Common Name: Alewife floater
Scientific Name: *Anodonta implicata*
Taxon: Freshwater Mollusks

SGCN – High Priority

Federal Status: Not Listed
New York Status: Not Listed

Natural Heritage Program Rank:
Global: G5
New York: S1S2
Tracked: Yes

Synopsis:
Anodonta implicata belongs to the subfamily Unioninae, diagnosed by the presence of subtriangular glochidia with large, medial hooks, and the tribe Anodontini, which includes 16 extant and 1 likely extirpated New York species of the genera *Alasmidonta*, *Anodonta*, *Anodontoides*, *Lasmigona*, *Pyganodon*, *Simpsonaias*, *Strophitus*, and *Utterbackia* (Haag 2012, Graf and Cummings 2011). *A. implicata* can be distinguished by its subelliptical shell, toothless hinge, pink to purple nacre, and its double looped beak sculpture (Strayer and Jirka 1997).

In New York, this species is restricted mainly to the Hudson River Estuary as well as the Lower Delaware River and is currently found in five water bodies. Since the invasion of zebra mussels in its range, the population number has declined dramatically (Strayer and Jirka 1997), but is expected to stabilize at 4% of its pre-invasion densities. Due to this decline, it is ranked as "critically imperiled" in New York, although its population is "secure" range-wide (NatureServe 2013). Unlike other *Anodonta* species, *A. implicata* prefers strong currents in the tidal Hudson River and can be found among cobbles in the Neversink River (Strayer and Ralley 1993, Strayer et al. 1994).

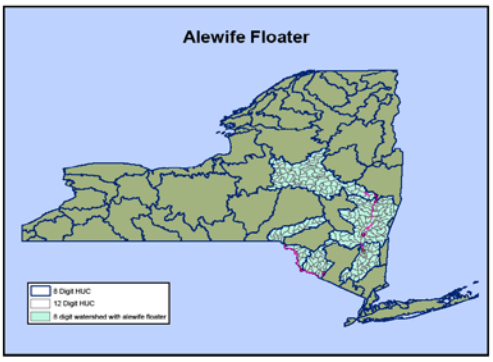
Distribution (% of NY where species occurs)		**Abundance** (within NY distribution)		**NY Distribution Trend**	**NY Abundance Trend**
0% to 5%		Abundant		Moderate Decline	Rapid Recent Decline
6% to 10%	X	Common			
11% to 25%		Fairly common			
26% to 50%		Uncommon			
> 50%		Rare	X		

Habitat Discussion:
Across its range, high densities of *A. implicata* are found in coastal ponds with a direct unimpeded connection to rivers that support yearly runs of alewife. In lakes, they are found in shallow areas with high wave intensity and in deep areas (>30 ft) below the thermocline. It may be more tolerant of mud and silt than many other species, and is abundant in tidal-depositional environments were aquatic plant growth is high. This species also exists in small streams and large rivers, without clear preference for substrate, depth, or flow conditions. Habitat use and population density seems to be more strongly tied to where its host fish are likely to spawn or congregate. It occurs in gravel and cobble substrate in small rivers with fairly strong flows (Nedeau 2008). Although *Anodonta* species are usually said to prefer quiet waters, in New York, *A. implicata* lives in the strong currents of the tidal Hudson River and among cobbles in the Neversink River (Strayer and Jirka 1997).

Primary Habitat Type
Lake
Large/Great River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Small River; Low Gradient; Moderately Buffered, Neutral; Warm

Distribution:
Since 1970, *A. implicata* has been found in five New York State waterbodies, including the Hudson, Mohawk, Neversink, and Delaware Rivers, and Catskill Creek, a Hudson River tributary (NY Natural Heritage Program 2013, White et al. 2011). Current occurrences are the same as historic occurrences (NY Natural Heritage Program 2013). In 2010, live specimens were found in the South Bay Creek and marsh area near the City of Hudson (NY Natural Heritage Program 2013). As of 1991-1992, the only location in New York where *A. implicata* had maintained a large population was in the Hudson River estuary (approximately 400 million individuals). Following the arrival of zebra mussels, this population has declined sharply with an annual decline rate of 57% per year from 1993 to 1999. Populations have since recovered slightly and are expected to stabilize at 4% of their pre-invasion densities (Strayer and Malcom 2007).

