

**COSEWIC**  
**Status Appraisal Summary**

on the

**Yellow Lampmussel**  
*Lampsilis cariosa*

in Canada

**SPECIAL CONCERN**  
**2013**

**COSEWIC**  
Committee on the Status  
of Endangered Wildlife  
in Canada



**COSEPAC**  
Comité sur la situation  
des espèces en péril  
au Canada

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Production note:

COSEWIC acknowledges Andrew Hebda for writing the status appraisal summary on the Yellow Lampmussel, *Lampsilis cariosa*, in Canada, prepared under contract with Environment Canada. This status appraisal summary was overseen and edited by Gerry Mackie, Co-chair of the COSEWIC Molluscs Specialist Subcommittee.

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Également disponible en français sous le titre Sommaire du statut de l'espèce du COSEPAC sur le Lampsile jaune (*Lampsilis cariosa*) au Canada.

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## COSEWIC Assessment Summary

### Assessment Summary – November 2013

**Common name**

Yellow Lampmussel

**Scientific name**

*Lampsilis cariosa*

**Status**

Special Concern

**Reason for designation**

Populations still occur in the Sydney River watershed, Nova Scotia, and in the Saint John River watershed, New Brunswick. In addition, a new site has been found at Pottle Lake in Nova Scotia. While cumulative threat impacts from non-native species of fish and from industrial pollution are high, there is uncertainty about the timing and possibility of invasion by Zebra Mussels and the impact of non-native species of fish on host fish for the Yellow Lampmussel.

**Occurrence**

New Brunswick, Nova Scotia

**Status history**

Designated Special Concern in May 2004. Status re-examined and confirmed in November 2013.



## COSEWIC Status Appraisal Summary

*Lampsilis cariosa*

Yellow Lampmussel

Jurisdictions: Nova Scotia, New Brunswick

Lampsile jaune

### Current COSEWIC Assessment:

#### Status category:

XT  E  T  SC

**Date of last assessment:** May 2004

#### Reason for designation at last assessment:

Populations are quite large and apparently stable in Canada but found only in the Sydney River watershed, Nova Scotia and Saint John River watershed, New Brunswick. Threats are currently very limited but there are long-term concerns related to the potential for introduction of Zebra Mussels into the Saint John River, and maintaining habitat quality of the sole population in the Sydney River.

#### New reason for designation (only if different from above):

**Criteria applied at last assessment:** No alpha-numeric code applies  
From previous assessment:

#### Criterion A (Declining Total Population):

No data available on population decline rates.

#### Criterion B (Small Distribution, and Decline or Fluctuation):

Extent of occurrence and area of occupancy both small and meet endangered, but "continuing declines" either not present, unknown, or population is stable.

#### Criterion C (Small Total Population Size and Decline):

Number of mature individuals unknown, but probably much larger than criteria for threatened (e.g. total population estimated at > 1,000,000).

#### Criterion D (Very Small Population or Restricted Distribution):

Number of mature individuals unknown, but probably much larger than criteria for threatened (e.g. total population estimated at > 1,000,000. If area of occupancy < 20 km<sup>2</sup> it would qualify for threatened under D2, but AO unknown for Saint John River.

**Criterion E (Quantitative Analysis):** No data available for quantitative analysis

**If earlier version of criteria was applied<sup>1</sup>, provide correspondence to current criteria:** not applicable

**If different criteria are proposed based on new information, provide explanation:** not applicable

<sup>1</sup> An earlier version of the quantitative criteria was used by COSEWIC from October 1999 to May 2001 and is available on the COSEWIC website: [http://www.cosewic.gc.ca/eng/sct0/original\\_criteria\\_e.cfm](http://www.cosewic.gc.ca/eng/sct0/original_criteria_e.cfm)

**If application of current specific criteria is not possible, provide explanation:**

There is no apparent change in the criteria as noted in the previous assessment.

**SSC Recommendation:**

- No change in status and criteria  
 No change in status, new criteria

**Evidence (indicate as applicable):**

**Wildlife species:**

*Change in eligibility, taxonomy or designatable units:* yes  no

Explanation:

The taxonomy has not changed since 2004 Status Report.

**Range:**

*Change in extent of occurrence (EO):* yes  no  unk

*Change in area of occupancy (AO) :* yes  no  unk

*Change in number of known or inferred current locations:* yes  no  unk

*Significant new survey information:* yes  no

Explanation:

There have been limited new data generated since the last status report. During the preparation of this document, live mussel shells were retrieved from a new site in North Sydney (Pottle Lake draining directly to Sydney Harbour, 10 km from current Sydney River sites) indicating a population not recorded in the previous status report (COSEWIC 2004) (Figure 1). This was not a specific survey, but a random event, with brief follow-up for confirmation of presence of fresh versus aged shells. There are three historical sites (McKinley Ferry, Coal Creek, Darlings Lake) in the Saint John River but only Darlings Lake was re-sampled and no Yellow Lampmussel was found by Sabine *et al.* (2004).

The EO in 2004 was 20 km<sup>2</sup> in Nova Scotia and approximately 245 km<sup>2</sup> in New Brunswick (COSEWIC 2004). Based on the minimum convex polygon of extant sites, the current extent of occurrences in Nova Scotia (Figure 1) and New Brunswick (Figure 2) are 76 km<sup>2</sup> and 3464 km<sup>2</sup>, respectively. The combined extent of occurrence in Nova Scotia and New Brunswick is 19,462 km<sup>2</sup> (Figure 3). The increase in EO in Nova Scotia since 2004 is due mostly to finding a new site, Pottle Lake. The trend in EO in New Brunswick is unknown because no significant searches have been made since 2002.

