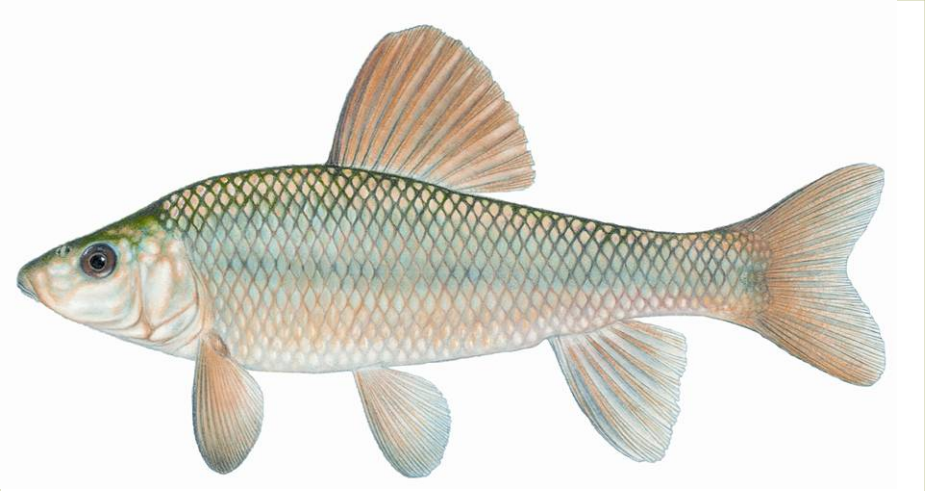
Species at Risk Act
Recovery Strategy Series

Recovery Strategy for the Lake Chubsucker (*Erimyzon sucetta*) in Canada

Lake Chubsucker



June 2010

Fisheries and Oceans Canada
Pêches et Océans Canada

Canada

About the *Species at Risk Act* Recovery Strategy Series

What is the *Species at Risk Act* (SARA)?

SARA is the Act developed by the federal government as a key contribution to the common national effort to protect and conserve species at risk in Canada. SARA came into force in 2003 and one of its purposes is *"to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity."*

What is recovery?

In the context of species at risk conservation, **recovery** is the process by which the decline of an endangered, threatened, or extirpated species is arrested or reversed and threats are removed or reduced to improve the likelihood of the species' persistence in the wild. A species will be considered **recovered** when its long-term persistence in the wild has been secured.

What is a recovery strategy?

A recovery strategy is a planning document that identifies what needs to be done to arrest or reverse the decline of a species. It sets goals and objectives and identifies the main areas of activities to be undertaken. Detailed planning is done at the action plan stage.

Recovery strategy development is a commitment of all provinces and territories and of three federal agencies — Environment Canada, Parks Canada Agency, and Fisheries and Oceans Canada — under the Accord for the Protection of Species at Risk. Sections 37–46 of SARA (http://www.sararegistry.gc.ca/approach/act/default_e.cfm) outline both the required content and process for developing recovery strategies published in this series.

Depending on the status of the species and when it was assessed, a recovery strategy has to be developed within one to two years after the species is added to the List of Wildlife Species at Risk. Three to four years is allowed for those species that were automatically listed when SARA came into force.

What's next?

In most cases, one or more action plans will be developed to define and guide implementation of the recovery strategy. Nevertheless, directions set in the recovery strategy are sufficient to begin involving communities, land users, and conservationists in recovery implementation. Cost-effective measures to prevent the reduction or loss of the species should not be postponed for lack of full scientific certainty.

The series

This series presents the recovery strategies prepared or adopted by the federal government under SARA. New documents will be added regularly as species get listed and as strategies are updated.

To learn more

To learn more about the *Species at Risk Act* and recovery initiatives, please consult the SARA Public Registry (http://www.sararegistry.gc.ca/)

Recovery Strategy for the Lake Chubsucker (*Erimyzon sucetta*) in Canada

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Additional copies:

Additional copies can be downloaded from the SARA Public Registry (http://www.sararegistry.gc.ca/)

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PREFACE

A proposed recovery strategy for this species was posted on the SARA Public Registry in September 2007, but did not include the identification of critical habitat; the current document includes critical habitat identification to the extent possible based on the best available information.

The Lake Chubsucker is a freshwater fish and is under the responsibility of the federal government. The Minister of Fisheries and Oceans is a "competent minister" for aquatic species under the *Species at Risk Act* (SARA). Since Lake Chubsucker is located in the Point Pelee National Park of Canada administered by the Parks Canada Agency (Parks Canada), the Minister of the Environment is also a "competent minister" under SARA. SARA, Section 37, requires the competent minister to prepare recovery strategies for listed extirpated, endangered and threatened species. The Lake Chubsucker was listed as Threatened under SARA in June 2003. The development of this recovery strategy was led by Fisheries and Oceans Canada – Central and Arctic Region in cooperation and consultation with many individuals, organizations and government agencies, as indicated below. The strategy meets SARA requirements in terms of content and process (Sections 39-41). It was developed in cooperation or consultation with (see Appendix 2 for full record of consultations), as appropriate:

- Jurisdictions - Province of Ontario, Environment Canada (CWS), Parks Canada Agency;
- Environmental non-government groups – Essex Region Conservation Authority, Trent University, Niagara Peninsula Conservation Authority, Ausable Bayfield Conservation Authority, Old Ausable Channel Management Committee.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Fisheries and Oceans Canada and Parks Canada or any other party alone. This strategy provides advice to jurisdictions and organizations that may be involved or wish to become involved in the recovery of the species. In the spirit of the National Accord for the Protection of Species at Risk, the Minister of Fisheries and Oceans and the Minister of Environment invite all responsible jurisdictions and Canadians to join Fisheries and Oceans Canada and Parks Canada in supporting and implementing this strategy for the benefit of the Lake Chubsucker and Canadian society as a whole. Fisheries and Oceans Canada and Parks Canada will support implementation of this strategy to the extent possible, given available resources and their responsibility for conservation of aquatic species at risk.

The goals, objectives and recovery approaches identified in the strategy are based on the best existing knowledge and are subject to modifications resulting from new information. The competent ministers will report on progress within five years.

This strategy will be complemented by one or more action plans that will provide details on specific recovery measures to be taken to support conservation of the species. The competent ministers will take steps to ensure that, to the extent possible, Canadians interested in or affected by these measures will be consulted.

RESPONSIBLE JURISDICTIONS

Under the *Species at Risk Act*, Fisheries and Oceans Canada is the responsible jurisdiction for the Lake Chubsucker. The Parks Canada Agency has jurisdiction for the individuals located within Point Pelee National Park of Canada. The province of Ontario and Environment Canada (Canadian Wildlife Service) also cooperated in the production of this recovery strategy.

AUTHORS

This document was prepared by Shawn K. Staton, Kara L. Vlasman and Amy L. Edwards on behalf of the Ontario Freshwater Fish Recovery Team.

ACKNOWLEDGMENTS

The Ontario Freshwater Fish Recovery Team would like to thank the following organizations for their support in the development of the Lake Chubsucker recovery strategy: Fisheries and Oceans Canada, Ontario Ministry of Natural Resources, Environment Canada, Essex Region Conservation Authority, Trent University, Niagara Peninsula Conservation Authority, Old Ausable Channel Management Committee, Ausable Bayfield Conservation Authority, Parks Canada Agency and the Niagara Parks Commission. Mapping was produced by Carolyn Bakelaar (GIS Analyst, DFO) and Josh Keitel (GIS/Data Management Specialist, Parks Canada Agency – Point Pelee National Park).

STRATEGIC ENVIRONMENTAL ASSESSMENT STATEMENT

In accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*, the purpose of a Strategic Environmental Assessment (SEA) is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally-sound decision making.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts on non-target species or habitats.

This recovery strategy will benefit the environment by promoting the recovery of the Lake Chubsucker. The potential for the strategy to inadvertently lead to adverse effects on other species was considered. In cases where critical habitats of multiple species occur, an ecosystem approach to the management of habitat is required to maximize benefit to co-occurring species at risk (of all taxa, including fishes, birds, reptiles, etc). Such an approach recognizes that negative impacts to some species and their habitats may result from habitat management practices aimed at achieving an overall net benefit to the ecosystem and the species at risk that it supports. The SEA concluded that such an ecosystem approach in the implementation of this strategy will benefit the environment overall and will minimize any adverse effects. Refer to the following sections of the document in particular: Description of the Species' Habitat and Biological Needs, Ecological Role, and Limiting Factors; Effects on Other Species; Recommended Approaches to Meet Recovery Objectives; and, Critical Habitat.

RESIDENCE

SARA defines residence as: "*a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of*

their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating" [SARA S2(1)].

Residence descriptions, or the rationale for why the residence concept does not apply to a given species, are posted on the SARA public registry:
http://www.sararegistry.gc.ca/sar/recovery/residence_e.cfm

EXECUTIVE SUMMARY

The Lake Chubsucker is declining throughout most of its range across Canada and the United States. The Canadian range of this species is restricted to southwestern Ontario in the Ausable River drainage, Lake St. Clair, Thames River drainage, coastal wetlands of Lake Erie and several tributaries of Big Creek and the Niagara River.

The Lake Chubsucker is a small (less than 254 mm in total length), robust, deep-bodied member of the sucker family, Catostomidae. Across its North American range, the Lake Chubsucker typically inhabits clear, well-vegetated, slow-moving or still waters with substrates of gravel, sand, silt and organic debris. Ontario specimens are usually captured in heavily vegetated, stagnant bays, channels, ponds and swamps. Suitable habitats are thought to be decreasing in size and quality, predominantly due to agriculture-induced siltation and wetland drainage.

The Lake Chubsucker is considered a Threatened species under the federal *Species at Risk Act* (SARA). As such, the Act requires that a recovery strategy be developed to identify approaches required to arrest or reverse the species' decline. Fisheries and Oceans Canada and Parks Canada Agency, in cooperation with the government of Ontario and Environment Canada, have developed a recovery strategy to facilitate the protection and recovery of this species.

The long-term recovery goal (>20 years) is to maintain current populations of the Lake Chubsucker and restore viable populations to formerly occupied wetland habitats. The following short/medium-term recovery objectives will be addressed over a 5 – 10 year period to assist with meeting the long-term goal:

i. Refine population and distribution objectives;
ii. Ensure adequate protection of critical habitat;
iii. Determine long-term population and habitat trends;
iv. Identify threats, evaluate their relative impacts, and implement remedial actions to reduce their effects, where feasible;
v. Determine the feasibility of repatriations for populations that may be extirpated or reduced;
vi. Enhance efficiency of recovery efforts through coordination of recovery efforts with aquatic and terrestrial ecosystem recovery teams and other relevant or complementary groups/initiatives; and,
vii. Improve overall awareness of the Lake Chubsucker and the role of healthy aquatic ecosystems, and their importance to humans.

The recovery team has identified several approaches necessary to ensure that recovery objectives for the Lake Chubsucker are met. These approaches have been organized into three categories; urgent actions are summarized below:

Research and Monitoring:

- Conduct targeted background surveys at historical sites as well as other areas of suitable habitat.
- Conduct targeted surveys of existing populations to determine range, abundance, and population demographics.
- Develop and implement a population and habitat monitoring program to assess changes in population and habitat characteristics.
- Determine seasonal habitat needs of all life-stages of the species.

Management and Coordination:

- Share knowledge with relevant ecosystem recovery teams and work cooperatively to implement recovery actions.
- Encourage municipalities to protect habitats that are important to the Lake Chubsucker. Ensure planning and management agencies are aware of habitats that are important to the Lake Chubsucker.

Stewardship, Outreach and Awareness:

- Promote stewardship among owners of land abutting habitats of the Lake Chubsucker. Ensure they are aware of opportunities for financial assistance.
- Work with landowners to implement best management practices. Encourage the completion and implementation of Environmental Farm and Nutrient Management plans.

Using available data, critical habitat has been partially identified for extant Lake Chubsucker populations in the Old Ausable Channel, L Lake, St. Clair National Wildlife Area (NWA; St. Clair Unit), Point Pelee National Park, Rondeau Bay, Long Point Bay (including Long Point NWA and Long Point Provincial Park), Big Creek NWA and Lyons Creek. A schedule of studies has been developed that outlines necessary steps to further refine these critical habitat descriptions.

A dual approach to recovery implementation will be taken which combines an ecosystem-based approach complemented by a single-species focus. This will be accomplished through coordinated efforts with relevant multi-institutional ecosystem-based recovery teams (Ausable River, Thames River, Essex-Erie and Walpole Island) and their associated Recovery Implementation Groups. The recovery strategy will be supported by one or more action plans that will be developed within five years of the final strategy being posted on the SARA registry. The success of recovery actions in meeting recovery objectives will be evaluated through the performance measures provided. The entire recovery strategy will be reported on every five years to evaluate progress and to incorporate new information.

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1. BACKGROUND

1.1 Species Assessment Information from COSEWIC

Common Name: Lake Chubsucker (Lacepède, 1803)
Scientific Name: *Erimyzon sucetta*
Current COSEWIC Status & Year of Designation: Endangered, 2008
Canadian Occurrence: Ontario
Reason for Designation: A species with a restricted geographic Canadian range with small extant populations having very specific and narrow habitat preferences, which are under continued stress. It is extremely susceptible to habitat change driven by urban, industrial and agricultural practices resulting in increased turbidity. Two populations have been lost, and of the 11 extant populations, 3 are in serious decline as a result of the continuing and increasing threats posed by agricultural, industrial and urban development that are expected to impact the remaining populations of Lakes Erie and St. Clair.
Status History: Designated Special Concern in April 1994. Status re-examined and designated Threatened in November 2001. Status re-examined and designated Endangered in November 2008. Last assessment based on an update status report.

1.2 Description

The following description has been adapted from COSEWIC 2008. The Lake Chubsucker (*Erimyzon sucetta* Lacepède, 1803) is a robust, slightly compressed, deep-bodied member of the sucker family, Catostomidae (Figure 1). It has a wide head, blunt snout, a small protruding downward directed mouth, and a moderately deep, arched, back. The fish's dorsal surface is deep olive to greenish-bronze. The underside is green-yellow to yellow-white. Scales on the back and upper sides are dark-edged, creating a crosshatched pattern. The lateral stripe, if present, is either continuous (often striking in juveniles) or broken into lateral blotches or bands. A lateral line is lacking. The dorsal fin has a short base without a rounded or pointed anterior lobe and has fewer than 20 rays, distinguishing this genus from *Carpiodes*, *Cycleptus* and *Ictiobus*. In Canada, it is typically less than 254 mm in total length (TL), but has been reported to reach lengths and weights up to 292 mm TL and 397 g, respectively (Coker *et al.* 2001). Individuals tend to be smaller in Canada than in their southern range.

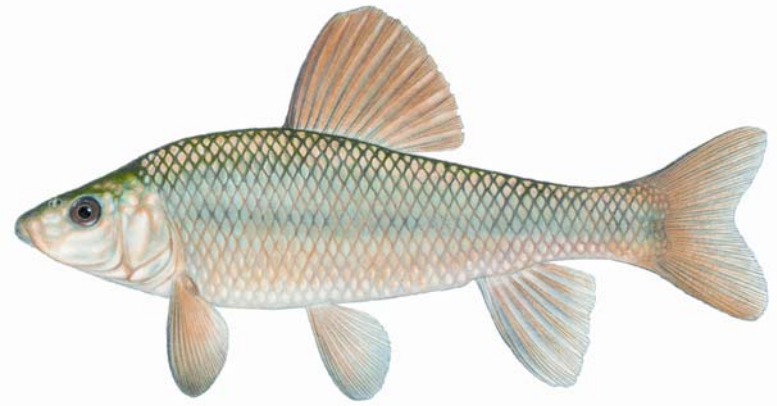

Figure 1. The Lake Chubsucker (*Erimyzon sucetta*). © Joseph R. Tomelleri.