In the Delaware basin, in 1997, five individuals were found in the Neversink River in the vicinity of The Nature Conservancy Preserve and Cuddlebackville Dam. In 1991, the Neversink population was estimated at 20,000 individuals (NY Natural Heritage Program 2013). Between 2001 and 2002, at least 290 individuals were found in the Delaware River, with occurrences in every river mile within the continuous 76.9-mile stretch of river, extending from just south of Hancock to Port Jervis, except at 4 locations where the distance of the gap ranged from 1 to 1.8 miles (NY Natural Heritage Program 2013).



A. implicata post-1970 distribution in New York (Mahar and Landry 2013, The Nature Conservancy 2009, NY Natural Heritage Program 2013, White et al. 2011, Harman and Lord 2010).

Threats to NY Populations				
Threat Category	**Threat**	**Scope**	**Severity**	**Irreversibility**
1. Human Intrusions & Disturbance	Work & Other Activities (bridge projects and other instream work)	N	L	L
2. Natural System Modifications	Other Ecosystem Modifications (levees and flood walls, channelization, navigational dredging, culverts)	W	M	H
3. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (zebra mussels, didymo)	P	M	H
4. Pollution	Agricultural & Forestry Effluents (pesticides, fertilizers, sediment)	P	L	M
5. Pollution	Household Sewage & Urban Waste Water (road runoff of salts and metals, other regulated discharges)	P	L	H
6. Pollution	Household Sewage & Urban Waste Water (waste water treatment effluent, sewer and septic overflows)	P	L	H
7. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (die offs from unknown disease)	N	L	H
8. Natural System Modifications	Dams & Water Management/Use (water withdrawal for NYC)	W	L	H
9. Climate Change & Severe Storms	Storms & Flooding (severe storms)	W	M	H

10. Invasive & Other Problematic Species & Genes	Problematic Native Species (loss of host fish species including shad and herrings?)	P	M	M

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Common Name: Black sandshell ***SGCN – High Priority***
Scientific Name: *Ligumia recta*
Taxon: Freshwater Mollusks

Federal Status: Not Listed
New York Status: Not Listed

Natural Heritage Program Rank:
Global: G4G5
New York: S2S3
Tracked: Yes

Synopsis:
Ligumia recta belongs to the subfamily Ambleminae and the tribe Lampsilini, which includes 17 extant and 6 likely extirpated New York species of the genera *Actinonaias*, *Epioblasma*, *Lampsilis*, *Leptodea*, *Ligumia*, *Obovaria*, *Potamilus*, *Ptychobranchus*, *Toxolasma*, *Truncilla*, and *Villosa* (Haag 2012, Graf and Cummings 2011). *L. recta* is grouped in the *Ligumia* genus, which means seed or pod of a legume, referring to its long and pod-shaped structure. The species name recta, which means straight, refers to the elongated shape and parallel dorsal margins (Watters et al. 2009).

Since 1970, *L. recta* has been found in ten New York waterbodies. This species is found in three areas in New York: the Allegheny basin, the Erie-Ontario basin, and the St. Lawrence-Champlain basin, reflecting its three routes of entry into the state. *L. recta* lives in large creeks, rivers, and large shallow lakes (Strayer and Jirka 1997).

In New York, *L. recta* is ranked as imperiled, although it is apparently secure throughout its range (NatureServe 2013). In North America, approximately ⅔ to ¾ of native mussel species are extinct, listed as endangered or threatened, or are in need of conservation status (Williams et al. 1993, Stein et al. 2000). While population trends in New York are unknown, based on sparse historical information, it is assumed that they too are declining due to a myriad of environmental stressors.

