



OCCURRENCES OF RARE, THREATENED, AND ENDANGERED MUSSEL SPECIES IN THE VICINITY OF THE NIAGARA POWER PROJECT

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**NIAGARA POWER PROJECT (FERC NO. 2216)
OCCURRENCES OF RTE MUSSEL SPECIES**

TABLE OF CONTENTS

EXECUTIVE SUMMARY ii

1.0 INTRODUCTION..... 1

2.0 INVESTIGATION AREA..... 1

3.0 METHODS 1

 3.1 Species Included 1

 3.2 Literature Review 2

 3.3 Field Surveys 2

4.0 RESULTS 3

 4.1 Literature Review of RTE Mussel Occurrences 3

 4.2 Results of Field Surveys 5

5.0 DISCUSSION 6

REFERENCES..... 11

TABLES AND FIGURES

Table 4.1-1 8
Rare and Common Mussels Recorded from the Niagara River and Immediate Vicinity 8

Table 4.2-1 9
Occurrences of NYNHP-Listed Mussels in the Investigation Area 9

Figure 3.3-1 10
Map of Mussel Survey Sites in the Investigation Area..... 10

NIAGARA POWER PROJECT (FERC NO. 2216) OCCURRENCES OF RTE MUSSEL SPECIES

EXECUTIVE SUMMARY

During 2001 and 2002, Riveredge Associates performed a literature-based review and field surveys for the occurrence of rare, threatened, and endangered species of mussels in the vicinity of the Niagara Power Project, Lewiston, New York. This report describes the results of both the literature review and field surveys. A previous report on rare, threatened, and endangered species ([Riveredge 2002](#)) contained additional information on the natural history and habitat requirements of mussels and information on threats to mussels.

The New York Natural Heritage Program Biological and Conservation Data System lists ten occurrences of seven species of rare mussels in the area investigated. A literature review revealed records of 31 species of mussels in the Niagara River within the investigation area; 20 of these are on the current New York Natural Heritage Program Rare Animal list. Many of these records are historical. Some are approximately 100 years old.

Field surveys conducted in 2001 and in 2002 at 22 sites along the Niagara River recorded ten mussel species on the Heritage Rare Animal list from live animals or spent shells. Live representatives of three of these ten species were found. The remaining seven species were represented only by the presence of spent shells. In addition to these ten rare species, another six species, all common, were represented by live animals or spent shells.

Three species of mussels considered endangered or threatened by the United States Fish and Wildlife Service or the New York State Department of Environmental Conservation are known to have once occurred in the Niagara River in or near the investigation area. The most recent records for these three species are from 1906. No other records of mussels considered endangered or threatened were found during this investigation.

NIAGARA POWER PROJECT (FERC NO. 2216) OCCURRENCES OF RTE MUSSEL SPECIES

1.0 INTRODUCTION

Riveredge Associates, LLC (Riveredge) was contracted by the New York Power Authority (NYPA) to conduct a survey of federal- and state-listed rare, threatened and endangered (RTE) species of mussels in the waters of the Niagara River near the Niagara Power Project (NPP) at Lewiston, New York.

This report describes known occurrences of RTE mussel species in the investigation area as determined through a literature review and field surveys. Mussels considered in this investigation include all species on the New York Natural Heritage Program (NYNHP) Rare Animal list ([NYNHP 2002](#)). This list includes all species listed as threatened or endangered (T&E) by the U.S. Fish and Wildlife Service (USFWS), all species listed as T&E or Special Concern (SC) by the New York State Department of Environmental Conservation (NYSDEC), and many other species inventoried by NYNHP (many of them uncommon) that are not listed by USFWS or NYSDEC, and are therefore unprotected.

2.0 INVESTIGATION AREA

Mussel surveys were conducted along the U.S. shoreline of the Niagara River, including the Grand Island shoreline, and in the mouths of its U.S. tributaries from Strawberry Island to the river's outlet at Lake Ontario.

3.0 METHODS

3.1 Species Included

All mussel species known to occur in the investigation area that are currently on the NYNHP Rare Animal list ([NYNHP 2002](#)) were covered in this investigation. This list includes all species designated as threatened or endangered by USFWS or by NYSDEC, all species designated as Special Concern by NYSDEC, and a number of unprotected species that are inventoried by NYNHP. In addition, any common species encountered during field surveys are included in this report.