1.3 Populations and Distribution

Global Population and Distribution: The global range of the Lake Chubsucker is restricted to North America where it has a fragmented, disjunct distribution from the lower coastal plain, extending from Texas to Virginia, to a northern element in the southern Great Lakes drainages (Figure 2). It occurs in one province and 22 states (introduced to Nebraska). The species is considered globally secure but is imperilled in Ontario (S2) and considered extirpated in Iowa, Pennsylvania and possibly New York (NatureServe 2008) (Table 1). Less than 5% of the species' global range currently occurs in Canada.

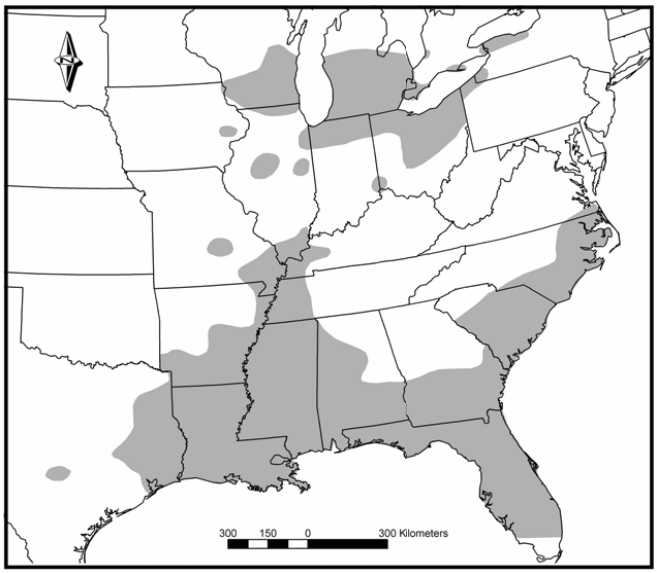

Figure 2. Global distribution of the Lake Chubsucker. Modified from Page and Burr (1991). (Source: COSEWIC 2008).

Table 1. Global, national, and sub-national ranks for the Lake Chubsucker.

Rank	Jurisdiction Rank
Global (G)	**G5** (Aug. 17, 2001)
National (N) Canada United States	 **N2** **N5**
Sub-National (S) Canada United States	 Ontario (**S2**) Alabama (**S5**), Arkansas (**S2?**), Florida (**SNR**), Georgia (**S5**), Illinois (**S2S3**), Indiana (**S3**), Iowa (**SX**), Kentucky (**S2**), Louisiana (**S5**), Michigan (**S4**), Mississippi (**S5**), Missouri (**S2**), Nebraska (**SNA**), New York (**SH**), North Carolina (**S3**), North Dakota (**SNR**), Ohio (**S2**), Oklahoma (**S3**), Pennsylvania (**SX**), South Carolina (**SNR**), Tennessee (**S3S4**), Texas (**S3**), Virginia (**S2**), Wisconsin (**S3**)

Source: NatureServe (2008). Refer to Appendix 1 for definition of status rankings.

Canadian Population and Distribution: In Canada, the Lake Chubsucker is only known to occur in southwestern Ontario (Figure 3). It has been found in the Ausable River drainage (Old Ausable Channel [OAC], L Lake), Lake St. Clair (Mitchell's Bay, St. Clair National Wildlife Area

[NWA] and Walpole Island), Thames River drainage (Jeanette's Creek), Lake Erie (Point Pelee National Park, Rondeau Bay, Long Point Bay [including Long Point Provincial Park and Long Point NWA – from this point forward, the phrase Long Point Bay includes reference to both the provincial park and the NWA] and Big Creek NWA) and several tributaries of Big Creek (Silverthorn Creek, Lynedock Creek, Trout Creek and Stoney Creek) and the Niagara River (Tea Creek and Lyons Creek). Since Tea Creek is a tributary of Lyons Creek, these occurrences may have been part of the same population. All populations should be considered nationally significant due to the species' restriction to southwestern Ontario. Canadian collections have not been made in a standardized manner, nor have there been specific studies on population size, making it difficult to assess population sizes and trends; however, the paucity of records suggests low abundance.

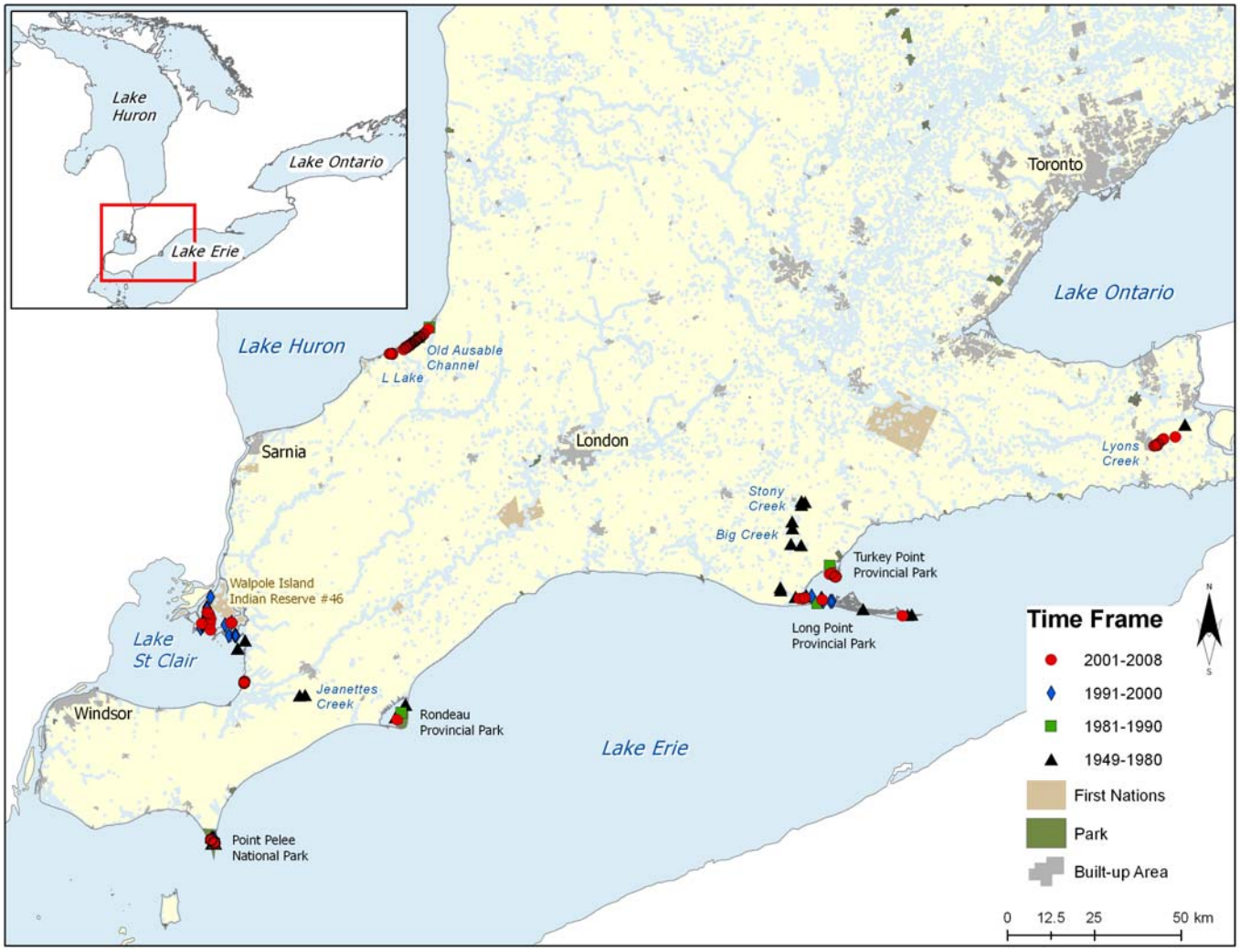

Figure 3. Canadian distribution of the Lake Chubsucker.

Ausable River drainage (OAC and L Lake):

The Lake Chubsucker is believed to have inhabited the lower Ausable River prior to its diversion in the late 1800s (ARRT 2006); however, habitat degradation as a result of this diversion has

resulted in the species being confined to the closed system of the OAC. The population in the OAC was only detected in 1982, despite earlier sampling events. Since 1982, the species has been caught in 1997, 2001, 2002, 2004 and 2005 (COSEWIC 2008). Size ranges (21-154 mm TL) of specimens collected from 2002-2005 suggest that natural reproduction is occurring (N.E. Mandrak unpubl. data) and the population is thought to have remained in stable condition since its discovery in 1982 (ARRT 2006). In 2007, the Lake Chubsucker was detected for the first time in L Lake, an oxbow lake in the vicinity of the OAC; 29 specimens, ranging from 51-260 mm TL, were recorded from six sites throughout the lake.

Lake Erie (Point Pelee National Park, Rondeau Bay, Long Point Bay, Big Creek NWA):

Point Pelee National Park: The population in Point Pelee National Park is thought to be stable (EERT 2008). The Lake Chubsucker was first recorded in Canada at Point Pelee National Park in 1949, but has only been caught in nine of 26 different years during which fish surveys have taken place (first fish surveys of the Park began in 1940) (V. M^{c}Kay, Point Pelee National Park, pers. comm. 2008). This could be attributed to the gear type used during surveys or the habitat characteristics of the ponds in the Park (i.e., soft organic substrates, dense aquatic vegetation and water depths typically exceeding 1 m) that make effective sampling difficult (COSEWIC 2008). The most recent records of Lake Chubsucker in Point Pelee National Park are from 2002-2003 when extensive sampling of over 300 sites using a variety of methods produced 25 individuals at 22 sites (Surette 2006). Specimens ranged in size from 46-247 mm TL, suggesting that natural reproduction is occurring (COSEWIC 2008).

Long Point Bay: In Long Point Bay, the species was first recorded in 1985 (Leslie and Timmins 1997); prior to this, the bay was sampled in 13 different years since 1928 (COSEWIC 2008). In 2004, one Lake Chubsucker (95 mm TL) was detected at one of 30 sites in the Inner Bay during a boat electrofishing survey (N.E. Mandrak, unpubl. data). The species has been recorded from Turkey Point in 1985 and 2007 (109-231 mm TL) (Royal Ontario Museum [ROM] unpubl. data, Fisheries and Oceans Canada [DFO] unpubl. data) and from the mouth of Big Creek in 1955. The ponds located along the spit that forms the southern boundary of Long Point Bay may be a separate location from the bay proper; the degree to which they are connected to the bay is not clear. The Lake Chubsucker was first collected in the ponds in 1975 and was not recorded again until 2005 when DFO captured a single specimen (132 mm TL) in Otter Ridge Pond (located within the Long Point Unit of Long Point NWA) at the tip of the spit (DFO unpubl. data).

Big Creek NWA: The diked marshes in Big Creek NWA are separate from Big Creek proper as movement between these populations is prevented by the dikes. In 2003 and 2004, sampling was conducted within the diked marshes using boat electrofishing and fine-mesh hoopnetting (COSEWIC 2008) and no specimens were detected. However, sampling in 2005 yielded 13 Lake Chubsucker ranging in size from 70-148 mm TL (N.E. Mandrak unpubl. data).

Rondeau Bay: The Lake Chubsucker was first reported from Rondeau Bay in 1955 and was subsequently recorded in 1963 and 1983 (COSEWIC 2008). The species was not recorded again until 2005, when a single individual was found despite considerable search effort in 2004 and 2005 using seine nets, fine-mesh hoopnets and electrofishing (T. Macdougall, Ontario Ministry of Natural Resources [OMNR] pers. comm. 2006). Before the first record of the species in 1955, Rondeau Bay had been sampled during 14 different years since 1921 (COSEWIC 2008).

Big Creek Tributaries:

Between 1960 and 1979 the Lake Chubsucker was recorded from several tributaries of Big Creek but was never captured at the same site twice. It has not been recorded from this location since 1979 (COSEWIC 2008); however, there as been limited re-sampling at these sites.

Lake St. Clair/Walpole Island:

Within Lake St. Clair proper, the species was last captured in 2001 when a single specimen was captured from the mouth of the Chematogen Channel at Walpole Island and six specimens were captured from the Johnston Channel. In 1999, two specimens were caught south of the Johnston Channel and five specimens were caught along the north shore of Johnston Bay (ROM unpubl. data). Multiple records exist for the species in the diked marshes and channels of Walpole Island; the most recent record is from 2001. Further surveys are required to verify the status of the population in Mitchell's Bay.

St. Clair NWA:

The Lake Chubsucker was detected for the first time in the St. Clair unit of the St. Clair NWA in 2004 when six specimens (66-255 mm TL) were captured within the western half of the diked marsh. Further surveys are required to determine population status in this location.

Thames River drainage:

Lake Chubsucker were caught in Jeanette's Creek, a tributary of the Thames River, in 1963 and 1965. Despite re-sampling, no additional specimens have been detected at this location. The site currently forms part of an agricultural drain and is channelized and very turbid (COSEWIC 2008).

Niagara River drainage (Tea Creek and Lyons Creek):

The Lake Chubsucker has not been recorded from Tea Creek since it was first detected in 1958 (COSEWIC 2008). Recent detailed fish biomass surveys which were undertaken in Tea Creek from 2003 to 2005 yielded no catches of this species (A. Yagi, OMNR, pers. comm. 2006); however, in 2005 the species was detected for the first time along a 1.8 km stretch of Lyons Creek, where clear water is maintained by overflow of the Welland Canal (Marson *et al.* 2007, COSEWIC 2008). Twenty-four sites were sampled and five specimens ranging from 28-68 mm TL were captured (N.E. Mandrak unpubl. data). In 2008, 28 specimens (63-209 mm TL) were captured from six sites, several of which overlapped with the 2005 sites, along a ~9 km stretch of the creek (OMNR unpubl. data).

1.4 Needs of the Lake Chubsucker

1.4.1 Habitat and biological needs

Spawn to Hatch: Lake Chubsucker move into marshes to spawn, although they are thought to have limited dispersal ability. Therefore, suitable spawning sites must be in close proximity to available habitat. In the Great Lakes area, spawning sites may include shallow waters of bays, lower reaches of tributaries, ponds and marshes where eggs are scattered over beds of aquatic vegetation, dead grass or filamentous algae (Goodyear *et al.* 1982). In Ontario, spawning likely occurs between late April and June, when water temperatures are approximately 20°C (COSEWIC 2008). Mature adult females (age 3 yr +) lay from 3000 to 20 000 eggs (Becker 1983) on aquatic vegetation. Nursery habitat for this species occurs over silt, sand or clay within the first two metres of vegetated water (Lane *et al.* 1996b).

Young of the Year: Young-of-the-year (YOY) Lake Chubsucker prefer shallow (0 – 2 m) habitats containing heavy aquatic vegetation and substrates of silt, sand and clay (Goodyear *et al.* 1982, Becker 1983, Lane *et al.* 1996b). Leslie and Timmins (1997) provide habitat descriptions of this species' early life-history based on collections from Inner Long Point Bay, Lake Erie. Age 0+ specimens were found inhabiting a vegetated drainage ditch with water temperatures of 24 – 28°C. Specimens on Walpole Island, in Lake St. Clair, were found in approximately 10 cm of water under a layer of leaves in a roadside ditch intermittently connected to the St. Clair River in early January.