Distribution (% of NY where species occurs)		**Abundance** (within NY distribution)		**NY Distribution Trend**	**NY Abundance Trend**
0% to 5%		Abundant		Moderate Decline	Moderate Decline
6% to 10%	X	Common			
11% to 25%		Fairly common			
26% to 50%		Uncommon	X		
> 50%		Rare			

Habitat Discussion:
L. recta is typically found in medium to large rivers (Cummings and Mayer 1992, McMurry et al. 2012, Metcalfe-Smith et al. 2005, Watters et al. 2009). It can also be found in large creeks, and some large, shallow lakes (Strayer and Jirka 1997). It is commonly cited that this species is associated with gravel or firm sand substrate (Parmalee 1967, Watters et al. 2009, McMurry et al. 2012, Metcalfe-Smith et al. 2005), but can occasionally be found in mud, silt, or cobbles (Parmalee and Bogan 1998, Metcalfe-Smith et al. 2005, NatureServe 2013). It is typically found in locations with strong current (riffles or raceways) in water depths from several inches to six feet or more (Metcalfe-Smith et al. 2005, Parmalee and Bogan 1998).

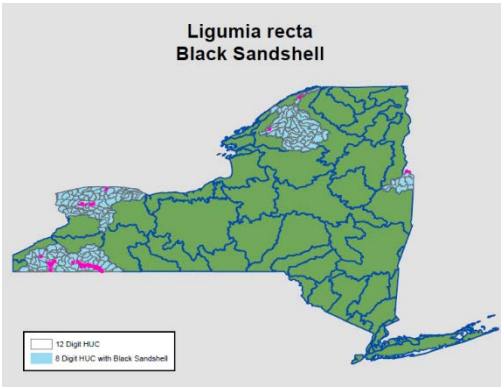
Primary Habitat Type
Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Transitional Cool
Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Medium River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Small River; Low-Moderate Gradient; Moderately Buffered, Neutral; Transitional Cool

Distribution:

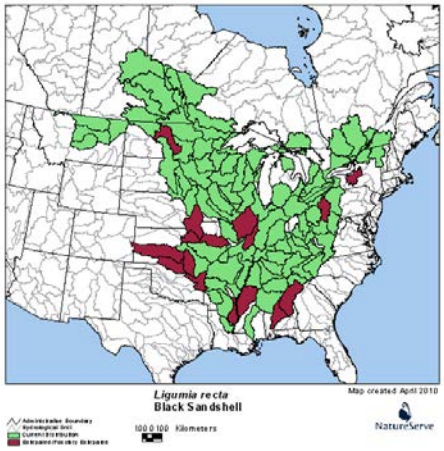
L. recta currently exists in eight waterbodies in New York State (not counting waterbodies in which only highly weathered shells "fossil shells" were found). A 2009 survey of the Allegheny basin by The Nature Conservancy found 80 live L. recta, with populations at most sites in the Allegheny River between Portville and Salamanca, and in the lower sections of Conewango and Cassadaga Creeks, and in Oswayo Creek. Shells were also found in Olean Creek. The greatest catches (up to 3.3 per hr) were in the Allegheny River near and upstream of Olean, NY. L. recta were considered viable at 13% (5 of 38 sites) of the sites where they were found (The Nature Conservancy 2009).

In 2010, an old weathered shell of this species was found in lower Oak Orchard Creek, a first record for this species in the Western Lake Ontario basin. In the Erie basin, more than 35 live specimens were confirmed at four locations on Tonawanda Creek between the towns of Pendleton and Alabama (Mahar and Landry 2013, NY Natural Heritage Program 2013). Additional recent occurrences include the Poultney River at the southern end of Lake Champlain, and in the St. Lawrence basin the Grass River and the Oswegatchie River (fossil) (Strayer and Jirka 1997, NY Natural Heritage Program 2013). Although widespread in New York, L. recta is usually seen in small numbers. It has not recently been found at historic sites between Rochester and Syracuse (Mahar and Landry 2013).

In 2011 and 2012 Zanatta, Burlakova, Karatayev et al. surveyed 6 locations (9 sites) in Lake Erie, and 54 sites at 33 locations in Lake Ontario (2012 only), and did not found L. recta at any of NYS locations.) Three live and 10 shells of L. recta were collected in 2012 at Chittenango Creek, a tributary of Oneida Lake (Bridgeport, Onondaga Co., State Hw 31 crossing), and 9 live L. recta were found in Tonawanda Creek in 2011-2013 (Burlakova, Karatayev, Karatayev, unpublished data).