In 2004 the AO was approximately 2.6 km<sup>2</sup> of the Sydney River and was unknown for the Saint John River (COSEWIC 2004). Based on 2 km by 2 km grids in continuous stretches of rivers/lakes, the IAO is currently 52 km<sup>2</sup> in Nova Scotia (Figure 4) and 924 km<sup>2</sup> in New Brunswick (Figure 5); the New Brunswick IAO assumes no changes in numbers of sites since 2002. The trends in IAO in both provinces are unknown because no significant searches have been made since 2002, excluding the Pottle Lake population.

The Yellow Lampmussel is found in as few as three locations (Sydney River, Pottle Lake, and Saint John River) based on combined impacts of invasive Zebra and/or Quagga (*Dreissena rostriformis*) Mussels on the Yellow Lampmussel, and illegal introduction of aggressive predatory species having a

potential impact on host fish throughout the Saint John River system, or 10 or more if based on pollution and other threats.

**Population Information:**

Change in number of mature individuals: yes  no  unk   
Change in total population trend: yes  no  unk   
Change in severity of population fragmentation: yes  no  unk   
Change in trend in area and/or quality of habitat: yes  no  unk   
Significant new survey information: yes  no

Explanation:

The sizes of populations at some sites are not known and the percent of total area of occupancy with small, unviable habitat patches is unknown. Some habitat patches are very remote from each other and might be considered fragmented but, with contiguity of White (*Morone americana*) and Yellow Perch (*Perca flavescens*) populations in the Saint John River system, fragmentation is probably not a factor.

The finding of a new population in Pottle Lake is significant new information because of the increase in EO for Yellow Lampmussel. The increase is due to increased search effort. However, there has been no work undertaken on the New Brunswick Yellow Lampmussel population in the last several years, and no specific survey work is planned at the moment (McAlpine pers. comm. 2013). While the Saint John River population is the largest for the species in Canada, there is no change in the information available since the last status report. The population sizes of mature individuals in 2002 were perhaps much greater than 100,000, but densities were small with 0.4 - 0.8/m<sup>2</sup> in both Sydney and Saint John rivers (COSEWIC 2004).

While there appear to have been long-term changes in quality and extent of habitat, the trends in population sizes are unknown.

**Threats:**

Change in nature and/or severity of threats: yes  no  unk

Explanation:

The threat from Zebra Mussels (*Dreissena polymorpha*), identified in COSEWIC (2004), has not yet materialized, but is still the most serious issue for the Yellow Lampmussel. High to low impact threats are three piscivorous predators – Chain Pickerel (*Esox niger*) and Smallmouth Bass (*Micropterus dolomieu*), which were illegally introduced into the Sydney River system (Nova Scotia) in approximately 2008, and the Muskellunge (*Esox masquinongy*), confirmed established in the Saint John River watershed. The former two species have been recorded as reducing both abundance and diversity of species associations in other small watersheds in parts of Nova Scotia (Gilhen pers. comm. 2012) so may pose a significant threat to possible host fish species. These two species have not been recorded in Pottle Lake although both species were noted by Fisheries and Oceans Canada (2010) as potential threats.

These fish species are also present in the Saint John River watershed in New Brunswick, but with the extensive nature of that system, there appears to be adequate diversity of habitats to maintain a wide base of fish species. The Sydney River system is substantively smaller and less diverse, so impact on possible host species may be significant (Appendix 1). It has been noted by Kneeland and

Rhymer (2008) that both Smallmouth Bass and Chain Pickerel are potential hosts for *Lampsilis* species, but not as frequently as species such as Yellow and White Perch or Banded Killifish (*Fundulus diaphanus*).

Dams and water management are negligible impact threats. Both the Sydney and Saint John systems are constrained, in part by dams. In the Saint John watershed, the Mactaquac dam is the upper limit of distribution of the species. Parts of the Saint John River watershed are being evaluated for possible development of small scale hydroelectrical generation, which could potentially impact Yellow Lampmussel habitat. The Sydney River system is maintained and, in part, protected from saltwater intrusion by the dam at the outflow. The DFO management plan suggests potential breach of the Sydney River dam could have a significant effect on this population, although the potential for such an event is not quantified (Appendix 1).

The number of locations was determined following IUCN guidelines by first selecting the most serious plausible threat that affects all of the taxon's distribution; where the most serious plausible threat does not affect all of the taxon's distribution, other threats can be used to define and count locations in those areas not affected by the most serious plausible threat. If there are two or more serious plausible threats, the number of locations should be based on the threat that results in the smallest number of locations. In the case of the Yellow Lampmussel, high to medium threat impacts included pollution from industrial and military effluents, agriculture, energy production (e.g. new oil pipeline with potential for spills/leaks), and invasive and other problematic species. Based on these cumulative threat impacts of pollution and introduction of non-native problematic species of fish, which are able to swim up or downstream of their introduction, three locations result: Sydney River, Pottle Lake, and the Saint John River. If pollution from the various sources is the highest impact threat, the number of locations is likely >10.

**Protection:**

*Change in effective protection:*

yes  no

Explanation:

The federal *Fisheries Act* historically represented the single most important piece of legislation protecting the Yellow Lampmussel and its habitat in Canada. However, recent changes to the *Fisheries Act* have significantly altered protection for this species and it is unclear at this time if the *Fisheries Act* will continue to provide protection for this species. Three significant changes are: All explicit references to fish habitat have been removed; "harmful alteration, disruption, or destruction of fish habitat" has been replaced by "serious harm to fish"; general prohibitions against harm to fish habitat have been replaced by those that apply now only to fish that are important to a "commercial, recreational, or Aboriginal fishery". Possibly the *Navigable Waters Act* may also afford protection to this species.