Juvenile (age 1 until sexual maturity [2 – 3 yrs]): In Canada, age 1+ specimens in Long Point Bay were found in marshes associated with hairgrass (*Eleocharis* sp.), sedges (*Carex* sp.) and cattails (*Typha* sp.) (Leslie and Timmins 1997). Nothing further is known regarding the habitat requirements of juvenile Lake Chubsucker; however, relationships can be inferred by examining other life-stages. Habitat requirements of YOY and adults are very similar (i.e., shallow [≤ 2 m] calm areas with abundant aquatic macrophytes and substrates of sand, silt, gravel and organic debris); therefore, it is probable that the habitat requirements of juvenile Lake Chubsucker are comparable.

Adult: In Ontario, adult Lake Chubsucker are found in clear, well-vegetated, slow-moving or still waters, with substrates of gravel, clay, sand and silt mixed with organic debris, such as those provided by backwaters, bayous, drainage ditches, floodplain lakes, marshes, oxbows, sloughs and wetlands (COSEWIC 2008). Preferred depth is 0 – 2 m (Lane *et al.* 1996a). Within Lake St. Clair and Lake Erie, coastal wetlands are particularly significant for this species (EERT 2008). Barriers between coastal wetlands adjacent to Lake Erie appear to maintain the species' preferred clear, well-vegetated habitat. The Lake Chubsucker is a warmwater species, with a preferred temperature range of 28 – 34°C (Coker *et al.* 2001). It is an omnivorous bottom feeder, feeding primarily on plankton, small crustaceans, mussels, aquatic insects, filamentous algae and other plant material.

1.4.2 Ecological role

The significance of this species' role in the ecosystem is not known due to its rarity; however, because of its specific habitat requirements (clear, slow-moving, heavily-vegetated waters), declining populations are indicative of deteriorating ecosystem conditions. In Ontario, the species is often associated with the Blackchin Shiner (*Notropis heterodon*), Blacknose Shiner (*N. heterolepis*) and Pugnose Shiner (*N. anogenus*) – species which prefer similar habitats (COSEWIC 2008). In Niagara area wetland streams, the species most commonly associated with such habitats include Grass Pickerel(*Esox americanus vermiculatus*), Golden Shiner (*Notemigonus crysoleucas*), Brown Bullhead (*Ameiurus nebulosus*) and Central Mudminnow (*Umbra limi*) (A. Yagi, pers. comm. 2006). The Lake Chubsucker has been identified as an ideal forage fish for bass (*Micropterus* spp.) (Carlander 1969; cited *in* COSEWIC 2008), but it is unlikely to be prominent in bass diets due to its general rarity.

1.4.3 Limiting factors

The Lake Chubsucker is limited in its distribution in Canada by cooler water temperatures in the northern portion of its range and the species is at its northern range limit in Canada. This species has very specific habitat requirements and is intolerant of turbidity and highly silted waters (COSEWIC 2008). The Lake Chubsucker appears to have limited dispersal ability (Leslie and Timmins 1997) which may prevent the re-establishment of extirpated populations.

1.5 Threats

1.5.1 Threat classification

Threats thought to be affecting the Lake Chubsucker are listed in Table 2. Ten unique threats were ranked based on their relative impact, spatial extent and expected severity.

Table 2. Threat classification table for the Lake Chubsucker.

Threat	Relative Impact	Spatial Extent	Evaluation of Threat
A Wetland Habitat Loss	Predominant	Widespread	Probable
B Siltation & Turbidity	Predominant	Widespread	Probable
C Nutrient Loading	Predominant	Widespread	Probable
D Channelization/Altered Water Flow	Contributing	Local	Speculative
E Exotic Species	Contributing	Widespread	Speculative
F Climate Change	Contributing	Widespread	Speculative
G Incidental Harvest (Commercial and Bait Fisheries)	Contributing	Local	Speculative
H Changes to Trophic Dynamics	Contributing	Local	Speculative
I Barriers to Movement	Contributing	Local	Speculative

1.5.2 Description of threats

The Lake Chubsucker is subject to a broad array of threats across its range. Threats to this species include siltation, increased turbidity, nutrient loading, and loss of its preferred wetland habitat (clear, still, well-vegetated waters) through habitat alteration, channelization, wetland drainage, pollution, changes to rates of flow, and possibly exotic species and climate change. In southwestern Ontario, the leading causes of habitat loss for this species appear to be the draining of wetlands, as well as siltation and nutrient loading due to agricultural practices. Unless further drainage and siltation of habitat is prevented, population declines will continue to occur (COSEWIC 2008). Remaining populations of the Lake Chubsucker are found predominantly in coastal wetlands where barriers (i.e., dikes and dams) between wetlands and the adjacent waters appear to maintain suitable habitat (but may also prevent movement). In such cases, the benefit to existing populations (in the OAC, St. Clair NWA, Big Creek NWA) created by these barriers and their management/operation appears to outweigh potential negative impacts. Exotic species such as Common Carp (*Cyprinus carpio*) and common reed grass (*Phragmites australis*) may pose a threat to some populations through alteration of wetland habitats. However, the establishment of the exotic Zebra Mussel (*Dreissena polymorpha*) may have improved habitat conditions in some areas through increased water clarity. Incidental harvest in commercial and bait fisheries may represent an additional threat but requires further investigation. Aquatic vegetation removal/control has been identified as a threat to the species in the United States (COSEWIC 2008); however, this is not currently considered to be a threat to populations in Canada.

Climate change is expected to have significant effects on aquatic communities of the Great Lakes basin in the coming decades. In a recent assessment of the projected impacts of climate change on coastal wetland fish communities in the lower Great Lakes, Doka *et al.* (2006) predicted several fish species at risk as most vulnerable; their results showed that the Lake Chubsucker ranked 4th highest in final vulnerability scores of 99 fish species that use lacustrine habitats. In this study, vulnerabilities were based on an assessment of climate change risk associated with coastal wetland and thermal preferences for different life-stages as well as species distributions.

The following summarizes information on threats to extant and extirpated populations. An overview is provided in Table 3.

Threats to Extant Populations:

Ausable River: Within the Ausable River watershed, the OAC population is believed to be stable and is protected from influxes of suspended solids in the Ausable River by a dam; therefore, siltation is not currently a serious threat to this population. Although much of the OAC habitat receives protection due to its presence in Pinery Provincial Park, the ecosystem is vulnerable to exotic, introduced species. The potential use of live baitfish in this habitat may present a real risk of introducing exotic species to the otherwise essentially closed system. Common Carp presently occur at low densities here, but represent a potential threat to the Lake Chubsucker if their numbers increase (ARRT 2006). The destructive feeding behaviour of Common Carp, involving the uprooting of aquatic vegetation and associated elevation of turbidity levels, can cause deterioration of wetland habitat. Development activities occurring outside Pinery Provincial Park in close proximity to the OAC may be exerting negative pressures on the system (e.g., siltation, nutrient loading) (ARRT 2006). Changes to trophic dynamics may also be a concern for this population. Recent shifts in the aquatic community have resulted in an increased prevalence of larger predatory centrarchids and the appearance of Northern Pike (*Esox lucius*) in the OAC (ARRT 2006).

L Lake: Threats to the population in L Lake are currently unknown as this population was only recently discovered.

Lake St. Clair, St. Clair NWA: Habitat loss through shoreline development in Lake St. Clair is a potential threat to the population occupying the east shore of Lake St. Clair. Potential threats to the population in St. Clair unit of the St. Clair NWA are unknown at this time.

Lake Erie (Rondeau Bay, Long Point Bay, Point Pelee National Park, Big Creek NWA): The main threats to the Lake Chubsucker in the coastal wetlands of Lake Erie are thought to be siltation, turbidity and, to a lesser extent, wetland loss (for Rondeau Bay and Long Point Bay only). Additional and related threats include nutrient loadings, exotic species (e.g., common reed grass) and alterations to shoreline processes (EERT 2008). The exotic common reed grass is becoming more prevalent within the coastal wetlands of Lake Erie, and may constitute a serious threat to the species in the future. Although aquatic vegetation removal/control is identified as a threat for other species within Rondeau Bay, such as the Spotted Gar (Staton *et al.* 2010), it is currently not believed to be a threat to the Lake Chubsucker population at this location. The population is located entirely within Rondeau Provincial Park where aquatic vegetation removal/control is limited to common reed grass (these control measures are not currently occurring within the area occupied by the Lake Chubsucker).

Lyons Creek (Niagara River drainage): The Lake Chubsucker presently occurs along a ~11 km stretch of clear water maintained by the clean overflow water of the Welland Canal (COSEWIC 2008). The remainder of the creek is now highly degraded and siltation may remain an immediate threat to this population. In addition, PCB contamination within Lyons Creek has been an ongoing concern with site remediation plans in the early stages (I. Barret, Niagara Peninsula Conservation Authority [NPCA], pers. comm. 2007).

Threats to Historically Occupied Habitats:

Jeanette's Creek (Thames River drainage): The main threats thought to be associated with this population's possible extirpation are increased siltation and turbidity from agriculture, industry and urbanization (TRRT 2005).

Upper tributaries of Big Creek (Long Point Region): Many Big Creek tributaries have been channelized and converted to agricultural drains; in the case of one of them, Silverthorn Creek, the drain has been tiled and buried (COSEWIC 2008). Current threats to possible remaining populations are not known at this time.

Tea Creek (Niagara River drainage): This population/subpopulation is now likely extirpated as a result of habitat degradation, primarily resulting from agriculture-induced siltation and turbidity (COSEWIC 2008). The historically occupied reaches of Tea Creek are now separated from extant populations in Lyons Creek by large distances of very poor habitat. Tea Creek now has a fairly entrenched channel and is classified as a municipal drain (I. Barret, pers. comm. 2007).

Table 3. Predominant threats to Lake Chubsucker populations in Ontario.

System	Distribution	Population Trends	Predominant Threats
Ausable River	Old Ausable Channel	Stable	Changes in trophic dynamics, exotic species, nutrients?
	L Lake	Extant	Unknown
Thames River	Jeanette's Creek	Extirpated	Habitat loss, sediment loading and turbidity, channelization/ altered water flow.
Lake St. Clair	Walpole Island	Extant	Unknown
	Mitchell's Bay	Extirpated?	Habitat Loss (Shoreline development)
	St. Clair NWA	Extant	Unknown
Lake Erie	Long Point Bay	Declining?	Habitat loss and siltation
	Big Creek NWA	Stable?	Unknown
	Point Pelee National Park	Stable	Nutrient loading and siltation
	Rondeau Bay	Declining?	Habitat loss, nutrient loading, siltation and exotic species
	Big Creek tributaries (Long Point region)	Extirpated?	Unknown
Niagara River	Tea Creek	Extirpated	Habitat loss, sediment loading and turbidity
	Lyons Creek	Declining	Habitat loss, sediment loading and turbidity

1.6 Actions Already Completed or Underway

Ecosystem Recovery Strategies: The following aquatic ecosystem-based recovery strategies address several Lake Chubsucker populations and are currently being implemented by their respective recovery teams. Each recovery team is co-chaired by DFO and a Conservation Authority and receives support from a diverse partnership of agencies and individuals. Recovery activities implemented by these teams include active stewardship and outreach/awareness programs to reduce identified threats; for further details on specific actions currently underway, please refer to the approaches identified in Table 7. Funding for these

actions is supported by the government of Canada's Habitat Stewardship Program (HSP) for Species at Risk.

Ausable River Ecosystem (OAC population): The long-term goal of this strategy is "to sustain a healthy native aquatic community in the Ausable River through an ecosystem approach that focuses on the recovery of species at risk" (ARRT 2006). The Ausable River recovery team has facilitated the development of a management plan for the OAC and contributed to the identification of critical habitat within the OAC.

Essex-Erie Region Fishes (Point Pelee National Park, Rondeau Bay, Long Point Bay, Big Creek NWA and Big Creek tributary populations): The long-term goal of this strategy is "to maintain and restore ecosystem quality and function in the Essex-Erie region to support viable populations of fish species at risk, across their current and former range" (EERT 2008). The Essex-Erie region is located on the north shore of Lake Erie, bordered to the east by the Grand River watershed, to the west by the Detroit River and to the north by Lake St. Clair and the Thames River watershed.

Thames River Ecosystem (Jeanettes Creek historical population): The long-term goal of this strategy is "to use an ecosystem approach to stabilize and improve species at risk populations within the Thames River ecosystem and to reduce or eliminate threats to these species and their associated habitats, so that their long-term viability in the watershed is ensured" (TRRT 2005).

Walpole Island Ecosystem Recovery Strategy: The Walpole Island ecosystem recovery team was established in 2001 to develop an ecosystem-based recovery strategy for the area containing the St. Clair delta, the largest freshwater delta in the world (Bowles 2005). This recovery strategy includes several fishes at risk, including the Lake Chubsucker. The recovery goal of the Walpole Island ecosystem recovery strategy is "to conserve and recover the ecosystems of the Walpole Island Territory in a way that is compliant with the Walpole Island First Nation Environmental Philosophy Statement, provides opportunities for cultural and economic development and provides protection and recovery for Canada's species at risk" (Bowles 2005).

Awareness – Incidental Harvest: A colour brochure of fish species at risk (including the Lake Chubsucker) was distributed to baitfish harvesters in 2006 to raise general awareness and help prevent incidental harvest through this means.

Recent Surveys: The following table summarizes recent fish surveys conducted by various agencies within areas of known occurrence of the Lake Chubsucker.

Table 4. Summary of recent fish surveys in areas of Lake Chubsucker occurrence (adapted from EERT 2008 and COSEWIC 2008).

Waterbody/ General Area	Survey Description (years of survey effort)
OAC (Ausable River)	• DFO targeted sampling 2002, 2004[a,c,d,e] • Complementary habitat surveys also conducted by DFO
Essex region	• Essex Region Conservation Authority [ERCA] sampling of inland watercourses (2000-2001)[c], targeted sampling (2004)[c], surveys of drains and inland watercourses (2004)[c]
Lake Erie	• OMNR coastal wetlands along Lake Erie (2004-2005)[c]
Point Pelee National Park	• Fish species composition study (Surette 2006), University of Guelph, DFO and Point Pelee National Park (2002-2003)[a, b, d, e]
Rondeau Bay	• DFO targeted sampling in 2002[d] • OMNR and DFO (2004-2005)[a, e]
St. Clair NWA	• DFO sampling (2003, 2004)[d, e]
Walpole Island (Lake St. Clair)	• ROM (1999-02)[a, d]
Mitchell's Bay (Lake St. Clair)	• DFO/University of Guelph sampling (2003, 2004)[d, e]
Long Point Bay, Big Creek NWA	• OMNR Index Surveys of Long Point Bay (annually)[b] • DFO targeted sampling in 2004, 2005 (including diked marshes)[a ,d , e]
Lyons Creek	• DFO targeted sampling 2004 along the entire creek [a, c, d, e]

Gear type: a – seine; b – trawl; c – backpack electrofishing unit; d – boat electrofishing unit; e – additional gear (trap nets, hoop nets, Windermere traps).

