Value: No

End Use	Subsistence	National	International	Other (please specify)
10. Wearing apparel, accessories	True	true	-	-

Is there harvest from captive/cultivated sources of this species? No

Trend in level of total offtake from wild sources: Increasing

Trend in level of total offtake from domesticated sources: Not domesticated for harvest.

Harvest Trend Comments: (Harvest rates have increased in relation to growth of populations and increases in the area where trapping is legally permitted for the species).

Non- Consumptive Use

Non-consumptive use of the species? (Wildlife viewing and aquatic education.)

Explanation of non-consumptive use:

Threats

Threats to otter populations in North America vary among regions and are influenced by type, distribution, and density of aquatic habitats and characteristics of human activities. Prior to settlement of North America by Europeans, otters were widespread among aquatic habitats throughout most of the continent (Hall 1981, Melquist et al. 2003). The synergy of unregulated trapping and loss or degradation of aquatic habitats through filling of wetlands and development of coal, oil, gas, tanning, timber, and other industries resulted in extirpations or declines in otter populations in many areas (Toweill and Tabor 1982, Melquist and Dronkert 1987). River otter declines were particularly severe in the USA, where, by 1980, populations were considered completely extirpated from 11 states and had experienced severe declines in nine other states (Nilsson (1980). The most severe population declines occurred in interior regions where fewer aquatic habitats supported smaller otter populations. Over the last 40 years reintroduction projects and factors that control trapping intensity have facilitated the recovery of extirpated river otter populations in many areas of North America (Raesly 2001, Bricker et al, *in press*). Improvements in the conservation status of river otter populations in North America, particularly the USA, constitutes a substantial conservation success story, but efforts are still needed to guard against complacency in conserving the species and in addressing ongoing and potential threats that may be overlooked by failing to understand ecological aspects of the species throughout its range.

Fur trapping - The river otter has transitioned from a species of conservation concern in many areas of North America to one that is now widely legally trapped for fur, including states where the species was reintroduced (Bricker et al. *in press*). This trapping of river otters is generally considered by management authorities in the USA and Canada to be sustainable. However, increases in river otter harvest have furthered the need for implementing reliable approaches for monitoring the long-term status of populations, which is currently lacking

throughout most of North America, especially where river otters are trapped for fur. Bricker *et al.* (*In press*) showed that relatively few USA states or Canadian provinces and territories that harvest river otters have formal monitoring protocols for assessing either the density or the distribution of populations, except for recording annual trapper-kill levels and sometimes deriving demographic data from those killed otters.

An important issue that has not been meaningful, relates to levels of trapping that may enable perpetuation of local populations at levels below biological carrying capacity, but inhibits natural expansion. Interestingly, reintroduced river otter populations appear to have expanded rapidly with protection from legal trapping (Becker et al., *in press*). Such outcomes necessitate an introspective review of why legally trapped, native populations seemingly did not expand at rates comparable to reintroduced populations. This outcome suggests that trapping native populations of river otters, even if sustainable at local levels may, have diminished natural expansion by some of these populations. A better understanding of the dynamics of sustainable trapping in relation to natural expansion of river otter populations is in need of additional research attention. Expansion of river otter populations is undoubtedly associated with the combination of better trapping regulations, downward trends in the number of trappers, and periods of lower fur prices, which further diminishes levels of trapping intensity. Understanding the interaction between trapping and expansion of populations will be particularly important in areas where there is relatively high levels of river otter trapping (and the trapping of species that often result in the unintended capture of river otter, e.g., American beavers) or if there is a general increase in number of trappers and intensity of trapping pressure. However, particularly lacking is an integrated approach that can be applied overtime and conservation jurisdictions to meaningful assess population trends.

