Report Towards the Implementation of the Management Plan for the

Yellow Lampmussel (*Lampsilis cariosa*)

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For copies of the recovery document, or for additional information on species at risk, including Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status reports, and other related documents, please visit the Species at Risk Public Registry.

Cover illustration: Yellow Lampmussel. Photo by Aaryan Sharma, 2025.

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Preface

The *Species at Risk Act* (S.C. 2002, c.29) (SARA) requires the competent minister(s) to monitor and report on the implementation of recovery documents (that is, recovery strategies, action plans, and management plans) for species at risk. These reports must describe the progress made towards the species' recovery or conservation[1].

The Minister of Fisheries is the competent minister for aquatic species at risk. Fisheries and Oceans Canada (DFO) has prepared this progress report.

Reporting on the progress toward implementing recovery documents includes reporting on the collective efforts of the competent minister(s), provincial and territorial governments, and all other parties involved in carrying out actions that contribute to the species' conservation.

As stated in the preamble to SARA, success in the recovery and conservation of species at risk depends on the commitment and cooperation of many contributors, and will not be achieved by DFO, or any other jurisdiction, alone. All Canadians are invited to join in supporting and implementing the recovery document, for the benefit of the species and Canadian society as a whole.

Acknowledgements

The progress report was prepared by regional recovery planners within DFO. The progress toward species conservation described in this report would not have been achieved without the partnerships and contributions of many individuals and organizations.

Executive summary

The progress report outlines the progress made by Fisheries and Oceans Canada (DFO) and its partners towards implementing the management plan for the Yellow Lampmussel (*Lampsilis cariosa*) between 2015 and 2022. For more information on the contents of this document, please contact the Species at Risk Program (dfo.ncrsara-leprcn@dfo-mpo.gc.ca).

[1] "Recovery" applies to species listed under SARA as threatened, endangered or extirpated, which require a recovery strategy and one or more action plan(s). "Conservation" applies to species listed under SARA as special concern, which require a management plan.

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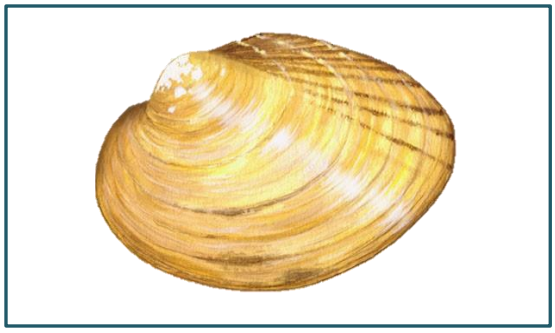
SPECIAL CONCERN

Fisheries and Oceans Canada (DFO) and its partners have made additional progress towards the implementation of the conservation measures identified in the "Management Plan for the Yellow Lampmussel (*Lampsilis cariosa*) in Canada", through the activities undertaken between April 2015 and December 2022, to support the conservation of the Yellow Lampmussel (YLM). The management plan provides detailed information on the species, its threats, its needs, management objectives, and conservation measures.



Credit: Jeff Domm (2004)

In Canada, YLM are known to occur in Nova Scotia (NS) and New Brunswick (NB). When the YLM management plan was finalized in 2010, YLM were only known to exist in 2 disjunct locations: the Sydney River (Blacketts Lake), Cape Breton, NS and the lower Saint John River watershed below the Mactaquac Dam in NB. Since then, 2 additional populations were discovered in Pottle and Forresters Lakes, which feed into the Sydney Harbour, Cape Breton, NS, in 2011 and 2015 respectively.

This progress report is part of a series of documents for this species that should be taken into consideration together including the YLM management plan (DFO 2010), and the first YLM progress report (DFO 2017). Refer to the YLM species profile on the Species at Risk Public Registry for more information and related documents.

1. Progress towards meeting the management objectives for the Yellow Lampmussel

Management goals establish, to the extent possible, the number of individuals and/or populations, and their geographic distribution, that are necessary for the conservation of the species. The management goal for the YLM is to:

- maintain the existing Yellow Lampmussel populations in Canada

There are 5 management objectives identified in the YLM management plan (DFO 2010) to meet the management goal for the YLM. During the reporting period, conservation actions were undertaken by DFO and its partners under each management objective. Some key achievements are described below.