1.7 Knowledge Gaps

Very little is known about the life-history or biology of this species. There is a specific need to examine any physiological or environmental tolerances that the Lake Chubsucker may have. Threat clarification is required, as well as determination of significant contributors to extirpation where populations have been lost (Jeanette's Creek and Tea Creek). Additional sampling is required to determine the full extent of the Lake Chubsucker's distribution across all Ontario populations, except in the OAC where the distribution extent is relatively well known. Sampling efforts are sometimes hampered by the lack of adequate sampling methods for small, highly vegetated ponds with soft organic substrates and water depths greater than 1 m (COSEWIC 2008). The impacts of introduced fishes (e.g., Common Carp, Northern Pike, centrarchids) and other exotic species (e.g., common reed grass) on the Lake Chubsucker and its habitat require further investigation.

2. RECOVERY

The following goals, objectives and recovery approaches were adapted from the Essex-Erie recovery strategy (EERT 2008) which covers a substantial portion of the Canadian range of the Lake Chubsucker. Additional considerations were included from the Ausable River recovery strategy (ARRT 2006) and Thames River recovery strategy (TRRT 2005).

2.1 Recovery Feasibility

The recovery of the Lake Chubsucker is considered to be both biologically and technically feasible. The following feasibility criteria[1] have been met for the species:

1. *Are individuals capable of reproduction currently available to improve the population growth or population abundance?*
   Yes. Reproducing populations currently exist within the Canadian range of the species (e.g., OAC, Point Pelee National Park and Long Point Bay).

2. *Is sufficient habitat available to support the species or could it be made available through habitat management or restoration?*
   Yes. Suitable habitat is present at several locations with extant populations. At locations with extirpated or declining populations, suitable habitat may be made available through restoration actions.

3. *Can significant threats to the species or its habitats be avoided or mitigated through recovery actions?*
   Yes. Significant threats such as sedimentation, increased levels of turbidity and loss of wetland habitat can be mitigated through established restoration methods.

4. *Do the necessary recovery techniques exist and are they demonstrated to be effective?*
   Yes. Techniques to reduce identified threats (e.g., Best Management Practices [BMPs] to reduce sedimentation) and restore wetland habitats are well known and proven to be effective.

The effort expended to achieve recovery will not be uniform across all populations. Locations with extirpated populations (Jeanettes Creek and Tea Creek) may require substantial effort to improve habitat as well as repatriations. In such cases, the recovery team endorses a repatriation approach as outlined below (modified from EERT 2008).

Repatriation Approach

Repatriation efforts to re-establish viable populations of the Lake Chubsucker need to consider the following:

i. Prior to developing repatriation plans, it is necessary to confirm through intensive sampling that they are no longer present.
ii. The success of repatriations will depend on an understanding of the species' habitat needs and on a sufficient quantity of suitable habitat being available at the repatriation site. Surveys need to be undertaken to characterize current habitat conditions and identify appropriate actions to improve degraded habitats. If habitat requirements are poorly understood, then studies of habitat use will need to be undertaken.
iii. Repatriations should not be considered until the factors for extirpation are understood and addressed.
iv. Source populations to support repatriations need to be identified. Ideally, source populations possess a high level of genetic diversity and genetic composition developed under similar historic conditions as the repatriation site. Where possible, source populations within the same watershed are preferred.

[1] Draft Policy on the Feasibility of Recovery, Species at Risk Act Policy. January 2005.

v. Removal of individuals from source populations should not negatively affect the status of these populations.
vi. The preferred method of repatriation (e.g., adult transfer versus captive-reared) needs to be determined. If captive-rearing is the preferred option, propagation and rearing methods and an appropriate rearing facility will need to be identified.
vii. To successfully establish self-sustaining populations and preserve the genetic composition, the number of individuals to be repatriated, appropriate life-stages and the frequency and duration of supplemental stockings needs to be determined.
viii. Monitoring is required to ensure that newly established populations are viable, that the stocking rate is appropriate and habitat conditions remain suitable.
ix. All proposed repatriations associated with this strategy will involve the preparation of a repatriation plan that will address the logistic and ecological aspects discussed above, as well as stakeholder issues.
x. Repatriations should follow the American Fisheries Society Guidelines for Introductions of Threatened and Endangered Fishes. Available at: http://www.fs.fed.us/rm/boise/publications/BTWorkshop/Williams%20et%20al.%201988.pdf

2.2 Recovery Goal

The long-term recovery goal (>20 years) is to maintain current populations of the Lake Chubsucker and restore viable populations to formerly occupied wetland habitats.

2.3 Population and Distribution Objective(s)

Over the next five year period, the population and distribution objective is to maintain current distributions and densities of known extant populations in the OAC, L Lake, Lake St. Clair (Walpole Island and St. Clair NWA), Lake Erie (Point Pelee National Park, Rondeau Bay, Long Point Bay, Big Creek NWA) and the upper Niagara River (Lyons Creek). More quantifiable objectives relating to individual populations are not possible at this time, but will be developed once the necessary sampling and studies have been completed. Such knowledge gaps will be addressed by recovery actions given 'urgent' priority included in the recovery planning approaches.

2.4 Recovery Objectives

In support of the long-term goal, the following short/medium-term recovery objectives will be addressed over a 5 – 10 year period:

i. Refine population and distribution objectives;
ii. Ensure adequate protection of critical habitat;
iii. Determine long-term population and habitat trends;
iv. Identify threats, evaluate their relative impacts, and implement remedial actions to reduce their effects, where feasible;
v. Determine the feasibility of repatriation for populations that may be extirpated or reduced;
vi. Enhance efficiency of recovery efforts through coordination with aquatic and terrestrial ecosystem recovery teams and other relevant or complementary groups/initiatives; and,
vii. Improve overall awareness of the Lake Chubsucker and the role of healthy aquatic ecosystems, and their importance to humans.

2.5 Approaches Recommended to Meet Recovery Objectives

2.5.1 Recovery planning

The overall approaches recommended to meet the recovery objectives have been organized into three categories represented by the following tables: Research and Monitoring; Management and Coordination; and, Stewardship, Outreach and Awareness. Each table presents specific steps with a ranking of priority (urgent, necessary, beneficial), a link to the recovery objectives, a listing of the broad approach, a description of the threat addressed, and suggested outcomes or deliverables to measure progress. A narrative following each table is included when further explanation of specific approaches is warranted. Implementation of the following approaches will be accomplished in coordination with relevant ecosystem-based recovery teams and associated implementation groups.

Table 5. Recovery planning table – research and monitoring.

Priority	Objective Addressed	Threats Addressed	Broad Strategy to Address Threats	Recommended Approaches to Meet Recovery Objectives	Outcomes or Deliverables (Identify Measurable Targets)
URGENT	i, vi	All	1. Background Surveys (historic occurrences)	Conduct targeted surveys of preferred habitats in tributaries of Big Creek (Long Point region), Jeanettes Creek and Tea Creek to determine the status of these populations.	Will determine the presence/absence of populations at these locations.
URGENT	i, vi	All	2. Background Surveys (extant occurrences)	Complete targeted surveys of extant populations.	Will determine health, range, abundance, and population demographics and contribute to the identification of critical habitat.
URGENT	i, vi	All	3. Background Surveys (potential new occurrences)	Conduct targeted surveys for undetected populations in high probability areas with suitable habitat. Areas to target would include tributaries of the upper Niagara River.	May detect new occurrences of Lake Chubsucker.
URGENT	iii	All	4. Monitoring-Populations and Habitat	Develop and implement a standardized index population and habitat monitoring program with a specific sampling and training protocol.	Will enable assessments of changes in range, abundance, key demographic characters and changes in habitat features, extent and health.

Table 5 (Con't). Recovery planning table – research and monitoring.

Priority	Objective Addressed	Threats Addressed	Broad Strategy to Address Threats	Recommended Approaches to Meeting Recovery Objectives	Outcomes or Deliverables (Identify Measurable Targets)
URGENT	ii	All	5. Research - Habitat Requirements	Determine the seasonal habitat needs of all life-stages of the Lake Chubsucker.	Will allow for the refinement of critical habitat for Lake Chubsucker. Will assist with the development of a habitat model.
NECESSARY	iv	Exotic Species	6. Threat Evaluation – Exotic Species	Evaluate the impacts of exotic species (including Common Carp and exotic plant species) on the Lake Chubsucker and its habitat.	Will help determine the severity of threat posed by exotic species in preferred wetland habitats and will inform the development of management actions to mitigate the potential threat.
NECESSARY	iv	All	7. Threat Evaluation	Investigate and evaluate the significance of threat factors that may be impacting extant populations. Take steps to mitigate immediate threats identified (See Table 7)	Will determine the severity of specific threats to individual populations and will direct stewardship activities to alleviate their impacts.
BENEFICIAL	iv	Exotic Species	8. Exotics - Monitoring	Monitor Lake Chubsucker watersheds for exotics of concern in cooperation with aquatic ecosystem recovery teams.	Will monitor the advancement/establishment of exotic species and provide early opportunities to mitigate this threat.
NECESSARY	ii, iv	Channelization/ Altered Water Flow; Barriers to Movement	9. Research - Controlled Water Levels and Wetland Dynamics	Investigate impacts of regulated water levels (i.e., diked wetlands) vs. natural wetlands (undiked or with natural barriers) on habitat conditions for Lake Chubsucker. Investigate the degree to which populations within diked wetlands are connected to adjacent waters.	Will determine the impact of controlled water levels and barriers on the species and its habitat. Will assist with restoring/maintaining ecological processes.

Table 5 (Con't). Recovery planning table – research and monitoring.

Priority	Objective Addressed	Threats Addressed	Broad Strategy to Address Threats	Recommended Approaches to Meeting Recovery Objectives	Outcomes or Deliverables (Identify Measurable Targets)
NECESSARY	i, iv, vi	Sediment Loading and Turbidity	10. Water Quality Monitoring	Measure sediment and nutrient loads emitted from streams.	Will determine priority areas for restoration/stewardship.

1-3. Background Surveys: Focused efforts are required to determine the current distribution of the Lake Chubsucker at extant and historic locations, as well as to detect new populations in high probability locations. This survey work will be facilitated through a coordinated effort amongst the ecosystem recovery teams responsible for the species. Concerted effort should be directed to historical occurrences within the tributaries of Big Creek, Rondeau Bay and nearshore areas in Long Point Bay and Niagara River tributaries (Lyons/Tea Creek). Additional suitable habitats may be located within old oxbows of the lower Ausable River in the vicinity of L Lake and the OAC, as well as tributaries of the upper Niagara River. Sampling methods should be standardized at all sampling sites and include a relevant assessment of habitat features. Previous work within the OAC suggests that boat seining and boat electro-fishing methods worked best for capturing the Lake Chubsucker in such habitats (DFO unpubl. data).

4. Monitoring Populations and Habitat: The monitoring program should be designed to allow for:
• Quantitative tracking of changes in population abundance and demographics.
• Analyses of habitat use and availability and changes in these parameters over time.
• The ability to detect the presence of exotic species such as Common Carp.

The fish monitoring protocol that is developed should have regard for the methodologies used in background survey work (see above) and provide guidance on time of sampling and the types of biological samples that should be collected (e.g., fin rays, length, weight).

8. Exotics – Monitoring: Common Carp densities in the OAC are currently low. Density and abundance of this exotic requires monitoring to ensure this threat level is not elevated (ARRT 2006). Carp captured during monitoring initiatives should be removed from the waterbody. The possible pathway of carp (and other exotics) entering the upper OAC through back flow conditions due to spring ice damming should be investigated.

Table 6. Recovery planning table – management and coordination.

Priority	Objective Addressed	Threats Addressed	Broad Strategy to Address Threats	Recommended Approaches to Meet Recovery Objectives	Outcomes or Deliverables Identify Measurable Targets)
URGENT	vi	All	1. Coordination with Other Recovery Teams and Relevant Agencies	Work with relevant ecosystem- and single-species based recovery teams and other groups to share knowledge, implement recovery actions and to obtain incidental sightings.	Will combine efficiencies, resources, ensure information dissemination, help prioritize most urgent actions across the species' range, and allow for a coordinated approach to recovery.
URGENT	vi, vii	Wetland Habitat Loss	2. Municipal Planning/Habitat Management – Involvement	Encourage municipalities to protect habitats that are important to the Lake Chubsucker in their Official Plans and ensure that planning and management agencies are aware of habitats important to the species.	Will assist with the recovery of the Lake Chubsucker and the protection of important Lake Chubsucker habitat from industrial and development activities.
NECESSARY	vi, vii	Sediment Loading and Turbidity; Channelization/ Altered Water Flow	3. Relationship Building – Drainage	Establish good working relationships with drainage supervisors, engineers and contractors to limit the effects of drainage activities on this species.	Will increase the knowledge and understanding of fish habitat needs and may lead to fewer and/or less harmful alterations.
NECESSARY	iv, vi	All	4. Evaluation of Watershed-Scale Stressors	In cooperation with relevant ecosystem recovery teams, evaluate watershed-scale stressors to populations and their habitat.	Will identify multiple stressors that may affect Lake Chubsucker populations.
BENEFICIAL	iv, vi	Exotic Species	5. Exotic Species Management Plan	Development of a management plan that addresses potential risks, impacts, and proposes actions (including feasibility of control) in response to existing exotic species, and to the arrival or establishment of new exotics.	Will ensure a timely response should this threat more fully materialize. Will assist with addressing key threats to this population.

Table 6 (Con't). Recovery planning table – management and coordination.

Priority	Objective Addressed	Threats Addressed	Broad Strategy to Address Threats	Recommended Approaches to Meet Recovery Objectives	Outcomes or Deliverables Identify Measurable Targets)
BENEFICIAL	iv	Exotic Species	6. Prohibitions – Baitfishes	Evaluate the feasibility of prohibitions on the use of live baitfishes within the OAC (outside of the Pinery Provincial Park).	Will help prevent the establishment of exotics in the OAC.

1. Coordination with Other Recovery Teams: Many of the threats facing the Lake Chubsucker are a result of habitat alteration and degradation. Ecosystem-based recovery strategies (Ausable River, Thames River and Essex-Erie region) have incorporated the biological and ecological requirements of this species into relevant watershed-based recovery approaches as well as species-specific approaches. There will be opportunities for these teams to share resources, develop and adopt similar approaches and combine efficiencies through a coordinated approach. The recovery team will coordinate a science-based threat ranking of all Lake Chubsucker populations to provide guidance for the prioritization of approaches to ecosystem teams.

Table 7. Recovery planning table – stewardship, outreach and awareness.

Priority	Objective Addressed	Threats Addressed	Broad Strategy to Address Threats	Recommended Approaches to Meet Recovery Objectives	Outcomes or Deliverables (Identify Measurable Targets)
URGENT	vi	All	1. Collaboration and Information Sharing*	Collaborate with relevant groups, initiatives and recovery teams to address recovery actions of benefit to the Lake Chubsucker.	Will combine efficiencies in addressing common recovery actions, and ensure information is disseminated in a timely, cooperative fashion.
URGENT	iv, vii	Wetland Habitat Loss; Sediment Loading and Turbidity; Nutrient Loading	2. Stewardship and Habitat Initiatives*	Promote stewardship among landowners abutting aquatic habitats of Lake Chubsucker and other local residents.	Will raise community support and awareness of recovery initiatives. Will raise profile of the Lake Chubsucker and improve awareness of opportunities to improve water quality and species habitat.

Table 7 (Con't). Recovery planning table – stewardship, outreach and awareness.