Monitoring - Formalized monitoring is important for examining expansions and contractions of river otter populations in relation to various management schemes (e.g., reintroductions and trapping) or environmental conditions (e.g., presumed habitat quality). Science-based trapping management is based on the premise that wildlife populations can be harvested sustainably. To ensure that this criterion is met, some level of monitoring to understand changes in the size, age and gender structure, as well as the distribution of trapped populations is necessary. The Appendix II listing of the river otter by CITES mandates the tagging of all river otter pelts intended for export outside of the U.S. and Canada (USFWS 2014). Records kept as part of the pelt tagging process ensure that wildlife agencies in jurisdictions where river otter are legally trapped will document the number of individuals harvested annually. Most conservation jurisdictions do not have population estimates for river otter populations. Instead, trapping data where river otters are legally trapped or accidental captures of otters (where otters are protected, but caught in traps intended for legally trapped species) is often used to assess population trends (e.g., Chilelli et al. 1996). Unfortunately, in contrast to the grid-based monitoring protocol followed for the Eurasian otter (*Lutra lutra*) in portions of Europe , no standardized landscape-level approaches are in place to serve as a basis for meaningful landscape-level assessments to levels of population declines or recoveries of the North American river otter – past of present. Erb et al. (2019) provided rationale to justify adequacy of current techniques used to monitor river otter populations in North America, and presented a map depicting the extensive, range-wide recovery of river otters. However, this depiction does not portray the overall paucity of uniform and consistently applied approaches for monitoring river otter populations at various scales and among conservation jurisdictions. The map presented by Erb et al. (2019) highly overestimates the actual occurrence of river otter in the landscape by not portraying the species in relation to the availability and abundance of suitable aquatic habitats, and serves to demonstrate the inadequacy of current approaches to monitor river otter populations (see Hubbard and Serfass [2005] for an example of limitations in depicting the distribution of river otters at various landscape scales, and as an example of the standardized, large-scale, and integrative approach used to monitor population Eurasian otters). Development of formal monitoring techniques, standardized (and thus comparable) across conservation jurisdictions and regimes (e.g., trapped versus non-trapped populations), should be regarded as a priority for assessing and mitigating long-term threats to river otter populations.

Limited research on native populations - Understandably, a large portion of research with river otters over the last 40 years has focused on evaluating aspects of reintroduced populations. However, comparable focus on native populations has lagged, with the notable exception of basic information derived largely from examination of carcasses obtained in areas where river otters are trapped, including carcass tagging associated with CITES requirements associated with the river otter's Appendix II listing. Basic natural history information is lacking for river otters inhabiting coastal environments, particularly along the Atlantic coast of North America, and northern portions of Canada.

Sub-optimal habitat use and oil spills. Water pollution and other degradation of aquatic and riparian habitats may limit distribution of otters and pose long-term threats if enforcement of water quality standards is not maintained and enforced. Acid drainage from coal mines is a persistent source of water pollution in some areas that eliminates prey base for otters and thereby inhibits recolonization or expansion of otter populations. Expansion of reintroduced and, in some cases, native river otter populations has resulted in the species now sometimes inhabiting areas formerly considered sub-optional habitats (i.e., areas with degraded water quality and riparian conditions). Consequently, there is potential for the paradigm to develop that river otters are tolerant of perturbations to aquatic environments, in lieu of long-term supporting evidence. Current optimism about river otters being able to tolerate a wider range of aquatic habitat disturbances may be misleading and unfounded in that such disturbed areas could represent sink habitats, where populations are sustained by dispersing individuals and not through adequate levels of reproduction and survival by individuals occupying the area. Assessments of source-sink dynamics is needed for river otter populations inhabiting aquatic system with

various types and levels of pollutants, and riparian perturbations. The threat of oil spills to river otters has been well studied and documented in Alaska Oil spills (e.g., Bower et al. 2003). Additional research is needed to clearly delineate the impact of possible threats to populations that various forms of water pollution, agricultural and other development along riparian habitats, industrial and housing development in coastal areas, cumulative impacts related to loss or alterations of wetlands, large flood control structures, and interactions that these and other factors have on otter populations.

River otter-human conflicts - The reintroduction of river otters in many states has in some cases been negatively depicted in the media because of the species' predatory (i.e., fish eating) habits. The successful reintroduction of river otters in the states of Missouri, Ohio, Kentucky, and Illinois was followed by strikingly similar patterns of negative media messages suggesting that river otter predation was having widespread negative impacts on commercially-reared fish and game fish important to anglers (Serfass *et al.* 2014). Management actions, including opening trapping seasons, subsequently were implemented in these states purportedly to alleviate the public concern and animosity portrayed in the media about river otters. Wildlife agencies responsible for managing trapping of river otters in some cases appear to have been complicit in fostering negative portrayals about river otter predation to gain public support for trapping seasons. Such negative portrayals have the potential to contribute long-term deleterious consequences regarding public attitudes towards river otters, thereby liming the value of this species in serving as a flagship to promote conservation of aquatic ecosystem (Stevens et al. 2011). In contrast, the Eurasian otter has been used extensively and successfully as a flagship to promote clean-water initiatives in Europe.