The second population in Cape Breton County (Pottle Lake) is in a protected designated drinking-water watershed area so would have some added protection from disturbance not currently afforded the Sydney River subpopulation(s).

**Rescue Effect:**

*Evidence of rescue effect:*

yes  no

Explanation:

If rescue from the US is possible it would have to be via a diadromous fish species; the only diadromous species in the Sydney River are Atlantic Salmon (*Salmo salar*), sea-run Brook Trout (*Salvelinus fontinalis*), Gaspereau (*Alosa pseudoharengus*) and American Eel (*Anguilla rostrata*), but they are not known hosts of Yellow Lampmussel. The only confirmed hosts are the freshwater fish, White Perch (*Morone americana*) (COSEWIC 2004), Banded Killifish, Chain Pickerel (*Esox Niger*), and Smallmouth Bass (*Micropterus dolomieu*) (Kneeland and Rhymer 2008). Due to isolation of both Yellow Lampmussel from these freshwater fish species, rescue would be unlikely. While White Perch are recorded to be anadromous in some parts of their range (Scott and Crossman 1973) they have only been recorded from freshwater or brackish water habitats in Nova Scotia waters (Gilhen pers. comm. 2012).

**Quantitative Analysis:**

*Change in estimated probability of extirpation:*

yes  no  unk

Details:

None performed.

**Summary and Additional Considerations:** [e.g., recovery efforts]

The mean and maximum ages of this species in Sydney River are 8 and 17 years, respectively (White 2003), with times for generation of 24 years average and 52 years maximum.

At this time, there is no information to indicate that the state of the two populations has changed substantially from the last survey work undertaken. Unlike the Sydney River where habitat quality was declining (COSEWIC 2004), the habitat conditions in the Saint John watershed appear to be relatively unchanged based on general overview, and there have not been any catastrophic events or exotic introductions that could have an impact on the Yellow Lampmussel or its required habitat as of November 2013.

Within the Sydney River system, there has been little change in physical habitat since 2002, although the shorelines along the Sydney River were progressively being subjected to residential and service industry development and there is increasing risk of pollution and siltation from property maintenance, transportation accidents, and recreational activities (COSEWIC 2004). The illegal introduction of two piscivorous fish could affect host fishes (See **Threats**).

The identification of an additional population within another (small) watershed in the Sydney area offers the possibility of added persistence in a more protected area, but this needs further investigation.

There is a finalized management plan generated by Fisheries and Oceans Canada (Fisheries and Oceans Canada 2010) for Yellow Lampmussel in Canada.



## Acknowledgements

Thanks are due to Jenny Wu for creating the maps and calculating the EOs and IAOs for the two jurisdictions.

### Authorities Contacted:

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- \* Tomie, Jared. August 28, 2013. Environmental Project Manager. Atlantic Coastal Action Program (ACAP) Cape Breton, Sydney, Nova Scotia. [jtomie@acapcb.ns.ca](mailto:jtomie@acapcb.ns.ca)
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\*Denotes that information was provided by authority contacted.

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## TECHNICAL SUMMARY

*Lampsilis cariosa*

Yellow Lampmussel

Lampsile jaune

Range of occurrence in Canada (province/territory/ocean): New Brunswick, Nova Scotia

### Demographic Information

Generation time (usually average age of parents in the population; indicate if another method of estimating generation time indicated in the IUCN guidelines(2008) is being used)	Mean age 8 years, maximum 17 years
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	yes
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations]. Based on high threat impacts of pollution and invasive and non-native fish species, there is potential for a 50% decline in total number of mature individuals over 10 years, but timing of invasion uncertain.	unknown
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations]. Based on high threat impacts of pollution and invasive and non-native fish species, there is potential for at least a 50% decline in number of mature individuals over 3 generations, according to the threats calculator, but timing of invasion uncertain.	unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future. Based on high threat impacts of pollution and invasive and non-native fish species, there is potential for at least a 50% decline in number of mature individuals over 3 generations, according to the threats calculator, but timing of invasion uncertain.	unknown
Are the causes of the decline clearly reversible and understood and ceased?	no
Are there extreme fluctuations in number of mature individuals?	not likely

### Extent and Occupancy Information

Estimated extent of occurrence	19,462 km <sup>2</sup>
Index of area of occupancy (IAO) (Always report 2x2 grid value).	976 km <sup>2</sup>

Is the population severely fragmented?	unlikely
Number of locations* As few as three (Sydney River, Pottle Lake, and Saint John River) based on combined impacts of invasive Zebra and/or Quagga Mussels on the Yellow Lampmussel, but timing of invasion unknown, and illegal introduction of aggressive predatory species having a potential impact on host fish throughout the system, or more than 10 if based on pollution.	3 or >10
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence?	no
Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy?	no
Is there an [observed, inferred, or projected] continuing decline in number of populations?	no
Is there an [observed, inferred, or projected] continuing decline in number of locations*?	no
Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat?	Sydney River, Yes (based on quality); Pottle Lake, probably not; Saint John River, no, although local degradation in quality
Are there extreme fluctuations in number of populations?	no
Are there extreme fluctuations in number of locations*?	no
Are there extreme fluctuations in extent of occurrence?	no
Are there extreme fluctuations in index of area of occupancy?	no

#### Number of Mature Individuals (in each population)

Population	N Mature Individuals
Sydney River	unknown
Pottle Lake	unknown
Saint John River	unknown
Total (assuming populations have not declined significantly since 2002)	unknown

#### Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	unknown
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#### Threats (actual or imminent, to populations or habitats)