Priority	Objective Addressed	Threats Addressed	Broad Strategy to Address Threats	Recommended Approaches to Meeting Recovery Objectives	Outcomes or Deliverables (Identify Measurable Targets)
URGENT	iv, vii	Wetland Habitat Loss; Sediment Loading and Turbidity; Nutrient Loading	3. Stewardship - Implementation of BMPs*	Work with landowners to implement BMPs in areas that will provide the most benefit. Encourage the completion and implementation of Environmental Farm Management Plans (EFPs) and Nutrient Management Plans (NMPs).	Will minimize threats from soil erosion, stream sedimentation, and nutrient and chemical contamination.
NECESSARY	vii	All	4. Communications Strategy	Develop a communications strategy that identifies partners and target audiences, approaches, information products, educational and outreach opportunities, stewardship resources and specific BMPs that will assist with the recovery of this species.	Will provide a strategic basis for improving public awareness of species at risk and promote ways in which community and public involvement can be most effectively solicited for the recovery of this species.
NECESSARY	vi	All	5. Stewardship – Financial Assistance/ Incentives*	Facilitate access to funding sources for landowner and local community groups engaged in stewardship activities.	Will facilitate the implementation of recovery efforts, BMPs associated with water quality improvements, sediment load reduction, etc.
NECESSARY	vii	All	6. Awareness – Addressing Landowner Concerns	Provide clear communications addressing compensation opportunities and landowner concerns and responsibilities under the *Species at Risk Act* (SARA).	Will address landowner concerns surrounding the Lake Chubsucker and facilitate public interest and involvement in stewardship initiatives.

Table 7 (Con't). Recovery planning table – stewardship, outreach and awareness.

Priority	Objective Addressed	Threats Addressed	Broad Strategy to Address Threats	Recommended Approaches to Meeting Recovery Objectives	Outcomes or Deliverables (Identify Measurable Targets)
BENEFICIAL	vii	Incidental Harvest	7. Awareness – Incidental Harvest	Provide a Lake Chubsucker information package to commercial fishers (including bait fishers). Request avoidance of occupied habitats, and the release and reporting of any Lake Chubsucker captured.	Reduce number of Lake Chubsucker lost to incidental harvest and build upon monitoring efforts of this species.
BENEFICIAL	vii	Exotic Species	8. Exotic Species/Baitfish Introductions	Increase public awareness of the impacts of exotic species on the natural ecosystem and encourage the use of existing exotic species reporting systems. Discourage anglers from emptying the contents of bait buckets in areas where the bait was not captured.	Will reduce the transport and release of exotics (including baitfish) and prevent their establishment in areas of Lake Chubsucker habitat.

** Approaches currently being implemented by one or more ecosystem-based recovery programs.*

2. Stewardship and Habitat Initiatives: Basin-wide efforts to improve the habitat quality of areas currently (and historically) occupied by the Lake Chubsucker will be required at some locations. It will be necessary to engage landowners, local communities and stewardship councils in the issues of Lake Chubsucker recovery, ecosystem and environmental health, clean water protection, nutrient management, BMPs, stewardship projects and associated financial incentive programs. Towards this end, the recovery team will work closely with relevant groups/agencies and the three ecosystem-based recovery teams, all of which have established stewardship programs that will benefit this species.

3. Implementation of BMPs: The implementation of BMPs will be largely facilitated through established stewardship programs. Additional stewardship programs will be directed as necessary to areas outside the boundaries of ecosystem-based programs. To be effective, BMPs should be targeted to address the primary threats affecting currently occupied/critical habitat. BMPs implemented will include those relating to the establishment of riparian buffers; soil conservation; herd management; septic improvements to prevent nutrient run-off; nutrient and manure management; and, tile drainage. Establishing riparian buffers reduces nutrient (nitrogen and phosphorus) and sediment inputs to receiving waters and overland run-off. Restriction of livestock from watercourses leads to reductions in erosion and sediment and nutrient loadings. Nutrient and manure management will reduce nitrogen and phosphorus inputs into adjacent waterbodies, thereby improving water quality. Low-till practices can reduce

soil erosion and improve soil structure while reducing the sediment loads of adjacent watercourses. EFPs prioritize BMP implementation at the level of individual farms and are often a prerequisite for funding programs. For more information on BMPs see: Ministry of Agriculture and Food, Best Management Practices Series: http://www.omafra.gov.on.ca/english/environment/bmp/series.htm.

4. Communications Strategy: The communications strategy will cover various topics, including, but not limited to, those outlined in the specific steps column. Target audiences should include the general public, local public and private landowners, stewardship groups, municipalities, drainage superintendents and industry. Public support and participation will be encouraged through the distribution of various educational materials and the provision of stewardship resources and contacts. The strategy will acknowledge and build upon ongoing work (e.g., the work of the OAC Management Committee, which is currently addressing awareness concerns related to the Lake Chubsucker through various means).

7. Awareness – Incidental Harvest: The Lake Chubsucker is not a legal baitfish in Ontario. It is unlikely this species was ever targeted by the baitfish industry due to its size and rarity. However, in some areas of its range it has been susceptible to incidental catches from commercial seining (Becker 1983). An information package will be developed and distributed with baitfish licenses in areas occupied by the Lake Chubsucker. The information package will include a description and illustration of the species, a map of known areas of occupation, a description of preferred habitats and a reporting form. Bait harvesters will be asked to avoid areas of known occurrence and to report incidental captures.

2.6 Performance Measures

The success of implementing the recommended recovery approaches will be evaluated primarily through routine population (distribution and abundance) and habitat (quality and quantity) surveys and monitoring. During the next five years, quantifiable targets will be established for the Lake Chubsucker. The recovery strategy will be reviewed in five years to evaluate progress made toward short-term and long-term targets, and the current goals and objectives will be reviewed within an adaptive management planning framework with input from relevant ecosystem recovery teams.

Performance measures to evaluate recovery progress in meeting the recovery objectives include:

- Extent of existing populations (including abundance and population demographics) fully determined through background surveys by 2011;
- Completion of activities outlined in the Schedule of Studies for the complete determination of critical habitat within the proposed timelines;
- Degree of protection/restoration achieved for known habitats of the Lake Chubsucker (e.g., number of habitat patches/populations enhanced);
- Long-term population and habitat monitoring program established by 2013;
- Quantification of stewardship effort (i.e., BMPs) implemented through ecosystem-based recovery teams and other relevant or complementary groups/initiatives by (e.g., number of EFPs and NMPs completed; hectares of riparian buffers established; number of livestock restricted from watercourses);
- Number of high priority sites enhanced/protected by stewardship actions; and,
- Documentation of public and agency participation/support for recovery actions identified in the recovery strategy (including in-kind and contributed financial resources).

2.7 Critical Habitat

2.7.1 Identification of the Lake Chubsucker's critical habitat

The identification of critical habitat for Threatened and Endangered species (on Schedule 1) is a requirement of SARA. Once identified, SARA includes provisions to prevent the destruction of the critical habitat of these species. Critical habitat is defined under section 2 of SARA as "the habitat necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species". The identification of critical habitat is best informed by a thorough knowledge of the species' habitat requirements during all life-stages as well as detailed knowledge of the distribution, quantity and quality of habitats across its range. An understanding of the mechanics associated with movements within and between populations and subpopulations, and the distribution of these units is also beneficial. Using the best available information, critical habitat has been partially identified for Lake Chubsucker populations in the OAC, L Lake, St. Clair NWA, Point Pelee National Park, Rondeau Bay, Long Point Bay, Big Creek NWA and Lyons Creek; additional areas of potential critical habitat within the Lake St. Clair/Walpole Island area will be considered in consultation with Walpole Island First Nation. Areas of critical habitat identified at some locations may overlap with critical habitat identified for other co-occurring species at risk (e.g., Spotted Gar in Rondeau Bay, Pugnose Shiner in the OAC).

The areas delineated on the following maps (Figures 4 – 11) represent the extent of critical habitat for the populations mentioned above. Within these areas, critical habitat is defined as the habitats that meet the functional habitat requirements for one or more Lake Chubsucker life-stages. *Note that permanent anthropogenic features that may be present within the areas delineated (e.g., marinas) are specifically excluded.* A summary of the functional habitat requirements for the life-stages of the Lake Chubsucker is presented in Table 8. For more information on functional habitat requirements refer to section 1.4.1 Habitat and biological needs.

Table 8. Functional habitat requirements for all life-stages of the Lake Chubsucker.

Life-Stage	Habitat Requirements
Spawn to Hatch	- shallow water (0 – 2 m) of bays, ponds, marshes, lower reaches of tributaries - abundant submerged aquatic vegetation - spawning occurs from April to June, when water temperatures are approximately 20°C
YOY, Juvenile, Adult	- shallow water (0 – 2 m), calm waters - abundant aquatic vegetation - substrates of sand, silt, clay, organic debris - low turbidity

Critical habitat for these populations was determined using an area of occupancy approach as this was the most appropriate, given the limited information available for the species and the lack of detailed habitat mapping for most of these areas. Where habitat information was available (e.g., Ecological Land Classification [ELC], bathymetry) it was used to inform the delineation of critical habitat. Further detail on the specific methods used to identify critical habitat (such as the use of ELC) is provided in the individual descriptions, when relevant.

Critical Habitat Descriptions:

Old Ausable Channel – Extant populations of Lake Chubsucker are located entirely in the dunes sub-basin within the OAC of the Ausable River watershed. A total of 125 specimens have been recorded since 1982; specimens ranged in length from 21-154 mm TL during surveys in 2002-2005. The species has been detected in all three regions of the channel (North, South and Central) and it is possible that two populations are present (North and Central region; South region), separated by a low-head dam within Pinery Provincial Park. These populations have been sampled extensively, relative to other Canadian Lake Chubsucker populations. Additionally, a detailed spatial analysis linking species occurrence to habitat conditions within a portion of the OAC has been completed by the Ausable River recovery team. Using these data, critical habitat for the Lake Chubsucker has been identified at this time, based on an area of occupancy approach, as the entire OAC from the mouth of the channel at the Ausable River, upstream to its end near Grand Bend (Figure 4).

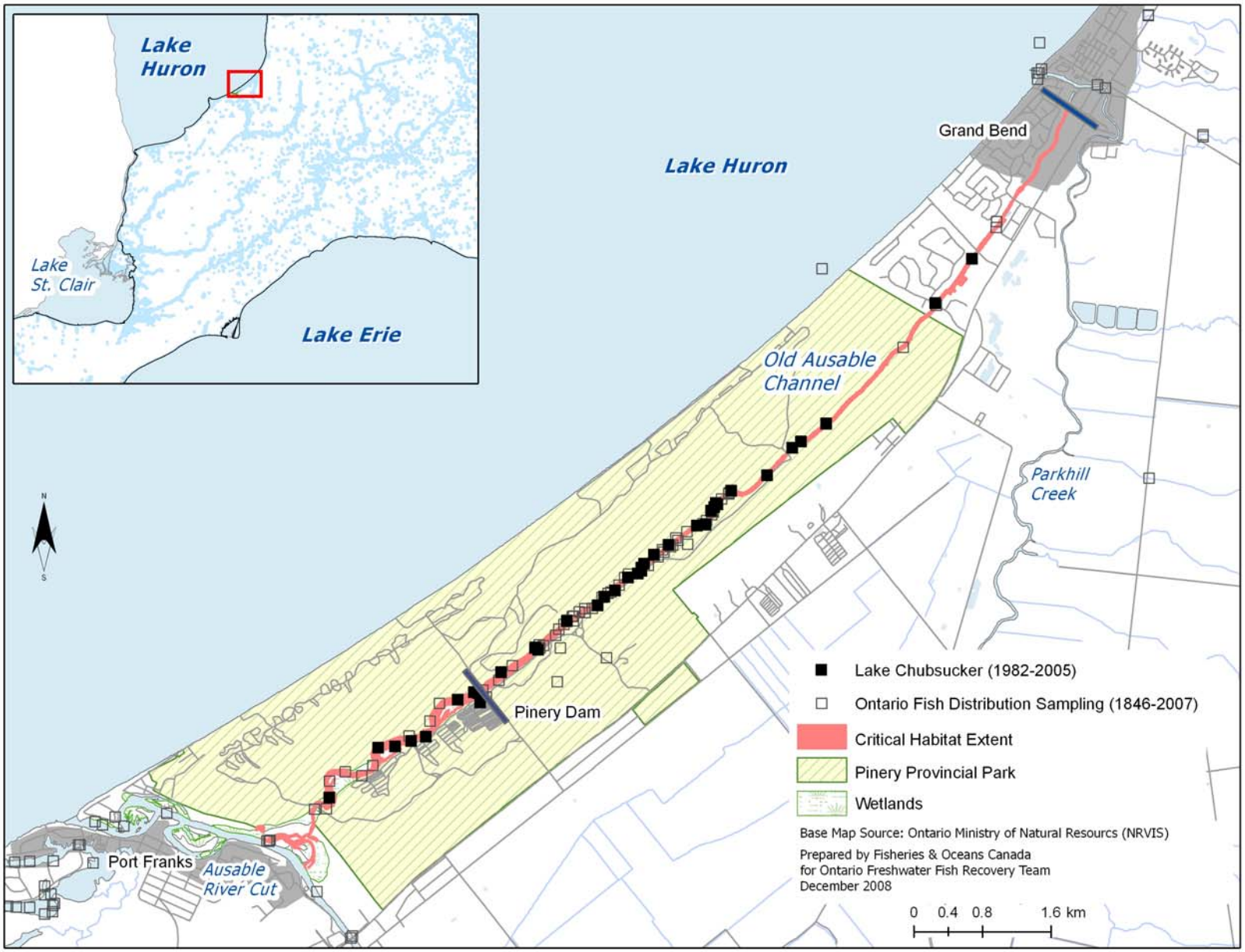

Figure 4. Critical habitat identified for the Lake Chubsucker within the Old Ausable Channel.

L Lake – Lake Chubsucker were recently (2007) detected for the first time in L Lake, an oxbow lake in the vicinity of the OAC. Twenty-nine specimens, ranging in size from 51 mm TL to 260 mm TL, were caught from six sites throughout the lake. Using these sampling data, critical habitat for Lake Chubsucker in L Lake is currently identified, using an area of occupancy approach, as all contiguous waters and wetlands of L Lake (Figure 5). The critical habitat extent includes the northern and western tips of L Lake bisected by Outer Dr., and the wetlands to the north of the lake (seasonally wetted).