Objective 1: Maintain current quality and quantity of known YLM habitat

- Non-government organizations undertook habitat restoration activities, prioritized during a threat management exercise for the Saint John River, which included assessing, improving, and removing fish passage barriers and restoring riparian areas to improve the water quality and habitat for aquatic species, including YLM and its confirmed and suspected host fish; White Perch (*Morone americana*) and Yellow Perch (*Perca flavescens*), respectively (Camaclang et al. 2020; World Wildlife Fund [WWF]-Canada 2020; WWF-Canada Atlantic Coastal Action Program [ACAP] 2021, 2022; WWF-Canada Kennebecasis Watershed

Restoration Committee [KWRC] 2022; WWF-Canada Nashwaak Watershed Association Inc. [NWAI] 2022)

- The NS Department of Natural Resources and Renewables (NSDNRR), in collaboration with the provincial Aquatics Recovery Team, developed a provincial recovery plan, which identifies the species' core habitat, and outlines recovery goals, objectives, and actions deemed necessary to protect, conserve, and recover YLM and its habitat
- The modernized *Fisheries Act* (2019) provided renewed federal fish and fish habitat protections, including for that of freshwater mussels in both NB and NS, in the form of regulations, standards, codes of practice, and guidelines for projects near water (*Fisheries Act* 1985)
- YLM and its habitat continue to be protected as a species at risk under the *NB Species at Risk Act* (2012) and the *NS Endangered Species Act* (1998), including the application of associated regulations and guidelines that protect and maintain water quality and quantity in YLM habitat
- University of New Brunswick (UNB) research indicated that YLM movement in the Saint John River is likely influenced by environmental factors, including water temperature and levels (Greeley 2023), while Cape Breton University (CBU) assessed the risks posed by seasonal water level declines and future climate change impacts on YLM habitats in the Sydney River watershed, revealing that populations adapt by physically relocating (White 2017)

Objective 2: Reduce direct threats to YLM populations

- DFO developed a draft response plan to address the potential threat of aquatic invasive Black Crappie (*Pomoxis nigromaculatus*) to YLM host fish following their detection in the upper Saint John River in 2019
- WWF completed a multi-partner Priority Threat Management exercise for the Saint John River for different ecological species groups (aquatic, terrestrial, and plants), which resulted in the identification and implementation of priority conservation strategies, including restoring fish migratory routes and riparian areas (WWF-Canada 2020)
- NB and NS Invasive Species Councils implemented various tools and approaches to help reduce the risk of non-native and invasive species, such as the Clean Drain Dry and Don't Let It Loose campaigns and the purchase of boat washing stations
- CBU research determined that muskrat (*Ondatra zibethicus*) predation on adult YLM and Chain Pickerel (*Esox niger*) predation on White Perch impact YLM population densities and age structure (White 2015, 2017, 2019), while studies conducted by Saint Mary's University (SMU) determined that Chain Pickerel predation on White Perch contributes to declines in abundance of the host fish (Campbell 2018; Campbell et al. 2019)
- DFO Gulf and Maritimes Aquatic Invasive Species National Core Programs, undertook risk assessments of freshwater aquatic invasive species established in NB and NS by using the Canadian Marine Invasive Screening Tool to assess the likelihood and impact of invasions for various species including Chain Pickerel, Smallmouth Bass (*Micropterus dolomieu*), and Black Crappie, and prioritized management actions such as creating rapid response plans
- Following the discovery of aquatic invasive Zebra Mussels (*Dreissena polymorpha*) in aquarium moss ball products across Canada in 2021, including NB and NS, DFO monitored the situation in collaboration with federal and provincial counterparts, and provided information on how to dispose of the moss balls to limit the spread (DFO 2021)