High to medium threat impacts included pollution from industrial and military effluents, agriculture, energy production (e.g. new oil pipeline with potential for spills/leaks), and invasive and other problematic species, which for fish are able to swim up or downstream of their introduction.
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**Rescue Effect (immigration from outside Canada)**

Status of outside population(s)? Heritage Status Rank Reasons: Range and abundance have contracted somewhat. United States National Heritage Status Rank: N3N4. Connecticut (SNR), Delaware (SH), District of Columbia (SH), Georgia (S2), Maine (S2S3), Maryland (SU), Massachusetts (SH), New Hampshire (SX), New Jersey (S2), New York (S3), North Carolina (S1), Pennsylvania (S3S4), South Carolina (S2), Vermont (SR), Virginia (S2), West Virginia (S1). International Union for the Conservation of Nature (IUCN): endangered. American Fisheries Society Status: Threatened (Williams <i>et al.</i> 1993)	G3G4
Is immigration known or possible?	no
Would immigrants be adapted to survive in Canada?	yes
Is there sufficient habitat for immigrants in Canada?	yes
Is rescue from outside populations likely?	unlikely

**Data-Sensitive Species**

Is this a data-sensitive species? If exact longitudes and latitudes of each siting were provided in this report, then yes, but none are given.	no
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**Status History**

COSEWIC: Designated Special Concern in May 2004. Status re-examined and confirmed in November 2013.
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**Additional Sources of Information:**

Management Plan for Yellow Lampmussel (DFO Apr 2010)  
Species Assessment Summary (A Hebda Feb 2013)

**Status and Reasons for Designation:**

<b>Status:</b> Special Concern	<b>Alpha-numeric code:</b> Not applicable
<b>Reasons for designation:</b> Populations still occur in the Sydney River watershed, Nova Scotia, and in the Saint John River watershed, New Brunswick. In addition, a new site has been found at Pottle Lake in Nova Scotia. While cumulative threat impacts from non-native species of fish and from industrial pollution are high, there is uncertainty about the timing and possibility of invasion by Zebra Mussels and the impact of non-native species of fish on host fish for the Yellow Lampmussel.	

### **Applicability of Criteria**

Criterion A (Decline in Total Number of Mature Individuals): Not applicable. Rate of decline unknown.
Criterion B (Small Distribution Range and Decline or Fluctuation): Not applicable. EO is less than 20,000km <sup>2</sup> , the IAO is less than 2,000km <sup>2</sup> , and there are less than 10 locations, but there is not a continuing decline projected in the EO, the IAO, the area, and extent and quality of habitat.
Criterion C (Small and Declining Number of Mature Individuals): Not applicable. No information on numbers of mature individuals.
Criterion D (Very Small or Restricted Population): Not applicable. No information on numbers of mature individuals and IAO exceeded.
Criterion E (Quantitative Analysis): Not applicable. No data available for quantitative analysis.