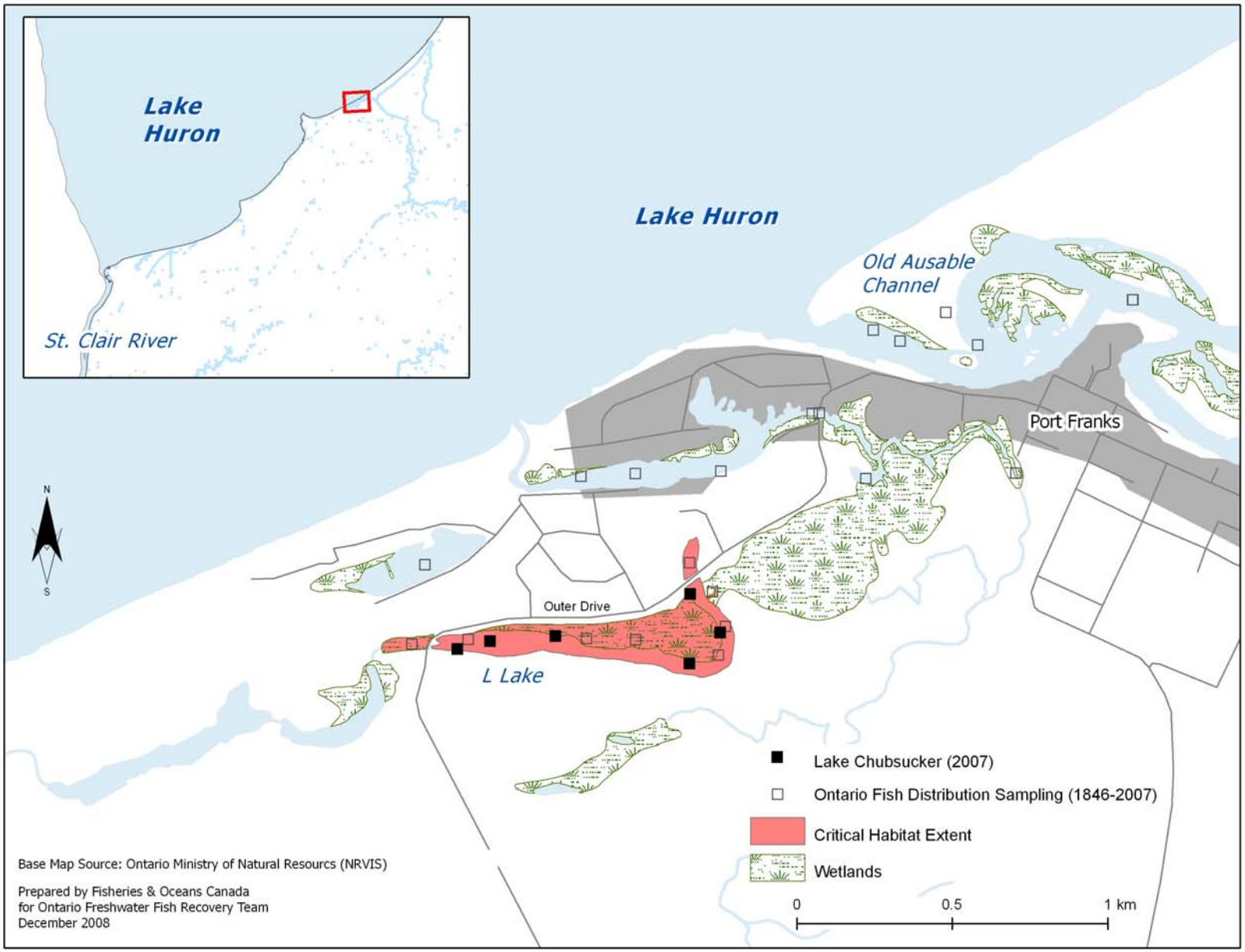

Figure 5. Critical habitat identified for the Lake Chubsucker in L Lake.

St. Clair NWA – The Lake Chubsucker was captured for the first time from the western diked marsh in the St. Clair unit of the St. Clair NWA in 2004; six specimens ranging in length from 66 mm to 255 mm TL were captured. The species was only detected in the western half of the cell; however, there has been very limited sampling in the eastern half of the cell and it is possible that the species is found throughout. ELC was used in the identification of critical habitat to exclude permanently dry areas. ELC looks at the distribution and groupings of plant species and attempts to understand them according to ecosystem patterns and processes. It also helps to establish patterns among vegetation, soils, geology, landform and climate, at different scales. Using the factors relating to geology, soils, physiography and vegetation, ELC can be used to map vegetation communities at varying organizational scales (Lee *et al.* 1998, Lee *et al.* 2001).

Using available sampling data, critical habitat is currently identified, based on an area of occupancy approach, and further refined using ELC classes (Lee *et al*. 1998) to exclude permanently dry areas, as the contiguous waters and wetlands of the entire western diked marsh in the St. Clair unit of the St. Clair NWA (Figure 6).

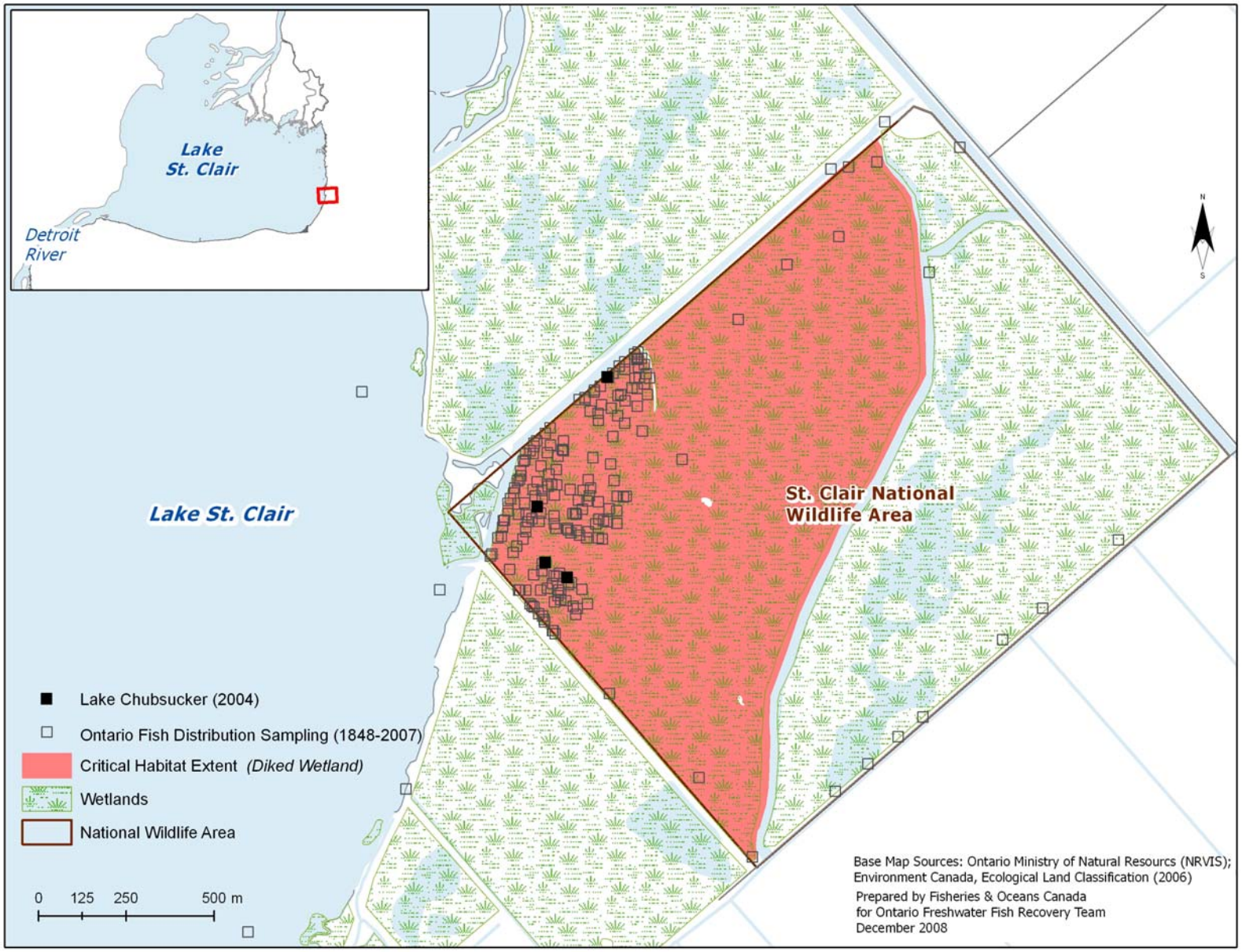

Figure 6. Critical habitat identified for the Lake Chubsucker in the St. Clair unit of the St. Clair NWA.

Point Pelee National Park – While limited sampling has been conducted for most Canadian Lake Chubsucker populations, the ponds within Point Pelee National Park have been rigorously sampled by Surette (2006) over a recent two year period, providing an extensive dataset for this population. Using these data, critical habitat for the Lake Chubsucker is identified, based on an area of occupancy approach, as the open and shallow waters historically and presently known as Girardin Pond and Redhead Pond within Point Pelee National Park of Canada, and as identified on the National Topographic System (NTS) map 40G/15 (Figure 7).

The above ponds are the locations within the Park where records of Lake Chubsucker were most recently documented by Surette (2006), during fieldwork for an M.Sc. thesis. This critical habitat definition is based on 25 records, collected during 605 sampling events between 2002 and 2003 across all Park ponds, with all captures occurring in 2003. Specimens captured in 2003 ranged in size from 46-247 mm TL. No other records of Lake Chubsucker have been documented within Point Pelee National Park within the last 20 years. Lake Pond is excluded from this definition, as the records for this pond (Wyett and Dutcher 1967, Wyett and Dutcher 1968, Wyett and Dutcher 1969, Ward 1973) are ≥ 35 years old and extensive sampling of this pond by Surette (2006) failed to locate Lake Chubsucker. Anthropogenic features are also excluded from this definition.

Figure 7. Critical habitat identified for the Lake Chubsucker in Point Pelee National Park.

Rondeau Bay – The Lake Chubsucker was first detected in Rondeau Bay in 1955 and since then it has been captured in 1963, 1983 and 2005. All records fall within the boundaries of Rondeau Provincial Park. Using available capture data, critical habitat is currently identified, based on an area of occupancy approach, as the contiguous waters and wetlands within a minimum convex polygon drawn around the occurrence points (Figure 8). This approach was used due to the fact that all known records for the species were found in a relatively localized area along the eastern shoreline of Rondeau Bay (rather than throughout the bay). Occurrence points on the edges of the polygon were further buffered by a distance of approximately 895 m. This buffer was determined using the radius of the home range of the Lake Chubsucker in Rondeau Bay, which was calculated using a body size – waterbody size dependent method (Woolnough *et al*. 2009). This critical habitat description does not extend east of Marsh Trail, the dike that runs down the middle of Rondeau Marsh, as the species has not been recorded from this area and the connection to the backwater areas east of the dike is located at the extreme south end of Rondeau Marsh where the species has not been recorded. The vast majority of critical habitat falls within the boundaries of the Park.

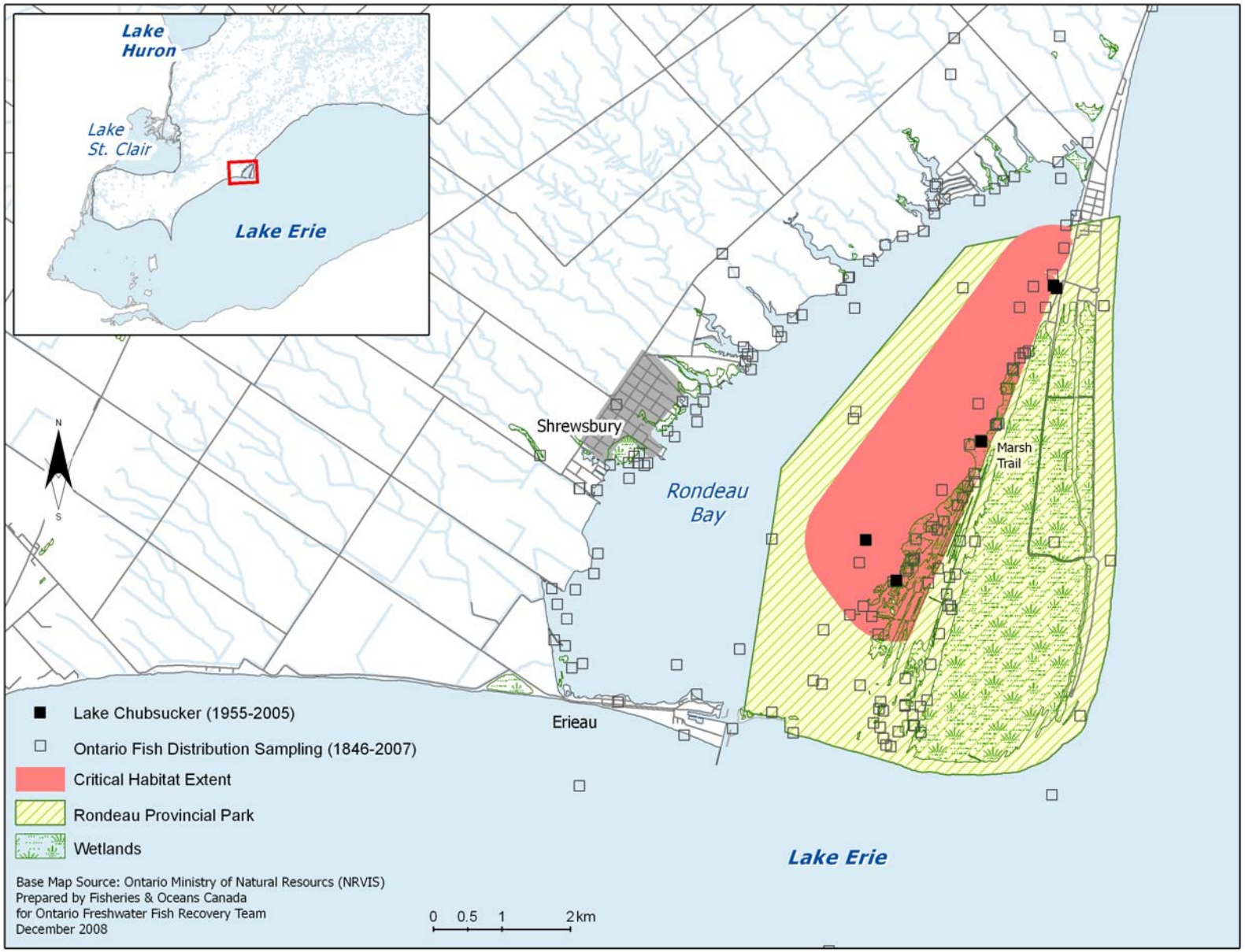

Figure 8. Critical habitat identified for the Lake Chubsucker in Rondeau Bay.

Long Point Bay – The Lake Chubsucker has been captured from Inner Long Point Bay near the mouth of Big Creek NWA, Long Point NWA, and Turkey Point marsh in the northern portion of the Inner bay. The species was first detected in Turkey Point in 1985 and has since been recaptured from this location in 2007 (23 specimens; 109-231 mm TL). Using available sampling data, critical habitat for the Lake Chubsucker in Long Point Bay, including Long Point NWA (not diked), Long Point Provincial Park and Turkey Point, is currently identified, based on area of occupancy, and refined using NOAA bathymetry data, as the contiguous waters and wetlands of the Inner Bay and the tip, from the shore down to the 1 m contour (Figure 9). Although the species has been described as preferring depths up to 2 m, the 1 m contour was used as occupied habitats were found only within this area. This critical habitat description includes the ponds along the spit that forms the southern boundary of Long Point Bay.