River otter genetics - River otters from Louisiana have most commonly been used as a source for reintroduction projects in the US—about 64% of river otters reintroduced in the US were obtained from this state. Serfass *et al.* (1998) and Brandt *et al.* (2014) discussed genetic implications for river otter reintroductions in North America. Ultimately, how genetic introgression associated with expansion of reintroduced populations will influence the genetic structure and subspecies delineations of river otter populations in North America is unknown and should be the focus of future investigations as a basis for developing strategies to that best ensure maintenance of the species' historic levels of genetic variability.

Disease - Diseases in wild otter populations is poorly understood and has received relatively little study (Serfass *et al.* 1995). *Lontra canadensis* may be affected by canine distemper (Harris 1968, Park 1971), rabies (Serfass *et al.* 1995), respiratory tract disease, and urinary infection (Hoover *et al.* 1984, Route and Peterson 1991). In addition, North American Otters can contract jaundice, hepatitis, feline panleucopenia, and pneumonia (Harris 1968). North American Otters host numerous endoparasites such as nematodes (Hoberg *et al.* 1997), cestodes (Greer 1955), trematodes (Hoover *et al.* 1984), the sporozoan *Isopora* (Hoover *et al.* 1984), and acanthocephalans (Hoberg *et al.* 1997, Hoover *et al.* 1984). Ectoparasites include ticks (Eley 1977, Serfass *et al.* 1992), sucking lice *Latagophthirus rauschi* (Kim and Emerson 1974), and the flea *Oropsylla arctomys* (Serfass *et al.* 1992).

Threats Classification Scheme

No past, ongoing, or future threats exist to this species. False. (Trapping river otters for fur is regulated, but population-level effects need better monitoring. The influence of water quality and riparian disturbance need better evaluation based on categories of pollutants and disturbances.)

The threats to this species are unknown. False

Threat	Timing	Timing score	Scope	Severity	Impact Score	Impact category
1.1. Residential & commercial development -> Housing & urban areas	Ongoing	3	2	2	7	Medium
Stresses:	1. Ecosystem stresses-> 1.1. Ecosystem conversion 1. Ecosystem stresses-> 1.2. Ecosystem degradation 1. Ecosystem stresses-> 1.3. Indirect ecosystem effects					
1.2. Residential & commercial development -> Commercial & industrial areas	Ongoing	3	2	2	7	Medium
Stresses:	1. Ecosystem stresses-> 1.1. Ecosystem conversion 1. Ecosystem stresses-> 1.2. Ecosystem degradation 1. Ecosystem stresses-> 1.3. Indirect ecosystem effects					
2.1.2. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Small-holder farming	Ongoing	3	1	2	6	Medium
Stresses:	1. Ecosystem stresses-> 1.1. Ecosystem conversion 1. Ecosystem stresses-> 1.2. Ecosystem degradation 1. Ecosystem stresses-> 1.3. Indirect ecosystem effects					
2.1.3. Agriculture & aquaculture -> Annual & perennial non-timber crops -> Agro-industry farming	Ongoing	3	2	2	7	Medium
Stresses:	1. Ecosystem stresses-> 1.1. Ecosystem conversion 1. Ecosystem stresses-> 1.2. Ecosystem degradation 1. Ecosystem stresses-> 1.3. Indirect ecosystem effects					
2.3.2. Agriculture & aquaculture -> Livestock farming & ranching -> Small-holder grazing, ranching or farming	Ongoing	3	1	2	6	Medium
Stresses:	1. Ecosystem stresses-> 1.1. Ecosystem conversion 1. Ecosystem stresses-> 1.2. Ecosystem degradation 1. Ecosystem stresses-> 1.3. Indirect ecosystem effects					
2.3.3. Agriculture & aquaculture -> Livestock farming & ranching -> Agro-industry grazing, ranching or farming	Ongoing	3	2	2	7	Medium
Stresses:	1. Ecosystem stresses-> 1.1. Ecosystem conversion 1. Ecosystem stresses-> 1.2. Ecosystem degradation 1. Ecosystem stresses-> 1.3. Indirect ecosystem effects					
2.4.3. Agriculture & aquaculture -> Marine & freshwater aquaculture -> Scale Unknown/ Unrecorded	Ongoing	3	1	2	6	Medium
Stresses:	1. Ecosystem stresses-> 1.2. Ecosystem degradation 1. Ecosystem stresses-> 1.3. Indirect ecosystem effects					
3.2. Energy production & mining -> Mining & quarrying	Ongoing	3	1	1	5	Low
Stresses:	1. Ecosystem stresses-> 1.1. Ecosystem conversion 1. Ecosystem stresses-> 1.2. Ecosystem degradation 1. Ecosystem stresses-> 1.3. Indirect ecosystem effects					
5.1.1. Biological resource use -> Hunting & trapping terrestrial animals -> 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					