- DFO Maritimes Region Aquatic Invasive Species National Core Program initiated a scan of 156 non-indigenous aquatic species, including the Dark Falsemussel (*Mytilopsis leucophaeta*) that had not yet been reported in NS, and completed risk assessments and threat prioritizations on those most likely to survive if introduced and potentially impact native species like the YLM
- The NB Invasive Species Council initiated a project to assess the risk of invasive Zebra and Quagga mussels in the Saint John River and began actively monitoring and planning a response to Zebra Mussels after their detection in September 2022 in Lake Témiscouata in southeastern Quebec, which flows south to the Saint John River
- DFO and NSDNRR continued to enforce the *Fishery (General) Regulations* and the *NS Live Fish Possession Regulations* respectively, which aim to prevent the release or transfer of fish and the spread of aquatic invasive species that could directly or indirectly impact YLM by preying on host fish species

Objective 3: Improve our understanding of YLM populations in NB and NS

- The Maliseet Nation Conservation Council (MNCC) interviewed community elders in NB to gather Traditional Ecological Knowledge (TEK) on Rainbow Smelt (*Osmerus mordax*) and YLM, created maps to illustrate this knowledge, and informed the broader scientific community about their work including Indigenous organizations and communities, and recovery practitioners
- UNB and the Canadian Rivers Institute (CRI) found 6 new Saint John River YLM sites in the Canaan and Salmon River tributaries below the Mactaquac Dam (Gray et al. 2022)
- DFO assessed the use of Environmental DNA (eDNA) as a reliable method for detecting freshwater mussels (LeBlanc et al. 2021), after which CBU developed a YLM-specific eDNA assay and partnered with the Mi'kmaw Conservation Group (MCG) to test its application in the field (Button-Sibley 2020; Rawlings and White 2022)
- CBU completed a desktop exercise and visual surveys in 2016 to identify suitable habitat and potential presence of YLM in NS lakes, resulting in the identification of 556 lakes with suitable YLM habitat (41 in Cape Breton and 515 on mainland NS), and the 2015 discovery of a previously unidentified YLM population in Forresters Lake (White 2015, 2017, 2023)
- CBU compared YLM field survey methods and determined that lake shoreline surveys of muskrat middens (mussel shell piles) were the fastest and most reliable method for finding new YLM populations, for both novice and experienced searchers, rather than the live in-water time-search method (White 2018)
- CBU assessed YLM population demographics and determined that the YLM may live up to 23 years, and all 3 NS YLM populations (in Blacketts, Forresters, and Pottle Lakes) had more males (White 2015, 2017)
- Peticodiac Watershed Alliance (PWA) and MCG conducted freshwater mussel surveys in various watersheds, including the Petitcodiac River in NB and the Stewiacke River in NS respectively, which did not detect YLM but confirmed the presence of several other freshwater mussel species such as Brook Floater (*Alasmidonta varicose*) and Eastern Floater (*Pyganodon cataracta*) in both watersheds (Elward and Thongboonmee 2021; LaChance 2021; Elward 2022)

- CBU conducted genetic analysis on YLM samples and determined that there is little genetic variation between YLM populations both within NS and between NS and NB (White 2018, 2019)

Objective 4: Maintain existing host fish populations

- CBU studies confirmed that White Perch serves as a host fish for YLM in NS; however other species, such as Chain Pickerel and Smallmouth Bass, likely do not serve as hosts for YLM (White 2017, 2018, 2019)
- CBU developed a molecular key for all adult freshwater mussel species present within Atlantic Canada, including YLM, which aims to support field identification of freshwater mussel glochidia (larvae) and thereby help identify host fish species (Rawlings and White 2022)
- CBU assessed fish passage at the Sydney River dam and the Pottle Lake fish ladder; the NS Lands Corporation and NS Adopt-a-Stream subsequently fixed malfunctioning ladders at the Sydney River dam to facilitate White Perch migration (White 2018)
- NB Department of Natural Resources and Energy Development continued to apply the *Maritime Provinces Fishery Regulations* for sustainable management of White Perch

Objective 5: Increase public awareness and involvement in YLM conservation efforts