L. recta post-1970 distribution in New York (The Nature Conservancy 2009, Harman and Lord 2010, Mahar and Landry 2013, NY Natural Heritage Program 2013, White et al. 2011).



NatureServe (2013)

Threats to NY Populations				
Threat Category	**Threat**	**Scope**	**Severity**	**Irreversibility**
1. Human Intrusions & Disturbance	Work & Other Activities (bridge projects and other instream work)	N	L	L
2. Natural System Modifications	Dams & Water Management/Use (levees and flood walls, channelization, dredging, impassable culverts)	W	M	H
3. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (zebra mussels)	P	L	H
4. Pollution	Agricultural & Forestry Effluents (pesticides, fertilizers, sediment)	P	L	M
5. Pollution	Household Sewage & Urban Waste Water (road runoff of salts and metals, other regulated discharges)	P	M	H
6. Pollution	Household Sewage & Urban Waste Water (waste water treatment effluent, sewer and septic overflows)	P	M	H
7. Climate Change & Severe Weather	Droughts	W	L	V
8. Natural System Modifications	Dams & Water Management/Use (lowering of water table from agriculture, etc…, causing drying of habitat	R	L	L
9. Climate Change & Severe Weather	Storms & Flooding (extreme Storms)	W	M	V

10. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (die offs from unknown disease)	N	L	H

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Common Name: Brook floater ***SGCN – High Priority***
Scientific Name: *Alasmidonta varicosa*
Taxon: Freshwater Mollusks

Federal Status: Not Listed
New York Status: Threatened

Natural Heritage Program Rank:
Global: G3
New York: S1
Tracked: Yes

Synopsis:
Alasmidonta varicosa belongs to the subfamily Unioninae, diagnosed by the presence of subtriangular glochidia with large, medial hooks, and the tribe Anodontini, which includes 16 extant and 1 likely extirpated New York species of the genera *Alasmidonta*, *Anodonta*, *Anodontoides*, *Lasmigona*, *Pyganodon*, *Simpsonaias*, *Strophitus*, and *Utterbackia* (Haag 2012, Graf and Cummings 2011). A. varicosa is closely related to and is often confused with *Alasmidonta marginata* (Simpson 1914). Systematics of the genus have not been reviewed genetically.

A. varicosa is one of the most endangered mussels in northeastern America. It is listed as endangered in Massachusetts, Connecticut, New Hampshire, and New Jersey, threatened in Vermont and New York, and ranked as vulnerable throughout its range (Nedeau 2008). Since 1970, it has been found in 17 New York waterbodies in the Susquehanna and Delaware basins, and to a limited extent in the Connecticut coastal basin (Jirka 1991, Strayer and Jirka 1997). It is more commonly found in nutrient poor streams with low to moderate flow velocities and good water quality (Strayer and Jirka 1997, Nedeau 2008). Where it is found, it is usually uncommon (Strayer and Jirka 1997).

Significant declines have been noted in Massachusetts, New York, Pennsylvania, New Jersey, Rhode Island, Virginia, North Carolina, and South Carolina. Approximately 70-90 site extirpations (of 150 or more known historically) have occurred globally with only a portion of the remaining sites holding healthy, viable populations. Although precise area of occupancy is not known and precise extent of decline is not known with accuracy, the loss of historical sites is indicative of a significant decline in area of occupancy over the last century (likely greater than 50% area of occupancy and range). Some good populations are known in the north (Vermont, and particularly Maine and a very large population just discovered in New Hampshire plus nine new populations in New Brunswick and Nova Scotia) where the species is stable but declining even in the more stable portions of its range (NatureServe 2013).

Distribution (% of NY where species occurs)		**Abundance** (within NY distribution)		**NY Distribution Trend**	**NY Abundance Trend**
0% to 5%		Abundant		Severe Decline	Severe Decline
6% to 10%		Common			
11% to 25%	X	Fairly common			
26% to 50%		Uncommon			
> 50%		Rare	X		