5.1.2. Biological resource use -> Hunting & trapping terrestrial animals -> Unintentional effects (species is not the target)	Ongoing	3	2	2	7	Medium
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					
7.2.11. Natural system modifications -> Dams & water management/use -> Dams (size unknown)	Ongoing	3	2	2	7	Medium
Stresses:	1. Ecosystem stresses-> 1.1. Ecosystem conversion 1. Ecosystem stresses-> 1.2. Ecosystem degradation 1. Ecosystem stresses-> 1.3. Indirect ecosystem effects					
9.1.1. Pollution -> Domestic & urban waste water -> Sewage	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					
9.2.1. Pollution -> Industrial & military effluents -> Oil spills	Ongoing	3	1	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					
9.3.2. Pollution -> Agricultural & forestry effluents -> Soil erosion, sedimentation	Ongoing	3	2	2	7	Medium
Stresses:	1. Ecosystem stresses-> 1.2. Ecosystem degradation 1. Ecosystem stresses-> 1.3. Indirect ecosystem effects					
11. Climate change and sever weather -> Temperature extremes	Future	1	2	2	5	Low
Stresses:	1. Ecosystem stresses-> 1.2. Ecosystem degradation 1. Ecosystem stresses-> 1.3. Indirect ecosystem effects					

Conservation

The North American river otter is included in CITES Appendix II. This listing is in place to assure that the ongoing legal trade does not contribute to illegal trade of similar species of otters with a higher level of conservation concern (i.e., what is referred to as “look-alike” species, which could be illegally integrated with the legal trade of species with a similar appearance. See USFWS, 2014). Although trapped for fur, the overall trade in the fur of North American river otter generally should be regarded as sustainable. Considering that the river otters had experienced substantial declines caused by unregulated fur harvest in the 1800s and degradation of aquatic habitats through the mid-1900s, the current status of the species should be regarded as a substantial conservation success story. These declines were particularly severe in the USA, where, by 1980, populations were considered completely extirpated from 11 states and endangered in 9 others (Bricker *et al.* In press). However, populations have since expanded to occupy at least portions of the river otter’s historic range in all USA states and Canadian Provinces, except Prince Edwards Island (where there is recent evidence that some individuals may be pioneering the Province). The overall increase in the distribution and abundance of river otters was facilitated by a combination of reintroduction projects implemented in 22 states, improvements in aquatic habitat quality, and the natural expansion of native populations range (Bricker *et al.* In press). The conservation status of river otter populations in North America has improved considerably through progressive conservation efforts, including implementation of clean water regulations (e.g., the federal Clean Water Act; EPA undated).

Camp (2017) provides a comprehensive literature review for the North American river otter, which will be extremely useful in developing conservation planning and developing conservatinorelated research projects.

Conservation Actions In- Place

Action Recovery Plan	Note
Yes, most reintroduction efforts have concluded.	-

Systematic monitoring scheme	Note
Yes, mostly based on annual trapping records.	-

Conservation sites identified	Note
Yes, wildlife agencies in USA states and Canadian provinces and territories are responsible for general monitoring among the respective jurisdiction. No site specific, long-term conservation sites ae identified.	

Occur in at least one PA	Note
Yes	-

Percentage of population protected by PAs (0-100): NA

Area based regional management plan	Note
Yes, these are based on the respective wildlife agencies in USA states and Canadian provinces and territories.	-

Invasive species control or prevention: NA

Harvest management plan	Note
Yes, the river otter is classified as a furbearer and legally trapped is management authority believes the activity can be conducted at sustainable levels through regulation.	-

Successfully reintroduced or introduced benignly	Note
Yes, river otters have been reintroduced in 22 states.	-

Subject to ex-situ conservation	Note
Yes, river otters are commonly used in zoo exhibits and are popular among zoo visitors. Many zoos use river otters as a focus for educational activities associated with aquatic conservation.	-

Subject to recent education and awareness programmes	Note
Yes, but on a small scale, except for zoos.	-

Included in international legislation	Note
Yes	CITES Appendix II

Subject to any international management/trade controls	Note
Yes	CITES Appendix II

Important Conservation Actions Needed

Conservation Actions	Note
3.2. Species management -> Species recovery	-Reintroduction project have been completed
4.1. Education & awareness -> Formal education	-
4.3. Education & awareness -> Awareness & communications	-

Research Needed

Research	Note
1.1. Research -> Taxonomy/range-wide genetics assessment	-
1.2. Research -> Population size, distribution & trends	-
1.5. Research -> Threats	-

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