NIAGARA POWER PROJECT (FERC NO. 2216) OCCURRENCES OF RTE MUSSEL SPECIES

3.2 Literature Review

During the summer of 2001, species previously documented in the investigation area were identified through the review of NYNHP inventory records ([NYNHP 2001](#)), original NYNHP field survey forms, published museum records, and discussions with selected knowledgeable individuals in the region.

3.3 Field Surveys

To maximize the chances of finding rare mussel species it is necessary to find as many individual mussels as possible. This requires identifying all mussel habitats in the investigation area and targeting those sites most likely to support large numbers of mussels. By definition, rare mussels are uncommon, and they are often unevenly distributed. Research has shown that the number of mussel species found during field surveys is directly related to the number of individual mussels collected and the time spent searching ([Metcalf-Smith et al. 2000](#)).

In preparation for field surveys, mussel habitat and potential survey sites were identified through a review of the literature, past surveys, topographic maps, and aerial photos. In addition, potential survey sites were identified by scouting gravel bars, sand bars, backwaters, middens (areas of shell-piles left by muskrats), riffles, and island shorelines, since these habitats typically contain mussels. The sites near Beaver Island State Park and Buckhorn Island State Park where Strayer et al. ([1991](#)) collected mussels were included as survey sites because it was thought that mussels would likely still be present in these areas. Twenty-two sites were selected for mussel surveys ([Figure 3.3-1](#)). In the summer of 2001 and again in the summer of 2002, surveys were performed by two to four observers. Each site was visually examined for 15 minutes, often using view buckets or a mask and snorkel. If no evidence of mussels was found after 15 minutes, the site was abandoned. If evidence was found that mussels were present, such as spent shells, shell fragments, or living mussels, the survey was continued for a minimum total time of one hour. Live mussels were collected in a mesh bag, identified, and returned to the sampling site. Selected spent shells were retained for confirmation of identification.

NIAGARA POWER PROJECT (FERC NO. 2216) OCCURRENCES OF RTE MUSSEL SPECIES

In 2001, mussel surveys were conducted by two or three observers from July 11 through 13. During that summer, a few mussel shells were also collected in the course of fish surveys (being conducted separately) in the Niagara River's Tonawanda Channel (east channel) downstream of the south Grand Island Bridges. These specimens were collected using SCUBA.

In June and July 2002, more intensive mussel surveys were conducted. These surveys focused on Beaver Island, Buckhorn Island, and Spicer Creek, where living specimens or recently spent shells had been found in 2001. Not only did these surveys commence earlier in the year than in 2001, but they also included sampling in areas of soft substrate. Surveys were started in June to avoid midsummer algal blooms, which can make underwater observation difficult. Areas of soft substrate (i.e., sediment) were surveyed since they may serve as refugia for native mussels in areas infested by non-native zebra mussels ([Nichols and Wilcox 1997](#)). On June 11 and 12, 2002, sites near Beaver Island and Buckhorn Island were surveyed by two observers. Woods Creek and Grass Island (also known as Sunken Island) were also surveyed, and areas of soft sediments at these two sites were probed with a clam rake. Surveys at Spicer Creek were delayed until July 18 because the water was too turbid in June. Since Spicer Creek was still turbid in July, the four observers who surveyed this site combed systematically through the creek bed with their fingers. Each 2002 survey site received a minimum of 4 person-hours of survey time. Seven person-hours were spent at Spicer Creek because the survey had to be accomplished by feel rather than by sight.

4.0 RESULTS

The results of this investigation cover both the findings of the literature review ([Section 4.1](#)) and the results of the two field surveys ([Section 4.2](#)).

4.1 Literature Review of RTE Mussel Occurrences

Malacologists have studied the freshwater mussels of the Niagara River since the late nineteenth century. Robertson and Blakeslee ([1948](#)), who published one of the first comprehensive reviews of this subject, drew heavily on the earlier research of Lewis ([1874](#)), Marshall ([1895](#)) and Letson (1905 and

NIAGARA POWER PROJECT (FERC NO. 2216) OCCURRENCES OF RTE MUSSEL SPECIES

[1909](#)). Strayer and Jirka ([1997](#)) have provided more recent information, reviewing records of native mussels for New York State, including the Niagara River.