Habitat Discussion:
A. varicosa is strictly a running-water species and never occurs in lakes or reservoirs. It is said to favor gravelly riffles, sandy shoals, and stable habitats such as coarse sand and gravel in creeks and small rivers (Clarke 1981, Nedeau et al. 2000, Strayer and Jirka 1997), although Strayer and Ralley (1993) found no

consistent substrate preference. It is thought to prefer low to moderate flow velocities. In fast water, they often will be found clustered in protected areas such as behind boulders and near banks (Nedeau 2008). In general, *A. varicosa* is more common in upper portions of large watersheds with intact upland forest but is absent from headwater streams and high-gradient river reaches prone to scour (Nedeau 2008). It is found most frequently in nutrient-poor streams with low calcium levels, low nutrients, and good water quality (Nedeau 2008, Strayer and Jirka 1997). This species may be intolerant of the many stressors related to dams, urban areas, and other land uses that affect the quality of water and habitat (Nedeau 2008). Where it occurs, it is usually uncommon (Strayer and Jirka 1997).

Primary Habitat Type
Headwater/Creek; Low Gradient; Moderately Buffered, Neutral; Transitional Cool
Headwater/Creek; Low-Moderate Gradient; Low Buffered, Acidic; Transitional Cool
Headwater/Creek; Low-Moderate Gradient; Moderately Buffered, Neutral; Transitional Cool
Large/Great River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Large/Great River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Medium River; High Gradient; Assume Moderately Buffered (Size 3+ rivers); Transitional Cool
Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Transitional Cool
Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Medium River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Transitio
Medium River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Medium River; Moderate-High Gradient; Assume Moderately Buffered (Size 3+ rivers); Transiti
Medium River; Moderate-High Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Small River; Low Gradient; Highly Buffered, Calcareous; Transitional Cool
Small River; Low Gradient; Moderately Buffered, Neutral; Transitional Cool
Small River; Low-Moderate Gradient; Moderately Buffered, Neutral; Transitional Cool
Small River; Moderate-High Gradient; Moderately Buffered, Neutral; Transitional Cool

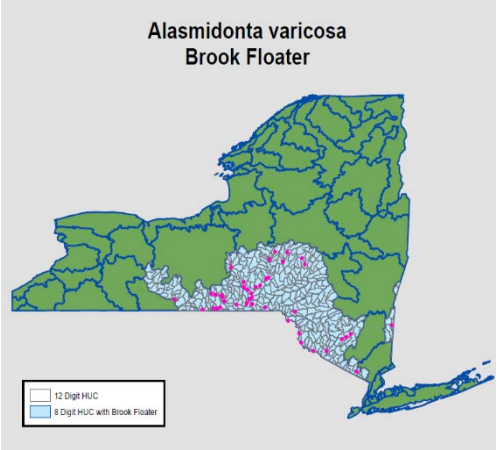
Distribution:

A. varicosa currently exists in 17 different waterbodies in New York.

Since 1970, *A. varicosa* has been found in the Susquehanna basin in Sangerfield River (2 sites: 6 live 2008), Chenango River (at least 5 sites: live 2008), Tioughnioga River (live 1996), Otselic River above Whitney Point Dam (1 site: 1 live 1996), and Catatonk Creek (7 sites: at least 18 live 1996) (NY Natural

Heritage Program, 2013). In a recent survey of the Susquehanna basin, Harman and Lord (2010) also found live *A. varicosa* in the main stem of the Susquehanna River (at least 5 sites: 23 live), Chenango River, Chemung River (at least 5 sites: 5 live), and West Branch Tioughnioga River (1 site: 2 live). In the Delaware basin, *A. varicosa* has been found in the Lower Beaver Kill East Branch (1 site: 1 live 2011), East Branch of the Delaware River (1 site: 2 live), its tributary, Twadell Brook, Delaware River from Hancock to Jarvis Point (7 sites: 9 live 2002), and the Neversink River between Woodbridge and Huguenot (13 sites, 129 live 2002), as well as its tributary, Sheldrake Stream (NY Natural Heritage Program 2013). In New York, only the Neversink River population is large, at approximately 100,000 animals (Strayer and Jirka 1997).

This species has also been found in Upper Hudson basin at Shawangunk Kill (3 sites: 4 live 1992, but not since), the Lower Hudson basin at Mahwah River (old shell 1994), and in the Connecticut coastal basin at Waebatuck and Wassaic Creeks (old shell 2010) (NY Natural Heritage Program 2013).