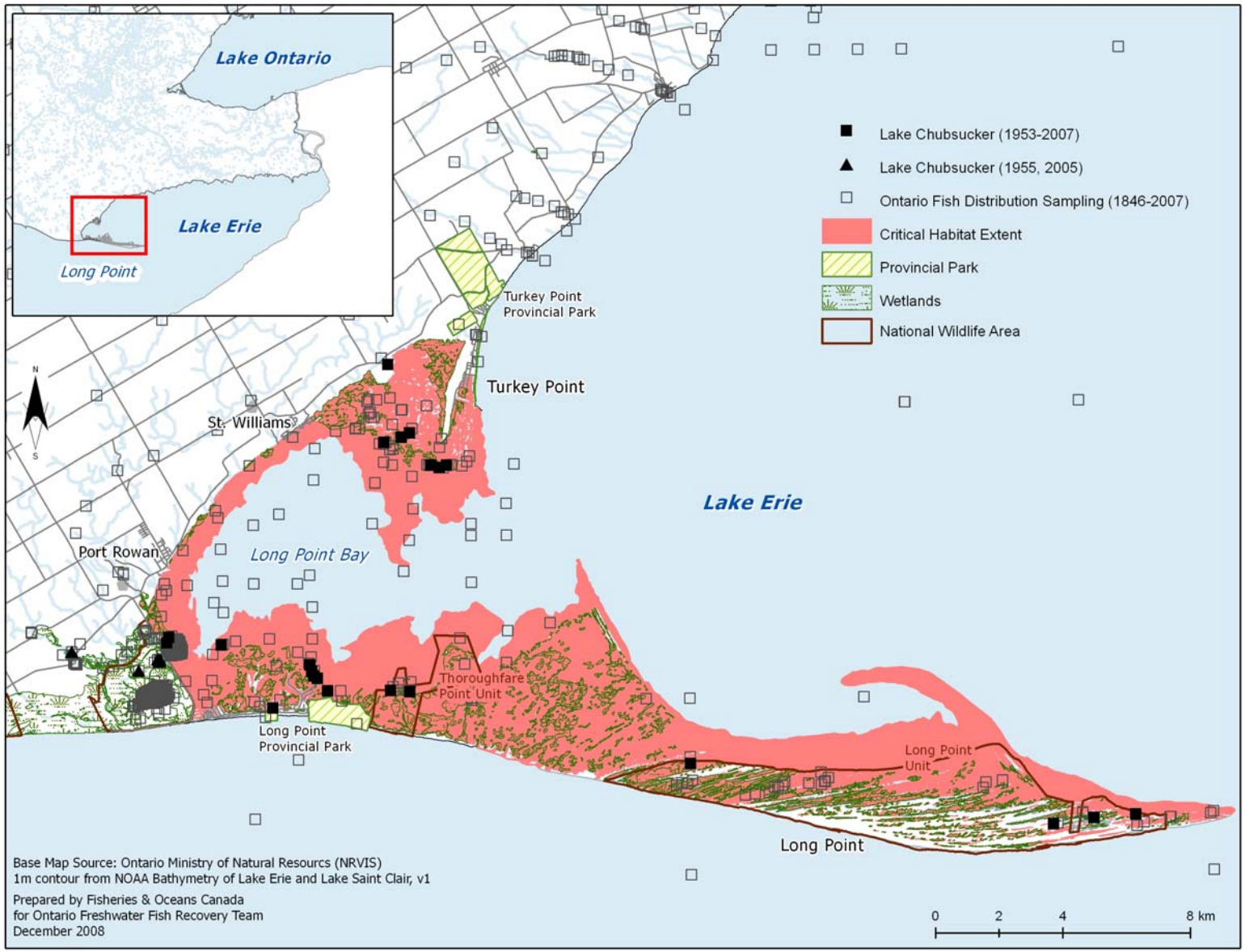

Figure 9. Critical habitat identified for the Lake Chubsucker in Long Point Bay (including Turkey Point, Long Point NWA and Long Point Provincial Park).

Big Creek NWA – Lake Chubsucker were detected for the first time in Big Creek NWA in 2005, where 13 specimens (70 – 148 mm TL) were caught from five sites in the northern cell of a diked impoundment within Big Creek NWA. Using these data, critical habitat is currently identified, using an area of occupancy approach, and refined using ELC data to exclude permanently dry areas, as the contiguous waters and wetlands within the northern portion of the diked marsh in Big Creek NWA (Figure 10).

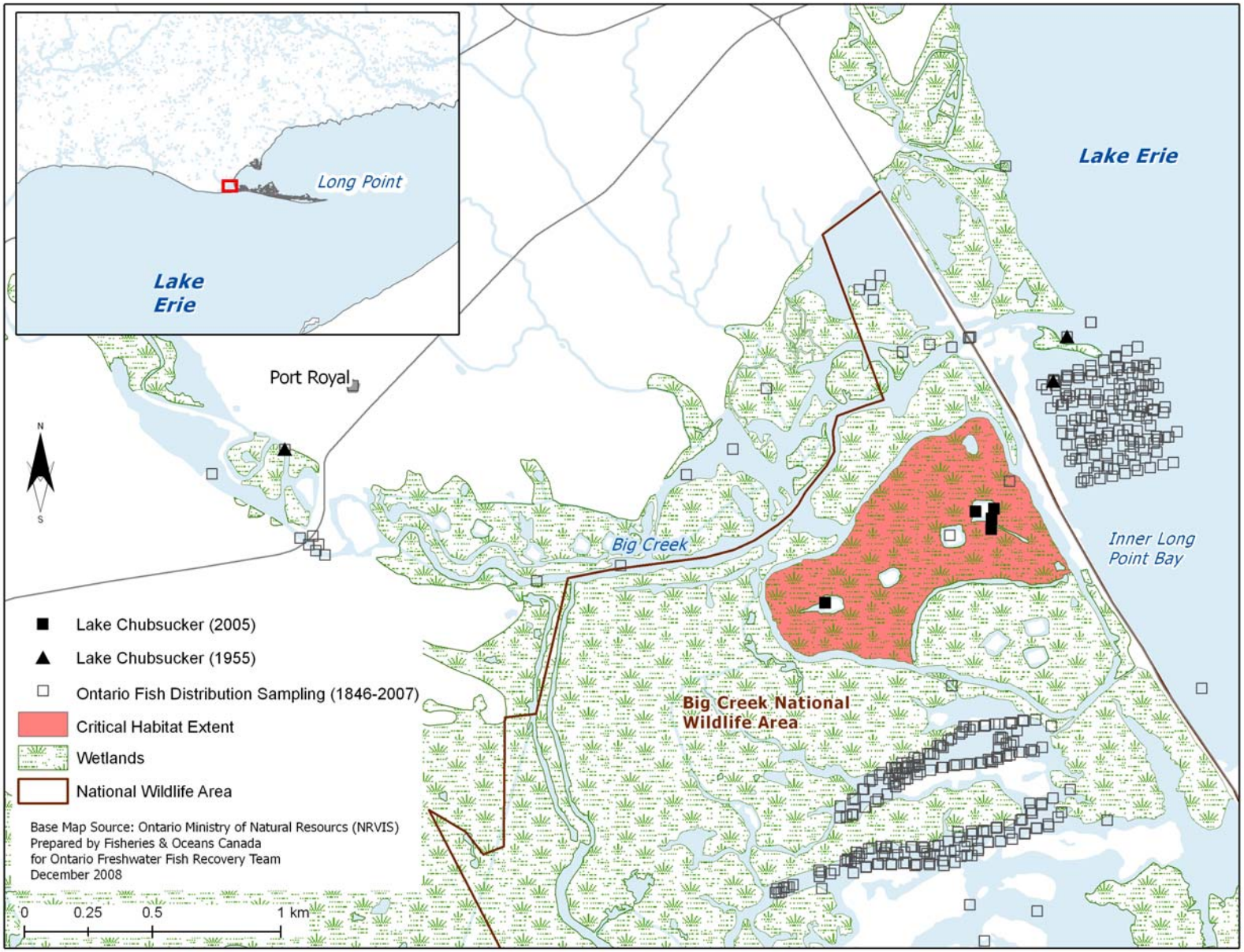

Figure 10. Critical habitat identified for the Lake Chubsucker in Big Creek NWA.

Lyons Creek – The first recorded occurrence of the Lake Chubsucker in Lyons Creek is from 2004, when five specimens ranging in size from 28 – 68 mm TL were captured from five sites along a 1.8 km stretch (Marson *et al*. 2007). In 2008, 28 (63-209 mm TL) Lake Chubsucker were captured from six sites located in a ~9 km reach of the creek (A. Yagi, unpubl. data). Using these data, critical habitat is currently identified based on an area of occupancy approach and refined using the Aquatic Landscape Inventory System (ALIS), an ecological classification system. ALIS was developed by the OMNR to define stream segments based on a number of unique characteristics found only within valley segments.

Critical habitat in Lyons Creek has been identified as all contiguous waters and wetlands located upstream of Montrose Rd. to the Welland Canal, which represents a stretch of creek ~11 km long with an area of 0.418 km^2. This includes all contiguous ALIS segments from the uppermost stream segment with the species present to the lowermost stream segment with the species present (Figure 11). The habitat in this section of the creek is relatively similar throughout (i.e., clear, calm, water with abundant aquatic/semi-aquatic vegetation) and it is reasonable to assume that the species is found throughout. However, there is a distinct change in the habitat downstream of Montrose Rd. compared to the upstream section where critical habitat has been identified. The habitat downstream of Montrose Rd. is channelized and is not presently suitable for Lake Chubsucker and it is not reasonable to believe that the species would be present (A.Yagi, pers. comm. 2009).

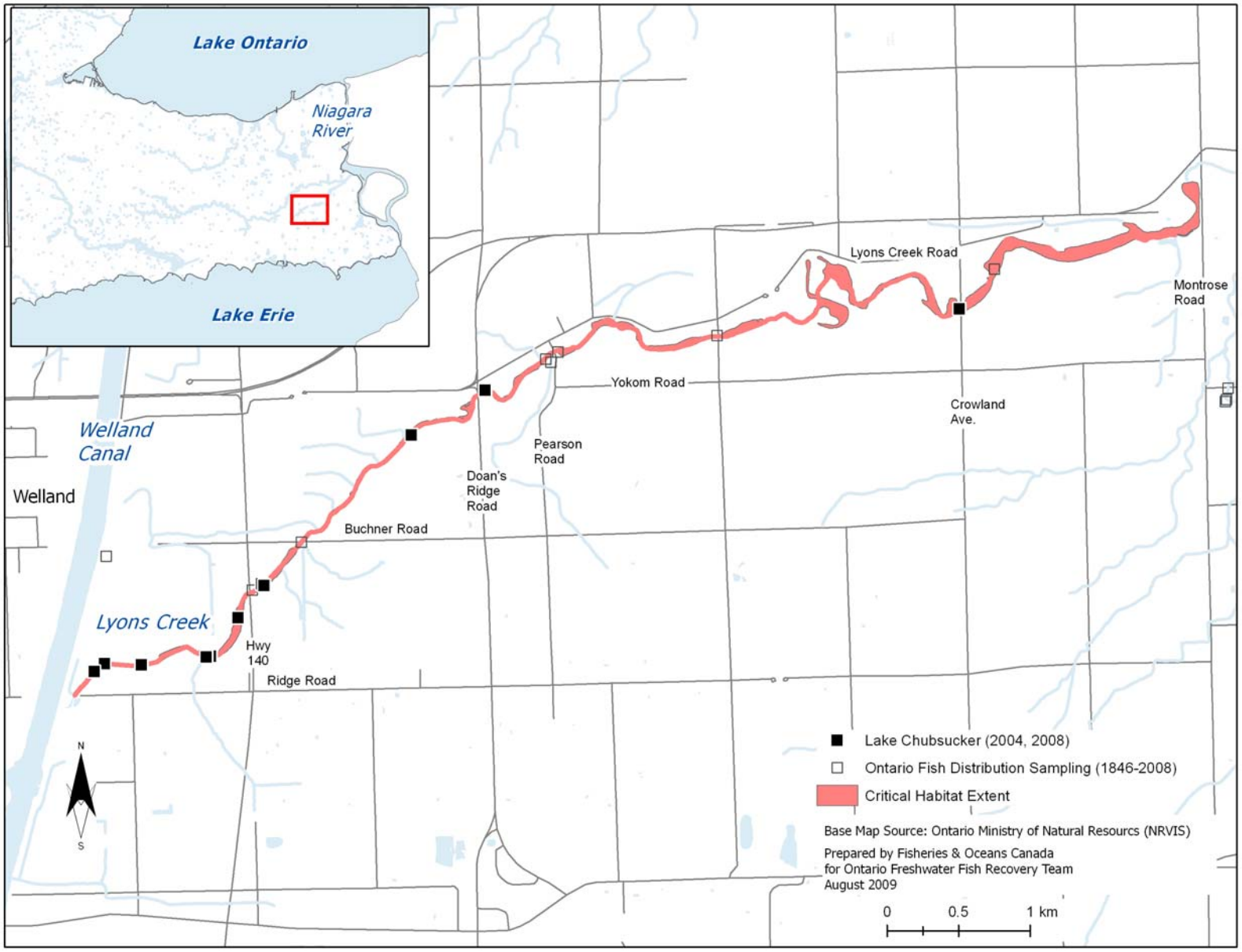

Figure 11. Critical habitat identified for the Lake Chubsucker in Lyons Creek.

These partial identifications of critical habitat ensure that currently occupied habitat within these areas is protected, until such time as critical habitat for the species is more accurately defined, according to the schedule of studies laid out in section 2.7.3. These areas of critical habitat identified will be refined as additional information becomes available.

Population Viability

The minimum area for population viability (MAPV) for all life-stages of the Lake Chubsucker was estimated for both riverine (river) and lacustrine (lake) populations in Canada. The MAPV is defined as the amount of exclusive and suitable habitat required for a demographically sustainable recovery target based on the concept of a minimum viable population size (MVP) (Vélez-Espino *et al.* 2008). Therefore, the MAPV is a quantitative metric of critical habitat that can assist with the recovery and management of species at risk (Vélez-Espino *et al*. 2008). The MAPV for the Lake Chubsucker has been estimated to be 2.76 km^2 and 6.39 km^2 in rivers and lakes, respectively (Vélez-Espino *et al*. 2008). MAPV values are somewhat precautionary in that they represent the sum of habitat needs calculated for all life-history stages of the Lake Chubsucker; these figures do not take into account the potential for overlap in the habitat of the various life-history stages and may overestimate the area required to support an MVP. However, since many of these populations occur in areas of degraded habitat (MAPV assumes habitat quality is optimal), areas larger than the MAPV may be required to support an MVP. In addition, for many populations, it is likely that only a portion of the habitat within that identified as the critical habitat extent would meet the functional requirements of the species' various life-stages. Future studies may help quantify the amount and quality of available habitat within currently identified critical habitats for all populations; such information, along with the verification of the MAPV model, will allow greater certainty for the determination of population viability. As such, the results below are preliminary and should be interpreted with caution.

Table 9. Comparison of the area of critical habitat identified (km^2) for each Lake Chubsucker population, relative to the estimated minimum area for population viability (MAPV)*.

Population	Area of Critical Habitat Identified (km^2)	Habitat Type	MAPV Achieved? (Y/N)
Old Ausable Channel	0.61	Riverine	No
L Lake	0.136	Lacustrine	No
St. Clair NWA	1.24	Lacustrine	No
Point Pelee National Park	0.33	Lacustrine	No
Rondeau Bay	9.43	Lacustrine	Yes
Long Point Bay	110.89	Lacustrine	Yes
Big Creek NWA	0.53	Lacustrine	No
Lyons Creek	0.418	Riverine	No

***** the MAPV estimation is based on modeling approaches described above.

Historically Occupied Habitat:

Ausable River: The Lake Chubsucker is assumed to have inhabited the lower Ausable River prior to its diversion in the 1800s, but to what extent is not known (ARRT 2006). The lower Ausable River has since become degraded in habitat quality and the species is now confined to the high quality habitat protected by the closed system of the OAC.

Lake Erie: Lake Chubsucker were recorded from tributaries in the upper reaches of Big Creek (Long Point Region), but have not been confirmed present in recent years.

Thames River: The Lake Chubsucker has not been recorded from Jeanettes Creek, a tributary of the lower Thames River, since before 1970 and is believed to be extirpated from this location.