Since researchers began documenting the mussel fauna of the Niagara River and Buffalo Harbor more than a century ago, 31 species of the family Unionidae have been reliably reported or collected from these waters ([Table 4.1-1](#)). Today, 20 of these 31 species are included on the NYNHP Rare Animal list ([NYNHP 2002](#)) ([Table 4.1-1](#)). Published records of three additional species (*Cyclonaias tuberculata*, *Epioblasma obliquata* and *Potamilus ohioensis*) are not included on [Table 4.1-1](#) because recent research by Strayer and Jirka ([1997](#)) has determined that these records are likely erroneous.

The most recent field surveys prior to this report were conducted during 1990 by Strayer et al. ([1991](#)) who surveyed the mussel fauna at 52 sites in western New York. Strayer et al. visited three Niagara River sites in the investigation area, including Goat Island, Buckhorn Island, and Beaver Island. They confirmed the presence of seven NYNHP-listed species from living animals or recently spent shells. The remaining 13 NYNHP-listed species ([NYNHP 2002](#)) were either not located or were represented only by old shells. NYNHP considers seven of these 13 species historical in New York, meaning they have not been seen in the last 15 to 20 years. The other six are not likely to be found anywhere in New York State except the Lake Erie-Niagara River watershed because they are at the eastern edge of their range in western New York.

Mussel species historically present include two that are listed as endangered by both NYSDEC and USFWS (*Lampsilis abrupta*, *Potamilus capax*) and one listed as threatened by NYSDEC (*Lampsilis fasciola*). Around 1906, a single specimen of *Lampsilis abrupta* was collected from the Niagara River (Strayer and Jirka 1997). Some authorities question the legitimacy of this record because the nearest extant populations are found in the lower Allegheny basin of Pennsylvania and the Wabash basin in Indiana. Strayer and Jirka ([1997](#)), however, present compelling evidence that this species might once have lived in New York State. Similarly, a specimen of *Potamilus capax* in the Buffalo Museum of Science supports its existence in the Niagara River and one other site in 1906. Both these specimens, however, are nearly 100 years old and neither of the globally rare species that they represent has been

NIAGARA POWER PROJECT (FERC NO. 2216) OCCURRENCES OF RTE MUSSEL SPECIES

seen in the Niagara River since. *Lampsilis fasciola* is still extant in the State but is very rare and is currently listed by NYSDEC as threatened.

4.2 Results of Field Surveys

Twenty-two sites in or adjacent to the Niagara River were selected for field surveys. Of these 22 sites, three showed no trace of mussel shells (Gill Creek, Woods Creek, and the south end of Strawberry Island), three had no suitable habitat for mussels (Big Sixmile Creek, Cayuga Creek, and the south fork of Gun Creek) and one had no public access for biologists (north fork of Gun Creek).

Mussel shells or live mussels were found at all of the remaining (15) survey sites, including (1) the south end of Beaver Island State Park, (2) the south end of Beaver Island, (3) the northwest side of Beaver Island, (4) the Niagara River at West River Road, (5) Spicer Creek, (6) Spicer Creek mouth, (7) Buckhorn Island North, (8) Buckhorn Island Southwest, (9) Buckhorn Island east of Woods Creek, (10) Grass (Sunken) Island, (11) Little Niagara River at Jayne Park, (12) Niagara River between the Holiday Inn and the south Grand Island Bridge, (13) Niagara River Tonawanda Channel (east channel), (14) lower Niagara River south of Joseph Davis State Park, and (15) the lower Niagara River south of Fort Niagara.

A review of spent shells and live mussels found at these 15 sites revealed 16 species, both rare and common. Six of these species are common and widely distributed and are not inventoried by NYNHP. These six common species were *Andontooides ferrussacianus*, *Elliptio complanata*, *Elliptio dilatata*, *Lampsilis radiata*, *Lampsilis siliquoidea*, and *Pyganodon grandis*. The other ten species encountered are on the NYNHP Rare Animal list ([NYNHP 2002](#)) ([Table 4.2-1](#)). Three of these ten species were represented by live animals and seven by spent shells. All specimens or shells of these ten species were found in the upper river. No evidence of mussels on the NYNHP Rare Animal list ([NYNHP 2002](#)) was observed in the lower river. None of the 16 mussel species recorded in field surveys is listed as threatened or endangered by NYSDEC or USFWS. All 16 mussel species encountered are unprotected.