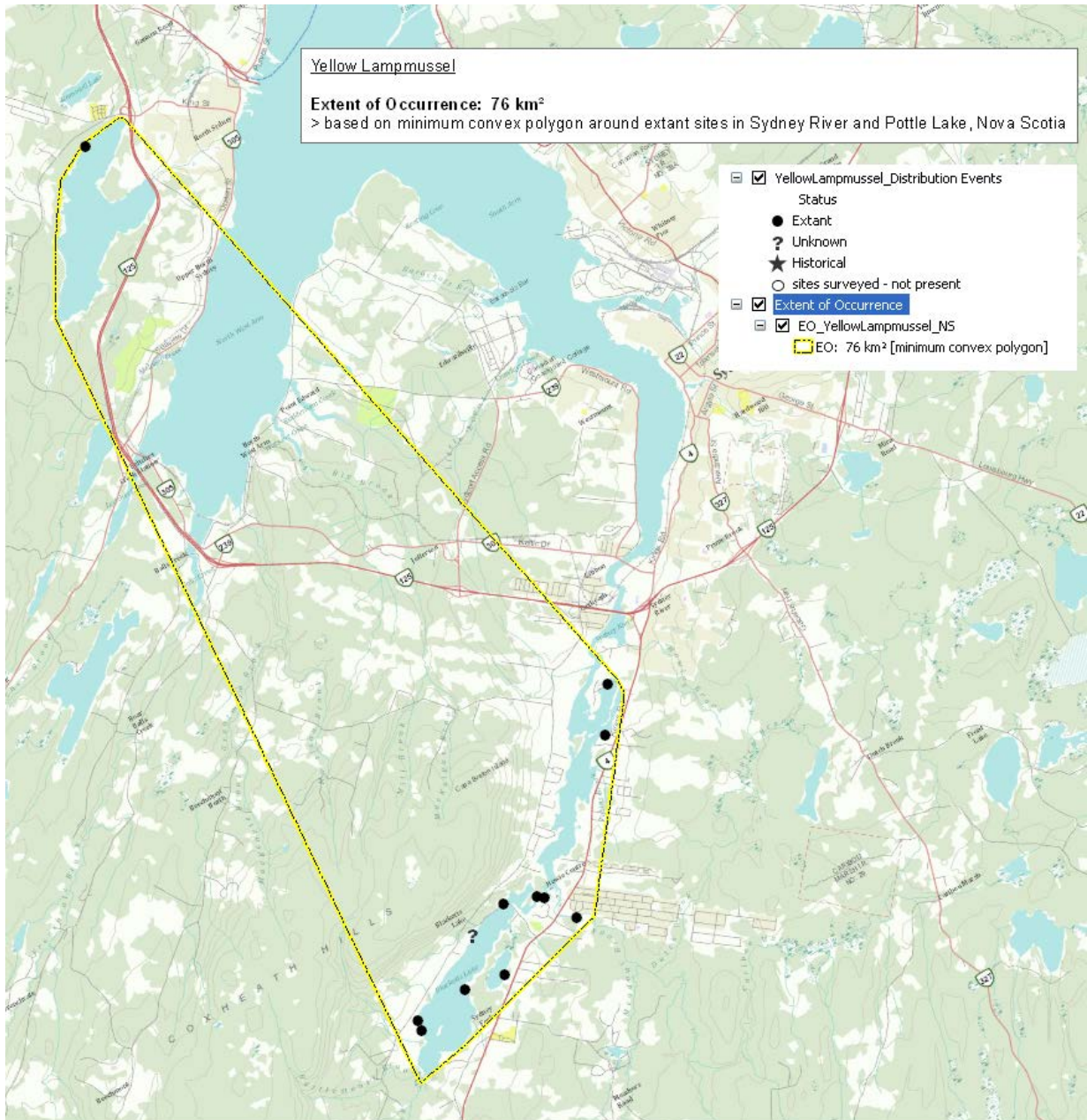


Figure 1. Historical and current extent of occurrence of the Yellow Lampmussel in Nova Scotia (Pottle Lake is top left point). Jenny Wu (Environment Canada) provided the map and calculations.



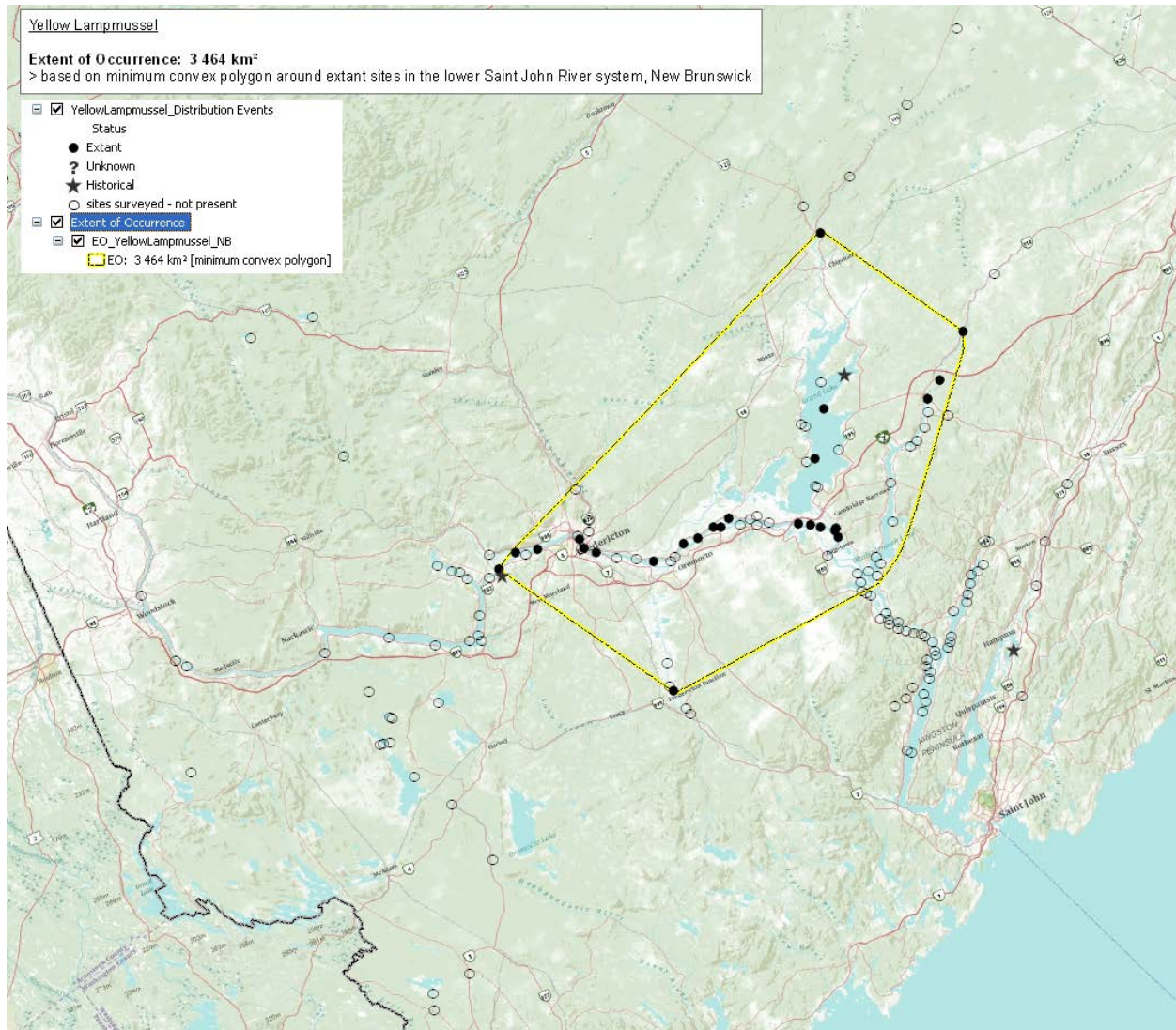


Figure 2 Historical and assumed current extent of occurrence of the Yellow Lampmussel in New Brunswick. Jenny Wu (Environment Canada) provided the map and calculations.