Tea Creek: Records for the species exist for Tea Creek, a tributary of Lyons Creek, which is in the Niagara River drainage. The Lake Chubsucker was last recorded from this location in 1970, despite recent surveys (2003 to 2005).

2.7.2 Examples of activities likely to result in the destruction of critical habitat

Habitats occupied by the Lake Chubsucker could be negatively impacted by a wide range of activities that ultimately increase nutrient and siltation/turbidity levels and/or result in the removal of significant amounts of dense aquatic vegetation. High levels of siltation and turbidity limits sunlight penetration through the water, thereby limiting aquatic macrophyte growth. In some cases, small-scale vegetation removal projects, using approved chemical and/or physical means may be allowed; the recovery strategy for Spotted Gar (*et al.* 2010), provides guidance to minimize harm during such removals.

Without appropriate mitigation, direct destruction of habitat may result from activities such as:

- Dredging;
- Infilling along shorelines;
- Shoreline hardening;
- Installation of docks, groynes and piers (in some cases, design choices [e.g., floating docks instead of crib docks] can allow for the mitigation of impacts);
- Instream/in-water work;
- Unfettered livestock access to waterways;
- Channelization and drainage works;
- Removal of riparian vegetation;
- Industrial, urban and/or rural chemical spills;
- Water-taking (this may include the prevention or interruption of clean water flow from the Welland Canal into Lyons Creek);
- Sewage treatment plant/septic system/manure spills;
- Construction of dams and impoundments; and,
- Deliberate introduction of exotic species.

Barriers such as dikes and dams at three locations (OAC, St. Clair NWA, Big Creek NWA) maintain habitat conditions for Lake Chubsucker populations. As such, the loss of these structures in these locations may result in the destruction of critical habitat.

Certain habitat management activities are recognized as being beneficial to the long-term survival and/or recovery of the species and may be allowed when required. Such activities may include, but are not limited to, the removal/control of exotic aquatic/semi-aquatic vegetation, water level management (including dike maintenance) and habitat restoration activities (e.g., fire management). For example, in NWAs, water levels may be managed and some aquatic vegetation may be removed, to maintain hemi-marsh conditions (i.e., 50/50 emergent/open water habitat). Big Creek and St. Clair NWAs, have been diked and have had ongoing water level/aquatic vegetation management (approximately once a decade) for the past 25 to 60 years (J. Robinson, pers. comm. 2008). Short-term water level draw-downs result in improved habitat conditions for waterfowl and, despite the obvious loss of habitat in the short term, also appear to improve habitat conditions for Lake Chubsucker in the long term; however, the impacts to the population and its long-term viability are unknown and require investigation. In future, research will inform such water management approaches to minimize short term impacts to existing Lake

Chubsucker populations. Many other restoration activities that improve the quality and/or quantity of available wetland habitat for the Lake Chubsucker may be necessary.

It is also recognized that in cases where critical habitats of multiple species occur, as in NWAs, that an ecosystem approach to the management of habitat is required to maximize benefit to co-occurring species at risk (of all taxa, including fishes, birds, reptiles, etc). Such an approach would require multi-jurisdictional discussions and recognizes that negative impacts to some species and their habitats may result from habitat management practices aimed at achieving an overall net benefit to the ecosystem and the species at risk that it supports. This approach could be formalized within a management plan for the relevant NWAs, developed by Environment Canada in consultation with Fisheries and Oceans Canada.

2.7.3 Schedule of studies to identify critical habitat

The following schedule of studies (Table 10) outlines activities that will assist in obtaining the required information to refine the critical habitat descriptions throughout the full range of the species. The activities in Table 10 are not exhaustive and outline the range and scope of actions that will lead to the identification of critical habitat in full, for the Lake Chubsucker. The process of investigating the actions outlined in Table 10 is likely to uncover knowledge gaps that will require further attention.

Table 10. Schedule of studies to fully identify critical habitat for the Lake Chubsucker.

Description of Activity	Approximate Time Frame[1]
Conduct studies to determine the habitat requirements for all life-stages of the Lake Chubsucker.	2009-2011
Survey and map habitat quality and quantity within historical and current sites, as well as sites adjacent to currently occupied habitat.	2009-2011
Conduct additional species surveys to fill in distribution gaps, and to aid in determining population connectivity.	2009-2011
Create a population-habitat supply model for each life-stage.	2012-2013
Based on information gathered, review population and distribution goals. Determine amount and configuration of critical habitat required to achieve goal if adequate information exists. Validate population-habitat supply model and refine critical habitat descriptions as necessary.	2012-2013

Activities identified in this schedule of studies will be further detailed in an action plan and carried out in collaboration with the appropriate ecosystem-based recovery teams and other relevant organizations, agencies, groups, land managers and individuals. Note that many of the individual recovery approaches will address some of the information requirements listed above.

2.8 Existing and Recommended Approaches to Habitat Protection

Habitat of the Lake Chubsucker receives general protection from works or undertakings under the habitat provisions of the federal *Fisheries Act*. The *Canadian Environmental Assessment Act* (CEAA) also considers the impacts of projects on all listed wildlife species and their critical habitat. During the CEAA review of a project, all adverse effects of the project on a listed species and its critical habitat must be identified. If the project is carried out, measures must be taken that are consistent with applicable recovery strategies or action plans to avoid or lessen

those effects (mitigation measures) and to monitor those effects. Once identified, SARA includes provisions to protect the critical habitat of the Lake Chubsucker.

The critical habitat of the Lake Chubsucker located in Point Pelee National Park and several NWAs (Big Creek, St. Clair and Long Point NWAs) will be protected by the prohibition against destruction of critical habitat, pursuant to subsection 58(2) of SARA, 90 days after the description of critical habitat, as identified in the recovery strategy, is published in the Canada Gazette. The prohibition provides additional protection to that already afforded and available under the *Canada Wildlife Act* as well as the *Canada National Parks Act* and its regulations.

Provincially, protection is also afforded under the *Planning Act*. Planning authorities are required to be "consistent with" the provincial Policy Statement under Section 3 of Ontario's *Planning Act* which prohibits development and site alteration in the habitat of Endangered and Threatened species. The *Ontario Lakes and Rivers Improvement Act* prohibits the impoundment or diversion of a watercourse if siltation will result. Stream-side development in Ontario is managed through floodplain regulations enforced by local conservation authorities. A majority of the land adjacent to the rivers inhabited by the Lake Chubsucker is privately owned; however, the river-bottom is generally owned by the Crown. Under the *Public Lands Act*, a permit may be required for work in the water and along the shore. In the Ausable River watershed, the majority of the OAC, where the Lake Chubsucker occurs, is protected within the boundaries of Pinery Provincial Park, conferring some degree of protection from development pressures and activities through the *Provincial Parks and Conservation Reserves Act*. This is also the case for the population within Rondeau Provincial Park (which represents a portion of Rondeau Bay). The Lake Chubsucker is listed as a Threatened species under Ontario's new *Endangered Species Act, 2007*. When the Act came into force on June 30, 2008, the species itself received protection, but the habitat of the Lake Chubsucker will not be protected until five years from this date unless a specific habitat regulation is developed under the Act by the provincial government at an earlier date.

Recommended high priority habitats for stewardship include Rondeau Bay and Lyons Creek where declining populations may benefit most from efforts to improve habitat. The recovery team will endeavor to more fully prioritize and direct efforts to improve and protect habitat as informed through the recommended approaches.

2.9 Effects on Other Species

The Lake Chubsucker habitat is shared by many other species, including multiple species at risk. These include not only aquatic species but also a number of amphibians, turtles, plants and birds. While some of the proposed recovery activities will benefit the environment in general and are expected to positively affect other sympatric native species, there could be consequences to those species whose requirements may differ from those of Lake Chubsucker. Consequently, it is important that habitat management activities for the Lake Chubsucker be considered from an ecosystem perspective through the development, with input from responsible jurisdictions, of multi-species plans, ecosystem-based recovery programs or area management plans that take into account the needs of multiple species, including other species at risk.

Many of the stewardship and habitat improvement activities to benefit the Lake Chubsucker will be implemented through existing ecosystem-based recovery programs that have already taken into account the needs of other species at risk.

2.10 Recommended Approach for Recovery Implementation

The recovery team recommends a dual approach to recovery implementation which combines an ecosystem-based approach complemented by a single-species focus. The team will accomplish this by working closely with existing ecosystem-based recovery teams and land managers to combine efficiencies and share knowledge on recovery initiatives. Currently, there are four aquatic ecosystem-based recovery strategies (Ausable and Thames rivers, Essex-Erie region and Walpole Island) that address several populations of the Lake Chubsucker and are currently being implemented. These strategies incorporate the biological and ecological requirements of the Lake Chubsucker, address the local threats it faces (or would face if repatriated, in the case of the Thames River strategy), and present prioritized approaches for the species' recovery within these systems. Ecosystem strategies simultaneously employ basin-wide recovery approaches to reduce identified threats to multiple aquatic species at risk including the Lake Chubsucker. Populations of the Lake Chubsucker also occur outside the boundaries of existing ecosystem-based recovery programs in the upper Niagara River drainage (Lyons/Tea Creek) and Lake St. Clair. As such, a single species approach to recovery will facilitate implementation of recovery actions within these watersheds through partnerships with local watershed management and stewardship agencies. If ecosystem-based recovery initiatives are developed in the future for these watersheds, the present single-species strategy will provide a strong foundation to build upon.

2.11 Statement on Action Plans

Recovery action plans are documents that describe the activities designed to achieve the recovery goals and objectives identified in recovery strategies. Using recommendations from the recovery strategy, action plans provide details with respect to who needs to be involved, and to what extent, in carrying out proposed activities.

One or more action plans relating to this recovery strategy will be produced within five years of the final strategy being posted on the public registry.

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4. RECOVERY TEAM MEMBERS

The following members of the Ontario Freshwater Fish Recovery Team were involved in the development of the recovery strategy for the Lake Chubsucker:

Shawn Staton (Chair)	Fisheries and Oceans Canada
Ian Barret	Niagara Peninsula Conservation Authority
Alan Dextrase	Ontario Ministry of Natural Resources
Joe de Laronde	Fisheries and Oceans Canada
Amy Edwards	Fisheries and Oceans Canada
Kari Killins	Ausable Bayfield Conservation Authority
Brian Locke	Ontario Ministry of Natural Resources
Dr. Nicholas Mandrak	Fisheries and Oceans Canada
Vicki M^{c}Kay	Parks Canada Agency
Mike Nelson	Essex Region Conservation Authority
Tom Purdy	OAC Management Committee
Dr. Scott Reid	Ontario Ministry of Natural Resources
Robert Ritchie	Niagara Parks Commission
Mari Veliz	Ausable Bayfield Conservation Authority
Jeff Robinson	Environment Canada (Canadian Wildlife Service)

Appendix 1

Definition of Status Rankings

G-Rank (global): Rank assigned to an element based on its range-wide conservation status rank (G1 to G5, in decreasing order of priority). Elements ranked G1, G2 or G3 are considered imperilled. G-rank is assigned by NatureServe or the conservation data centre responsible for the element in question.

N-Rank (national): Rank assigned to an element based on its national conservation status rank (N1 to N5, in decreasing order of priority). Elements ranked N1, N2 or N3 are considered imperilled.

S-Rank (subnational): Rank assigned to element based on its provincial or state conservation status rank (S1 to S5, in decreasing order of priority. Elements ranked S1, S2 or S3 are considered imperilled).

Priority ranking value	Priority ranking definition
S1 (extremely rare)	Usually 5 or fewer occurrences in the province or very few remaining individuals; often especially vulnerable to extirpation.
S2 (very rare)	Usually between 5 and 20 occurrences in the province or with many individuals in fewer occurrences; often susceptible to extirpation.
S3 (rare to uncommon)	Usually between 20 and 100 occurrences in the province; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.
S4 (common)	Apparently secure in Ontario; usually with more than 100 occurrences in the province.
S5 (very common)	Demonstrably secure in Ontario.

For more information on status ranks see: www.mnr.gov.on.ca/MNR/nhic/

Appendix 2.

Record of Cooperation and Consultation

The Lake Chubsucker recovery strategy was prepared by Fisheries and Oceans Canada (DFO) with input from representatives of the Ontario Ministry of Natural Resources (OMNR), Ausable Bayfield Conservation Authority, Essex Region Conservation Authority, Niagara Peninsula Conservation Authority, Old Ausable Channel Management Committee, Niagara Parks Commission, Trent University, Parks Canada Agency and Environment Canada.

Fisheries and Oceans Canada has attempted to engage all potentially affected Aboriginal communities in Southern Ontario during the development of this recovery strategy for the Lake Chubsucker (originally posted to the SARA registry in 2007). Information packages were sent to Chief and council of Aamjiwnaang First Nation, Caldwell First Nation, Chippewas of Kettle & Stony Point, Chippewas of the Thames First Nation, Mississauga of the New Credit, Moravian of the Thames, Munsee-Delaware Nation, Oneida Nation of the Thames, Six Nations of the Grand and Walpole Island First Nation. Information packages were also sent to the Metis Nation of Ontario (MNO), MNO Captain of the Hunt for Regions 7 and 9, Metis National Council, Association of Iroquois and Allied Indians, Union of Ontario Indians (Anishnabek Nation), Union of Ontario Indians (Anishnabek Nation), the Southern First Nations Secretariat, Chiefs of Ontario and the Assembly of First Nations. Members of these communities may have travelled or harvested fish from the waters where this fish species occurs or was historically found. Follow-up telephone calls were made to each community office to ensure that packages were received and to ask if they would like to schedule a meeting to learn more about species at risk in general and the proposed recovery strategies. As a result of these letters and calls, one meeting with Aamjiwnaang First Nation was requested and comments were received from the Association of Iroquois and Allied Indians.

With the addition of the section describing critical habitat, DFO once again endeavoured to include comments from any Aboriginal community that may be affected by the changes described in the 2009 version of the recovery strategy. Once again, information packages were sent to Chief and council of Aamjiwnaang First Nation, Caldwell First Nation, Chippewas of Kettle & Stony Point, Chippewas of the Thames First Nation, Mississaugas of the New Credit, Moravian of the Thames, Munsee-Delaware Nation, Oneida Nation of the Thames, Six Nations of the Grand, and Walpole Island First Nation. Information packages were also again sent to the Metis Nation of Ontario (MNO), MNO Captain of the Hunt for Regions 7 and 9, Grand River Metis Council, Hamilton-Wentworth Métis Council, Niagara Region Metis Council, and the Windsor/Essex Métis Council, Metis National Council, Association of Iroquois and Allied Indians, Union of Ontario Indians (Anishnabek Nation), the Southern First Nations Secretariat, Chiefs of Ontario, and the Assembly of First Nations. Further consultations with Aboriginal communities are continuing.

Before posting of the proposed recovery strategy, DFO consulted with Ducks Unlimited Canada (DUC) on the potential impacts of the strategy and critical habitat to the management of wetland habitats. Comments received by DUC were considered in the proposed recovery strategy.

DFO has prepared a list of non-government organizations and municipalities which may be impacted by the proposed recovery strategy. Information packages were prepared to inform these groups that the proposed recovery strategy was to be posted and invited each group to comment on the proposed recovery strategy. As well, an announcement was prepared and

placed in newspapers with circulation in the area where this fish occurs or was historically found to inform landowners and the general public about the recovery strategy and to request their comments. These packages were sent and the announcements were published when the proposed recovery strategy was posted on the SARA registry.

Comments on the proposed recovery strategy were solicited from OMNR, Parks Canada Agency and Environment Canada and have been incorporated.