NIAGARA POWER PROJECT (FERC NO. 2216) OCCURRENCES OF RTE MUSSEL SPECIES

Forty-six live mussel specimens were found, four during the 2001 surveys and 42 during the 2002 surveys. Of these 46 live specimens, 39 individuals (85%) were of three common, unlisted species. The remaining seven individuals represented three species on the NYNHP Rare Animal list ([NYNHP 2002](#)). All live mussels were found at only two sites in the upper river. The remaining 13 sites contained only spent shells.

For both rare species and common species, the vast majority of living animals and recently spent shells were found at sites near Beaver Island, Buckhorn Island, and Spicer Creek. Unlike most of the river shoreline in the vicinity of the Project, the shoreline at these sites is relatively undeveloped and the aquatic habitat relatively undisturbed. Beaver Island and Buckhorn Marsh are protected and managed by state agencies, and the lower portion of Spicer Creek retains some of its natural shoreline vegetation.

5.0 DISCUSSION

Field surveys recorded 16 unprotected species of both rare and common mussels in the area investigated. Although none of these species is listed as threatened or endangered by NYSDEC or USFWS, ten species are considered rare by NYNHP ([NYNHP 2002](#)). During surveys of the upper Niagara River, live specimens of three of these ten species were found along relatively undeveloped shoreline. The remaining seven rare species were represented only by spent shells. All species recorded in the Niagara River by Strayer et al ([1991](#)) were recorded in these surveys.

Although the presence of spent shells suggests that these species occurred in the area where the shells were found, the length of time a spent shell may persist in the river is unknown. Generally, older spent shells lose their luster and appear chalky, while shells more recently spent remain shiny and retain some of their natural color. Live mussels, however, provide the only truly unequivocal evidence that a species persists at a given location. Although these surveys recorded spent shells of *Obovaria olivaria*, this species is considered historical in New York ([NYNHP 2002](#)); there are no records of living or recently dead animals for the Niagara River since 1970 ([Strayer and Jirka 1997](#)).

NIAGARA POWER PROJECT (FERC NO. 2216) OCCURRENCES OF RTE MUSSEL SPECIES

Zebra mussels (*Dreissena* spp.) have dramatically changed the distribution and abundance of native mussels in Lake Erie ([Schloesser et al. 1996](#)). Zebra mussels were found at every survey site and it is likely that they have had the same impact in the Niagara River. Zebra mussels attach to the shells of native mussels and can quickly smother and kill them. Within just a few years of becoming established, zebra mussels can eliminate all native mussels in a given area ([Schloesser et al. 1996](#); [Strayer and Smith 1996](#)). Native mussels may be able to persist in areas where zebra mussels do not occur or in marshy areas where soft sediments allow the native mussels to burrow and avoid being smothered ([Nichols and Wilcox 1997](#)). Spicer Creek appears to provide just such a refuge, and is the only site where live native mussels were found in any number. Spicer Creek has relatively low flow and cooler bottom water than the main river, possibly due to groundwater infiltration. In the main Niagara River, zebra mussels appear to have largely eliminated native mussels.