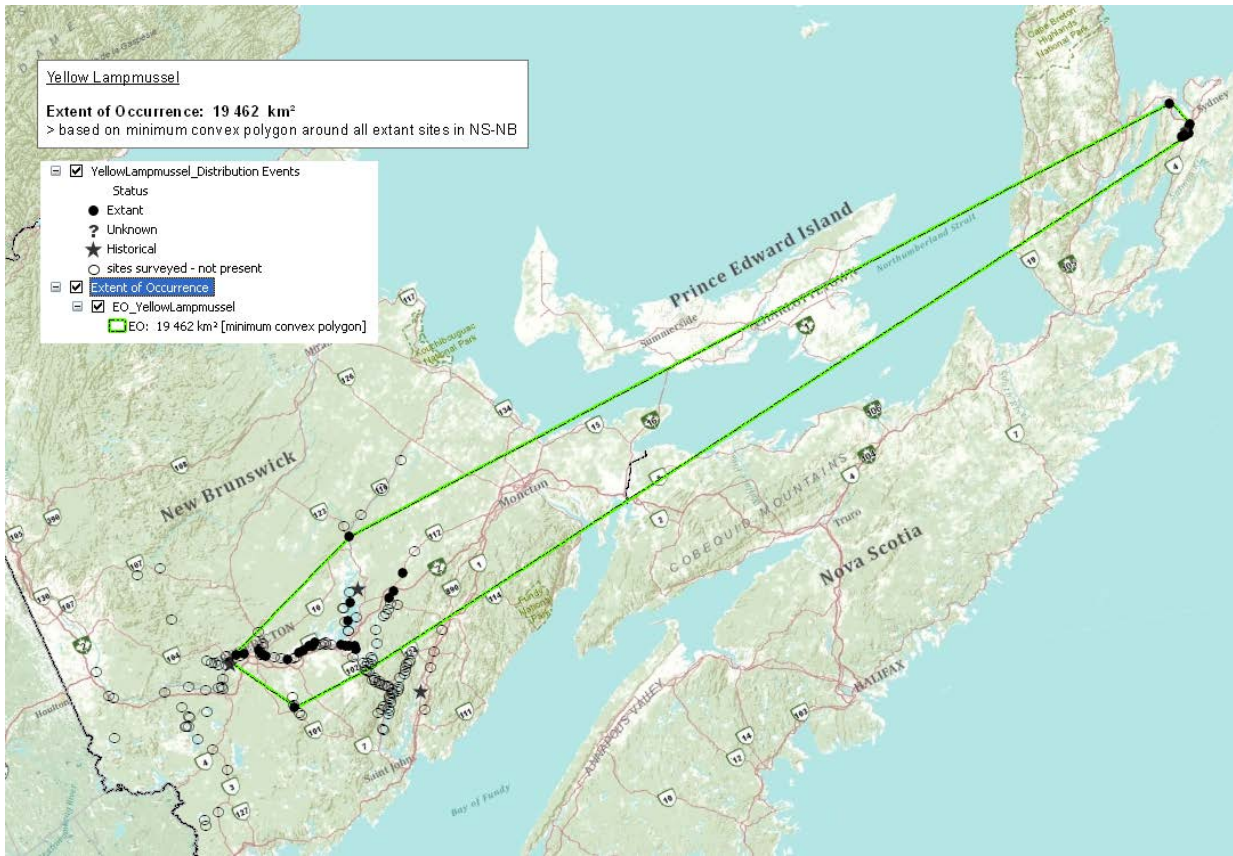


Figure 3. Historical and current combined extent of occurrence in Nova Scotia and New Brunswick. Jenny Wu (Environment Canada) provided the map and calculations.