A. varicosa post-1970 distribution in New York (The Nature Conservancy 2009, Harman and Lord 2010, Mahar and Landry 2013, NY Natural Heritage Program 2013, White et al. 2011).

Threats to NY Populations				
Threat Category	**Threat**	**Scope**	**Severity**	**Irreversibility**
1. Human Intrusions & Disturbance	Work & Other Activities (bridge projects and other instream work)	N	L	L
2. Natural System Modifications	Other Ecosystem Modifications (levees and flood walls, channelization, dredging, culverts)	N	M	H

3. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (rusty crayfish, zebra mussel)	N	L	H
4. Pollution	Agricultural & Forestry Effluents (pesticides, fertilizers, sediment)	P	M	M
5. Pollution	Household Sewage & Urban Waste Water (road runoff of salts and metals, other regulated discharges)	P	M	H
6. Pollution	Household Sewage & Urban Waste Water (waste water treatment effluent, sewer and septic overflows)	P	M	H
7. Climate Change & Severe Weather	Droughts	P	L	V
8. Natural System Modifications	Dams & Water Management/Use (lowering of water table from agriculture, NYC water use, etc…, causing drying of habitat)	R	L	M
9. Climate Change & Severe Weather	Storms & Flooding (extreme storms)	P	M	V
10. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (die offs from unknown disease)	N	L	H
11. Invasive & Other Problematic Species & Genes	Problematic Native Species (hybridization with elktoe)	W	H	V
12. Energy Production & Mining	Oil & Gas (hydraulic fracturing)	W	M	M

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Common Name: Chittenango Ovate Amber Snail ***SGCN – High Priority***
Scientific Name: *Novisuccinea chittenangoensis*
Taxon: Freshwater Mollusks

Federal Status: Threatened
New York Status: Endangered

Natural Heritage Program Rank:
Global: G1
New York: S1
Tracked: Yes

Synopsis:
The Chittenango ovate amber snail (COAS) is an endemic terrestrial snail only known from a single location in Chittenango Falls State Park of Madison County, New York. It is federally listed as a threatened species because of its rarity, narrow habitat range and population declines, and although protection measures have been implemented since listing, its status remains precarious. It's only known habitat is comprised of a ravine at the base of a 167-foot waterfall due to its requirement for cool, mild temperatures and misty conditions. This taxon was reportedly abundant when it was first discovered at Chittenango Falls in 1905 but declined severely due to competition with an invasive snail *Succinea* sp. B and human disturbance of its critical habitat. The population appears to be increasing since the start of a mark-release-recapture study in 2002 and the average population size over the last five survey years is estimated between 400 and 500 individuals (NYNHP 2013). Accurate population trends are not available for this species due to infrequent surveys, difficulty of surveying the falls habitat, and confusion of identification due to similarities with *Succinea* sp. B. and *Novisuccinea ovalis.*

Distribution (% of NY where species occurs)		**Abundance** (within NY distribution)		**NY Distribution Trend**	**NY Abundance Trend**
0% to 5%	X	Abundant		Stable	Stable
6% to 10%		Common			
11% to 25%		Fairly common	X		
26% to 50%		Uncommon			
> 50%		Rare			

Habitat Discussion:

The habitat of the COAS lies within the ravine at the base of the 167 foot waterfall formed by Chittenango Creek as it flows north from Cazenovia Lake toward Oneida Lake. This north-south oriented ravine forms a deep gorge that is shaded or partially shaded throughout most of the growing season, resulting in a relatively cool summer microclimate, and a relatively warm winter microclimate (USFWS 2003).

The COAS prefers cool, partially sunlit areas of lush herbaceous growth within the spray zone of the Falls. They occur on the vegetated slopes adjacent to the waterfall, preferring the moderate climate and high humidity. Spring thaws and periodic major rainfall events tend to remove vegetation from significant portions of the primary habitat. The only sloping weedy talus is on the east side of the falls and therefore individuals are not present on the west side (USFWS 2003).

Primary Habitat Type
Cliff and Talus
Small River; High Gradient

Distribution:
This species is endemic to the Chittenango Falls State Park in Madison County, NY.

Location of the Chittenango Falls State Park colony of the Chittenango ovate amber snail, Madison County, New York. Map from USFWS (2003).