- CBU initiated the development of a photo identification guide to help distinguish freshwater mussel species in the field and advance future development of volunteer-friendly survey protocols
- DFO supported the creation of 2 portable, bilingual (English and French), interactive freshwater mussel mini-museums to make available on loan to interested educators
- DFO and the NB Museum collaborated to create 2 waterproof pocket-sized field guides in English, French, Mi'kmaw, and Wolastoqey-Peskotomuhkati; 1 to freshwater mussels of Maritime Canada with contributions from the Canadian Museum of Nature (McAlpine et al. 2021), and another to Freshwater Fishes of Conservation Significance of Maritime Canada (McAlpine and Karstad 2024)[2]
- A total of 12 freshwater mussel identification and survey techniques workshops, some in partnership with DFO, were organized for Indigenous and non-government organizations, First Nation communities, academia, and government to increase capacity in freshwater mussel conservation activities (figure 1; figure 2)
    - A total of 8 workshops were held in NB and 4 were held in NS both hosted and taught by various organizations including CBU, SMU, Membertou First Nation, MCG, Unama'ki Institute of Natural Resources (UINR), and NSDNRR in NS and, PWA, NB Museum, Woodstock and Kingsclear First Nations, and Belleisle Water Coalition in NB
- Various organizations, including CBU, CRI, DFO, MCG, NB Museum, PWA, SMU, and WWF, developed and delivered educational content such as videos, conference

[2] The Fishes of Conservation Significance Field Guide was developed within the reporting period but finalized outside the reporting period. Versions of the guides in each language will be available on the NBM website.

presentations, news articles, social media posts, and newsletters, and DFO hosted an open house event at the Bedford Institute of Oceanography, to educate the public about aquatic species at risk, including YLM

- NB and NS recreational angling handbooks, which include information on aquatic invasive species such as Chain Pickerel and Zebra Mussels, were distributed by the relevant provincial department to those purchasing a recreational fishing license, and various conference presentations were delivered which brought awareness to the threat that Chain Pickerel pose to YLM host fish

Figure 1: Learning to identify freshwater mussels during a 2017 workshop taught by the NB Museum at the Woodstock First Nation Community Centre (Photo credit: DFO 2017).

Figure 2: Surveying freshwater mussels in the Saint John River during a 2017 workshop taught by the NB Museum at the Woodstock First Nation Community Centre (Photo credit: DFO 2017).

Achievement of the YLM management objectives was evaluated using the strategies outlined in the management plan. Table 1 provides an overview of the status of measures under each management plan strategy at the end of the reporting period and builds upon the progress already achieved during the first reporting period (2010 to 2015). Of the 22 measures, 12 were met or met/ongoing; 7 measures were partially met/underway; and 3 measures were not met. Measures that were partially met or not met are discussed in the “knowledge gaps and future priorities” section below. For additional information on the work done towards the objectives for the YLM, please contact DFO.MARSARA-LEPMAR.MPO@dfo-mpo.gc.ca.

Table 1: Status of measures identified in the Yellow Lampmussel (YLM) management plan under each strategy for the period of 2015 to 2022.

Management plan objective-strategy[3]	Measures identified under each strategy	Status[4]
O1-S1	a. Maintain current levels of water quality at all known sites	Met, ongoing
O1-S1	b. Monitor water quality conditions at known sites	Partially met, underway
O1-S1	c. Meet with, and disseminate information to water quality and aquatic habitat regulators to ensure that they are informed about YLM presence and its water quality needs and sensitivities	Met, ongoing
O1-S1	d. Inform and encourage stakeholders to implement water quality best practices	Partially met, underway
O1-S1	e. Prevent or reduce activities which result in shoreline degradation, habitat alteration, and sedimentation	Met, ongoing
O1-S1	f. Determine risk posed by low-water levels in the Saint John River and Sydney River	Partially met, underway
O1-S1	g. Enforce existing riparian zone protection regulations	Met, ongoing
O2-S1	a. Discourage the use of molluscicides in the Blacketts Lake (Sydney River) population	Not met
O2-S1	b. Determine the level of risk posed by muskrat predators on the Sydney River population	Met
O2-S1	c. Prevent the introduction of zebra mussels	Partially Met, Underway
O3-S1	a. Develop and implement a long-term monitoring protocol for all existing	Not met

[3] Refers to the YLM management objectives (O) as defined in section 2.2 of the management plan along with their associated strategies (S).