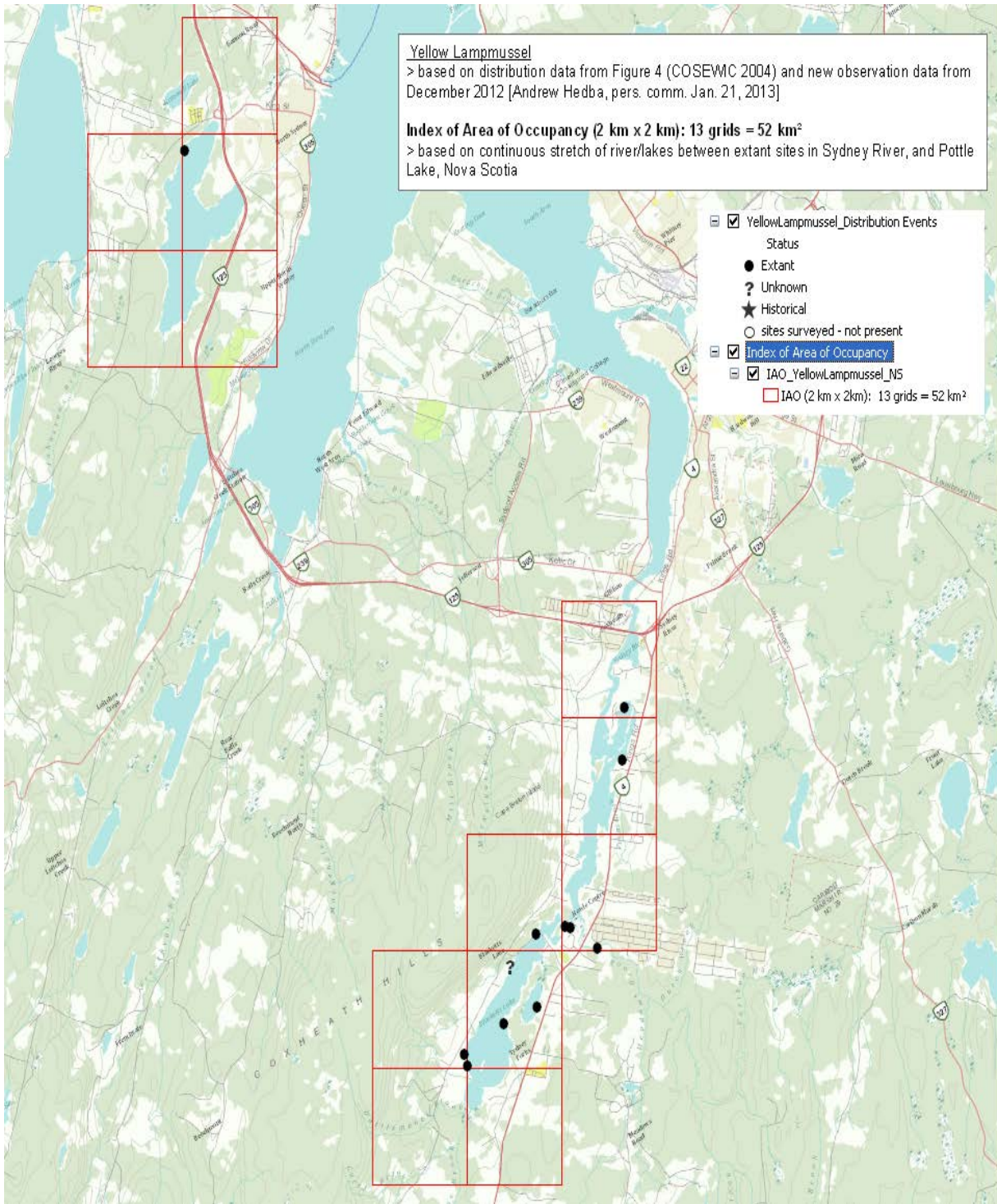


Figure 4. Index of area of occupancy of the Yellow Lampmussel in Nova Scotia, showing new Pottle Lake population since 2002, top left; remaining sites are assumed to still be extant since 2002. Jenny Wu (Environment Canada) provided the map and calculations.

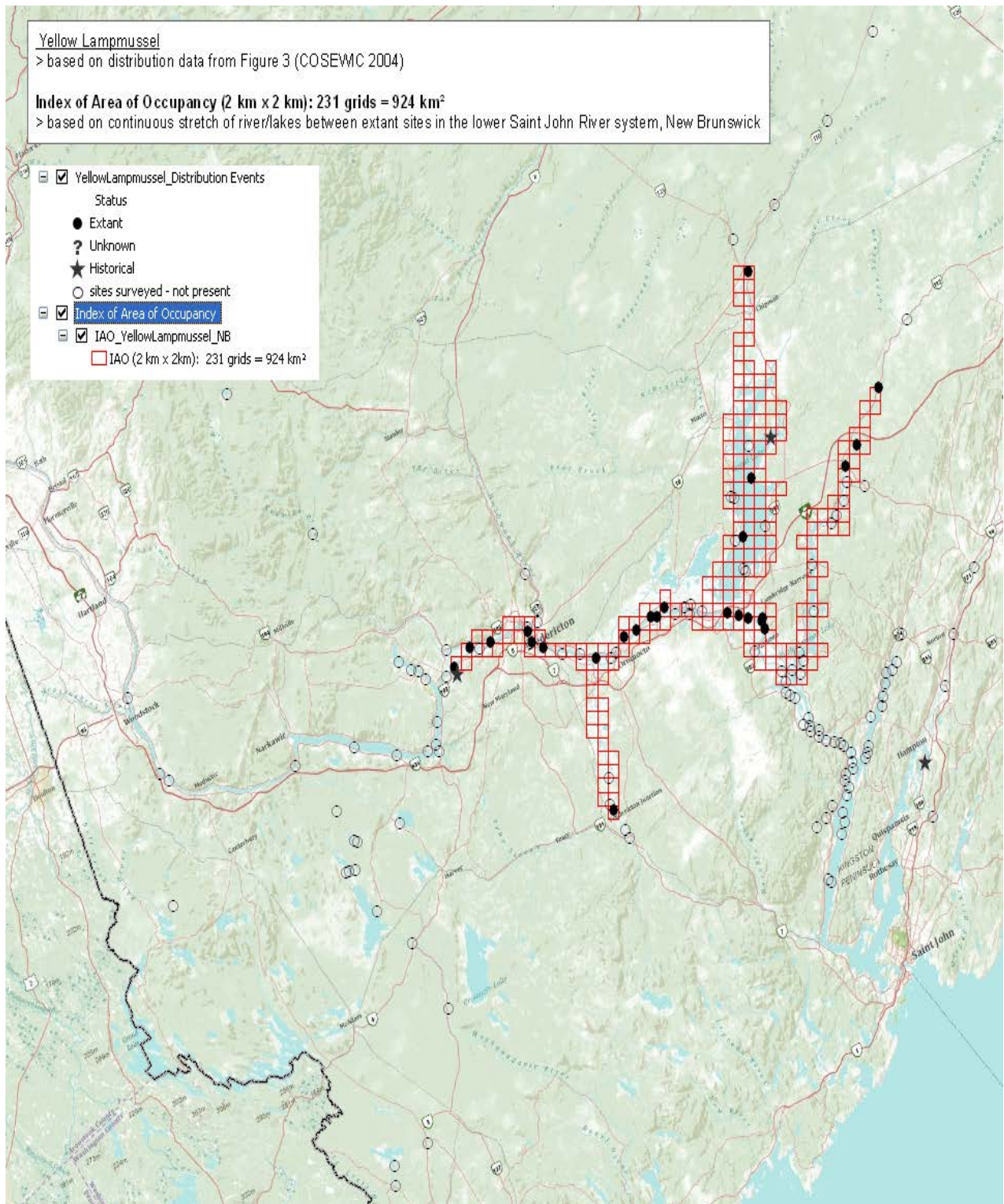


Figure 5. Assumed (based entirely on COSEWIC (2004)) index of area of occupancy of the Yellow Lampmussel in New Brunswick. Jenny Wu (Environment Canada) provided the map and calculations.