**NIAGARA POWER PROJECT (FERC NO. 2216)
OCCURRENCES OF RTE MUSSEL SPECIES**

**TABLE 4.1-1
RARE AND COMMON MUSSELS RECORDED FROM THE NIAGARA RIVER AND
IMMEDIATE VICINITY**

#	Species	Date	USFWS Status	NYSDEC Status
1	<i>Actinonaias ligamentina</i>	1906	-	-
2	<i>Alasmidonta marginata</i>	<1948	-	-
3	<i>Alasmidonta viridis</i>	<2001	-	-
4	<i>Amblema plicata</i>	<2001	-	-
5	<i>Anodontooides ferussacianus</i>	<2002	-	-
6	<i>Elliptio complanata</i>	2001	-	-
7	<i>Elliptio dilitata</i>	<2002	-	-
8	<i>Epioblasma triquetra</i>	<1950	-	-
9	<i>Fusconaia flava</i>	<2001	-	-
10	<i>Lampsilis abrupta</i>	1906	Endangered	Endangered
11	<i>Lampsilis cardium</i>	<1990	-	-
12	<i>Lampsilis fasciola</i>	1906	-	Threatened
13	<i>Lampsilis radiata</i>	2001	-	-
14	<i>Lampsilis siliquoidea</i>	<2002	-	-
15	<i>Lampsilis teres</i>	1900	-	-
16	<i>Lasmigona costata</i>	1909	-	-
17	<i>Lasmigona compressa</i>	1948	-	-
18	<i>Leptodea fragilis</i>	2002	-	-
19	<i>Ligumia nasuta</i>	<2002	-	-
20	<i>Ligumia recta</i>	<2001	-	-
21	<i>Obovaria olivaria</i>	<2002	-	-
22	<i>Pleurobema sintoxia</i>	2002	-	-
23	<i>Potamilus alatus</i>	2001	-	-
24	<i>Potamilus capax</i>	1906	Endangered	Endangered
25	<i>Ptychobranhus fasciolaris</i>	<2002	-	-
26	<i>Pyganodon grandis</i>	2002	-	-
27	<i>Quadrula pustulosa</i>	1906	-	-
28	<i>Quadrula quadrula</i>	1931	-	-
29	<i>Simpsonaias ambigua</i>	<1895	-	-
30	<i>Strophitus undulatus</i>	1990	-	-
31	<i>Villosa iris</i>	<2002	-	-

Species on the NYNHP rare animal list ([NYNHP 2002](#)) are in **bold**; species not listed as endangered or threatened are unprotected. Dates indicate last confirmed record. Dates with < are records of spent shells, indicating live animals were present before this date.

**NIAGARA POWER PROJECT (FERC NO. 2216)
OCCURRENCES OF RTE MUSSEL SPECIES**

**TABLE 4.2-1
OCCURRENCES OF NYNHP-LISTED MUSSELS IN THE INVESTIGATION AREA**

Species	Best Record	Beaver Island	Buckhorn Island	Spicer Creek	West River Parkway	Tonawanda Channel	Little Niagara River
<i>Amblema plicata</i>	Old shell		X				X
<i>Fusconaia flava</i>	Recent shell	X	X	X	X	X	
<i>Leptodea fragilis</i>	Live animal	X	X	X		X	
<i>Ligumia nasuta</i>	Recent shell	X	X	X	X		
<i>Ligumia recta</i>	Old shell			X			
<i>Obovaria olivaria</i>	Old shell		X	X		X	
<i>Pleurobema sintoxia</i>	Live animal	X	X	X	X		
<i>Potamilus alatus</i>	Live animal		X	X		X	
<i>Ptychobranchnus fasciolaris</i>	Recent shell	X			X	X	
<i>Villosa iris</i>	Old shell	X			X	X	

Occurrence records in this table include live animals, recent shells, and old shells. Species represented by live animals are in **bold**. Note that old shells of *Obovaria olivaria* were found at three sites, but no recent shells or live animals recorded in Niagara River since 1970 ([Strayer and Jirka 1997](#)). NYNHP considers this species historical in the state ([NYNHP 2002](#)).

**NIAGARA POWER PROJECT (FERC NO. 2216)
 OCCURRENCES OF RARE, THREATENED, AND
 ENDANGERED MUSSEL SPECIES IN THE
 VICINITY OF THE NIAGARA POWER PROJECT**

Mussel Survey Sites in the Investigation Area

LEGEND:

- Mussel Survey Site
- ⋯ Municipal Boundary
- Water Bodies
- Roads

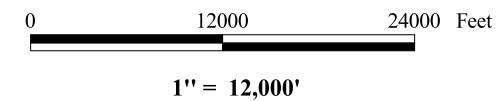
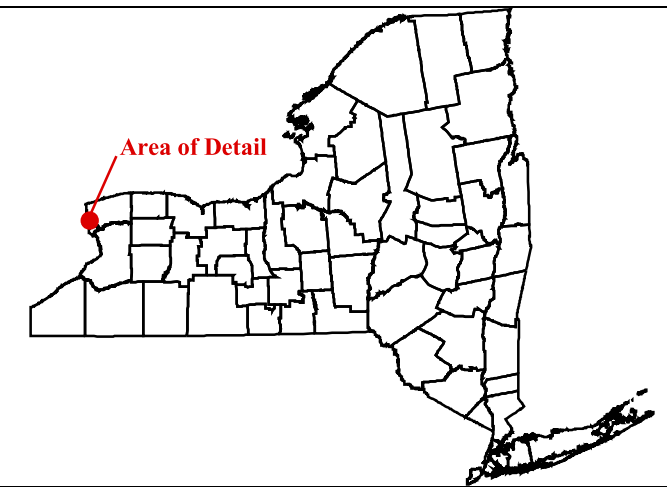
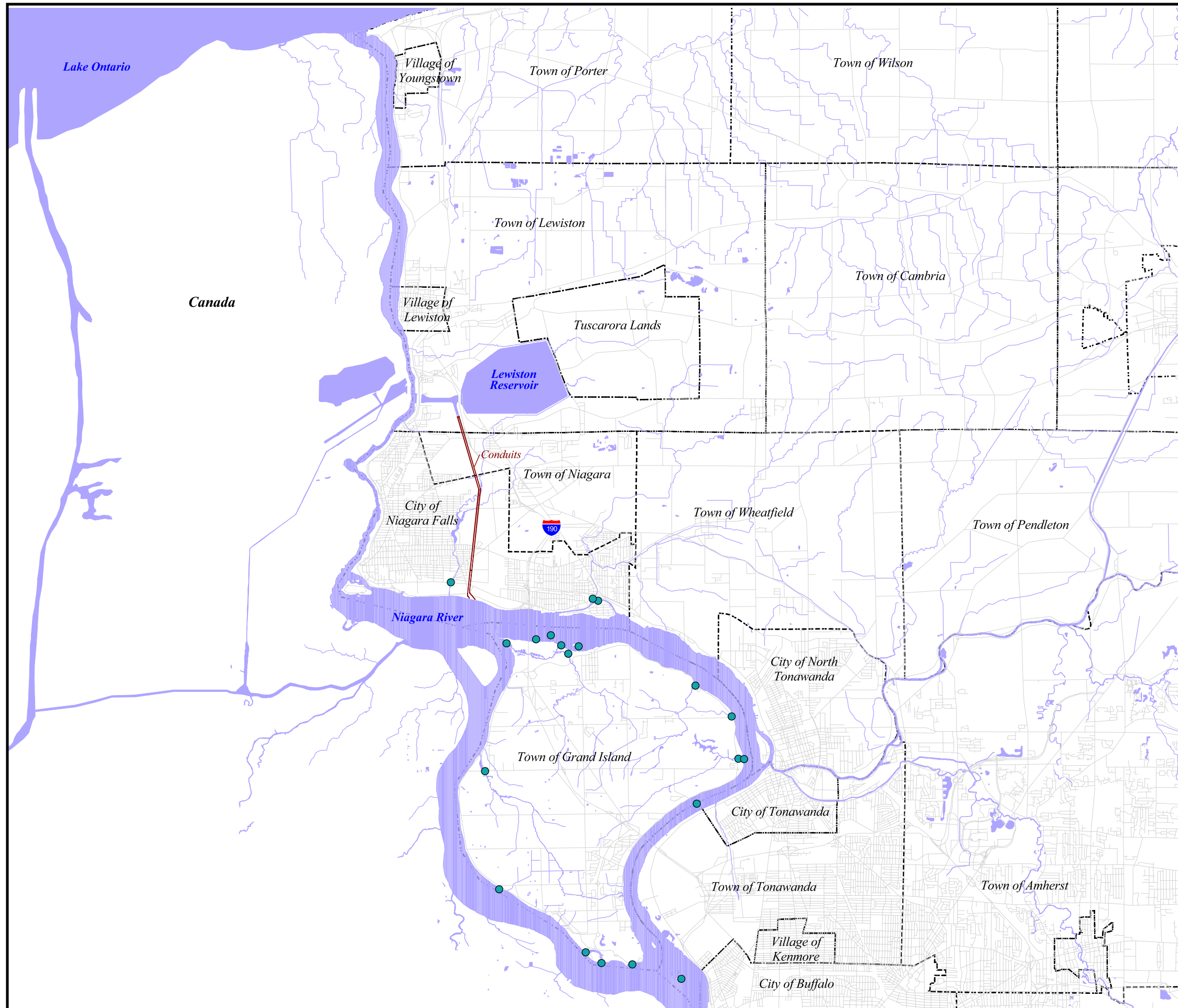


FIGURE 3.3-1



**NIAGARA POWER PROJECT (FERC NO. 2216)
OCCURRENCES OF RTE MUSSEL SPECIES**

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**NIAGARA POWER PROJECT (FERC NO. 2216)
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