[4] **Met:** the management plan measure has been met and no further action is required
Met, ongoing: the management plan measure has been met, but efforts will continue until such time that the management goal is considered achieved.
Not met: the management plan measure has not been met, and little to no progress has been made
Partially met, underway: the management plan measure has not been met, but there has been moderate to significant progress made

Management plan objective-strategy[3]	Measures identified under each strategy	Status[4]
	populations to gather abundance and trend information	
O3-S1	b. Develop and implement a survey protocol to look for new occurrences of YLM in suitable habitat	Met, ongoing
O3-S1	c. Gather information on habitat and biology which is necessary to assist actions in O3-S1-a and b.	Met, ongoing
O3-S2	a. Determine potential interactions with Atlantic sturgeon (*Acipenser oxyrinchus*) and Shortnose sturgeon (*Acipenser brevirostrum*) in the Saint John River	Not met
O4-S1	Identify and gather information on host fish species in NB and NS	Partially met, underway
O4-S2	Assess and reduce potential threats to host fish populations, including potential negative impacts from non-native and invasive species	Partially met, underway
O5-S1	a. Raise awareness of the presence of YLM in the Saint John and Sydney rivers and conservation efforts under the *Species at Risk Act*	Met, ongoing
O5-S1	b. Raise awareness of the effects of non-native and invasive species on YLM and other species at risk	Met, ongoing
O5-S1	c. Raise the importance of maintaining biodiversity and the functional components of existing habitats for YLM and other native species	Met, ongoing
O5-S1	d. Raise awareness of existing federal and provincial regulations which protect YLM habitat	Partially met, underway
O5-S1	e. Raise awareness on issues pertaining to riparian zone degradation and the potential for sediment deposition in the lower Saint John River watershed	Met, ongoing

Management plan objective-strategy[3]	Measures identified under each strategy	Status[4]
O5-S2	Adopt and/or develop tools and approaches which reduce the risk of non-native and invasive species introductions	Met, ongoing

1.1 Key gaps and future priorities for the YLM

Future work will focus on amending the YLM management plan to include the additional populations discovered at Pottle and Forresters Lakes and completing activities that were initiated but not finalized during this reporting period. Opportunities will be explored and implemented to maintain and ideally increase the quality and quantity of known YLM habitat for the species and its host fish. Priorities will include developing and implementing long-term monitoring protocols for existing YLM populations, continuing to search for new occurrences, and addressing knowledge gaps regarding YLM population size and dynamics, habitat needs, viable fish host species, and interactions with other native fish species. Mitigating threats to YLM remains a priority, particularly through the development of tools and approaches to address, monitor, and prevent the spread of aquatic invasive species like Zebra Mussels and Chain Pickerel. Given the lack of YLM recruitment in Blacketts Lake, likely due to declines in White Perch abundance resulting from Chain Pickerel predation, innovative mitigation measures such as stocking of host fish and translocating YLM to new habitats may be evaluated during the amendment of the management plan. Assessing and reducing threats to host fish populations will also be prioritized, with considerations for habitat restoration and fish passage improvement projects to encourage YLM dispersal.

Existing collaborations will continue to be supported, new partnerships will be encouraged, and engagement with industries and recreational resource users will be expanded to support the protection of freshwater mussel habitat and the prevention of aquatic invasive species introductions. Finally, it is essential to engage educators in highlighting the importance of mussels in maintaining clean and healthy freshwater ecosystems.

2 Concluding statement

During the reporting period, progress was made toward implementing the measures under each strategy identified in the management plan for the Yellow Lampmussel.

DFO remains committed to the recovery and conservation of all aquatic species at risk. The work that has been initiated and completed to date has built a strong foundation for the continued management of the Yellow Lampmussel. DFO and its partners will continue to work towards the achievement of the management objectives for Yellow Lampmussel, and welcome the participation of additional partners.

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