**Appendix 1. Threats calculator for Yellow Lampmussel. Based on discussions among members attending the Mollusc SSC meeting in Yellowknife, NWT, September 9, 2013, Dave Fraser, Ministry of Environment, Victoria, B.C. via teleconference, and Mary Sabine, Department Natural Resources, Fredericton, NB via written comments.**

		Level 1 Threat Impact Counts	
Threat Impact		high range	low range
A	Very High	1	1
B	High	1	0
C	Medium	0	1
D	Low	1	1
<b>Calculated Overall Threat Impact:</b>		<b>Very High</b>	<b>Very High</b>

Threat	Impact (calculated)	Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments	
1	<a href="#">Residential &amp; commercial development</a>					
1.1	Housing & urban areas				See pollution - siltation by housing & urban development	
1.2	Commercial & industrial areas				See pollution - siltation by commercial and industrial areas pollution	
1.3	Tourism & recreation areas				Shallow water so not applicable; no rafting,	
2	<a href="#">Agriculture &amp; aquaculture</a>	Negligible (<1%)	Extreme (71-100%)	High (Continuing)		
2.3	Livestock farming & ranching	Negligible (<1%)	Extreme (71-100%)	High (Continuing)	Trampling by cattle in stream	
3	<a href="#">Energy production &amp; mining</a>	D Low	Small (1-10%)	Extreme (71-100%)	Moderate - Low	
3.1	Oil & gas drilling	Unknown	Small (1-10%)	Unknown	Moderate (Possibly in the short term, < 10 yrs/3 gen)	Seismic testing occurring within Yellow Lampmussel range; potential for more fracking; potential sites for small hydro dams have been mapped across NB
3.3	Renewable energy	D Low	Small (1-10%)	Extreme (71-100%)	Moderate - Low	Possibility of hydro dam in Yellow Mussel habitat
5	<a href="#">Biological resource use</a>	Negligible	Pervasive (71-100%)	Negligible (<1%)	High (Continuing)	
5.4	Fishing & harvesting aquatic resources	Negligible	Pervasive (71-100%)	Negligible (<1%)	High (Continuing)	Fishing for host fish (White Perch)
6	<a href="#">Human intrusions &amp; disturbance</a>	Negligible	Negligible (<1%)	Extreme - Serious (31-100%)	High (Continuing)	
6.1	Recreational activities	Negligible	Negligible (<1%)	Extreme - Serious (31-100%)	High (Continuing)	ATV, boat traffic
7	<a href="#">Natural system modifications</a>	Negligible	Negligible (<1%)	Moderate-Slight (1-30%)	High (Continuing)	

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
7.2	Dams & water management/use						Potential breach of the Sydney River dam could have a significant effect on this population, although the potential for such an event is not quantified.
7.3	Other ecosystem modifications		Negligible	Negligible (<1%)	Moderate - Slight (1-30%)	High (Continuing)	Rip rap, retaining walls to water's edge
8	<a href="#">Invasive &amp; other problematic species &amp; genes</a>	A	Very High	Pervasive (71-100%)	Extreme (71-100%)	Moderate (Possibly in the short term, < 10 yrs/3 gen)	
8.1	Invasive non-native/alien species	A	Very High	Pervasive (71-100%)	Extreme (71-100%)	Moderate (Possibly in the short term, < 10 yrs/3 gen)	Chain Pickerel, Muskellunge, Smallmouth Bass; impact questionable in next 10 years in both Saint John River and Sydney River. Zebra Mussel invasion timing uncertain, possibly in short or long term. The Sydney River system is substantively smaller than the Saint John River and less diverse, so impact on possible host fish species may be significant'
9	<a href="#">Pollution</a>	BC	High - Medium	Pervasive (71-100%)	Serious - Moderate (11-70%)	High (Continuing)	Many cumulative effects
9.1	Household sewage & urban waste water	CD	Medium - Low	Pervasive (71-100%)	Moderate - Slight (1-30%)	High (Continuing)	Water quality in NB improving but still impaired in some areas; stochastic events uncertain
9.2	Industrial & military effluents	BD	High - Low	Pervasive - Restricted (11-100%)	Serious - Moderate (11-70%)	High - Moderate	Proposed west-east pipeline likely to occur in next 10 years, potential for oil spills; vehicle upsets; a large open pit tungsten mine project is proposed and potential for tailings to enter upper Nashwaak watershed; lots of sediment/bedload movement from Canadian Forces Base at Georgetown
9.3	Agricultural & forestry effluents	CD	Medium - Low	Pervasive (71-100%)	Moderate - Slight (1-30%)	High (Continuing)	Runoff from agricultural land & forestry practices and episodic releases
11	<a href="#">Climate change &amp; severe weather</a>						Increased concern over the long term ~60 years

Kneeland, Stephen C., "Identification of Fish Hosts for Wild Populations of Rare Freshwater Mussels (*Lampsilis cariosa* and *Leptodea Ochracea*) Using a Molecular DNA Key" (2006).

M.Sc. thesis, Department of Environmental Ecology and Environmental Science, University of Maine.



### COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

### COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

### COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

### DEFINITIONS (2013)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

\* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

\*\* Formerly described as "Not In Any Category", or "No Designation Required."

\*\*\* Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.



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The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.