Threats to NY Populations				
Threat Category	**Threat**	**Scope**	**Severity**	**Irreversibility**
1. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (non-native *Succinea*)	P	L	M
2. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (black swallow-wort)	P	L	H
3. Human Intrusions & Disturbance	Recreational Activities (visitors to waterfall)	W	L	L
4. Pollution	Agricultural & Forestry Effluents (fertilizers, herbicides, pesticides)	P	L	M
5. Climate Change & Severe Weather	Temperature Extremes	W	M	V
6. Climate Change & Severe Weather	Storms & Flooding	P	L	V

References Cited:
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U.S. Fish and Wildlife Service (USFWS). 2006. Chittenango ovate amber snail (*Novisuccinea chittenangoensis*) recovery plan, first revision. Hadley, Massachusetts. 55p.

Common Name: Clubshell
Scientific Name: *Pleurobema clava*
Taxon: Freshwater Mollusks

SGCN – High Priority

Federal Status: Endangered
New York Status: Endangered

Natural Heritage Program Rank:
Global: G1G2
New York: S1
Tracked: Yes

Synopsis:
Pleurobema clava belongs to the subfamily Ambleminae and the tribe Pleurobemini, which includes four extant and one likely extirpated New York species in the genera *Elliptio*, *Fusconaia*, and *Pleurobema* (Haag 2012). In general, the shells are of this tribe are unsculptured and larvae are brooded only in the outer demibranchs (with exceptions) (Graf and Cummings 2011). *Pleurobema clava* is the only member of the Pleurobema genus with an orange viscera and foot. The genus name *pleurobema*, meaning step, refers to the ribs found between the shell annulae. The species name, *clava*, means club and refers to the general shape of the shell (Watters et al. 2009).

P. clava prefers small, gravelly riffles of creeks and is commonly found burrowed deep into sediment (Strayer and Jirka 1997). It is known from Cassadaga Creek, in the Allegheny basin where four individuals were found at two sites during recent surveys by The Nature Conservancy (2009). Historically, the species may have been scattered through the upper Allegheny basin (Strayer and Jirka 1997). *P. clava* is listed as endangered at both the Federal and State levels. New York populations are thought to be declining, as no new recruits have been found during recent surveys.

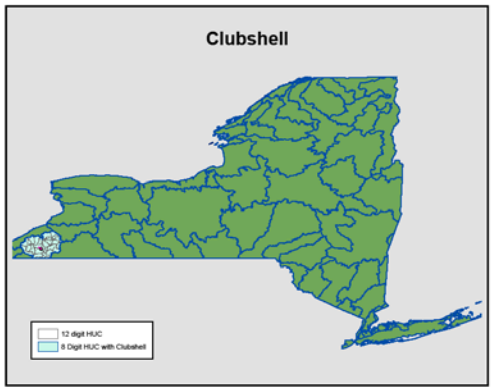
Distribution (% of NY where species occurs)		**Abundance** (within NY distribution)		**NY Distribution Trend**	**NY Abundance Trend**
0% to 5%	X	Abundant		Moderate Decline	Moderate Decline
6% to 10%		Common			
11% to 25%		Fairly common			
26% to 50%		Uncommon			
> 50%		Rare	X		

Habitat Discussion:
The habitat of *P. clava* has been reported as creeks and small rivers (Strayer and Jirka 1997), small to medium-sized rivers and streams (USFWS 1994), and medium to large rivers (Cummings and Mayer 1992). This species is generally found in clean, coarse sand and gravel or cobble, where it may live several inches beneath the surface of the substrate (USFWS as cited in NatureServe 2013, Cummings and Mayer 1992, Watters et al. 2009, Strayer and Jirka 1997). It is most common in the current at downstream ends of riffles and islands (Watters et al. 2009) or in riffles (Strayer and Jirka 1997), or runs, often just downstream of a riffle (USFWS 1994). It cannot tolerate mud or slackwater conditions, and is very susceptible to siltation (USFWS 1994). Because it deeply buries itself beneath the substrate, living animals may be hard to find even in places where it is believed to occur in some numbers (Strayer and Jirka 1997, USFWS 1994).

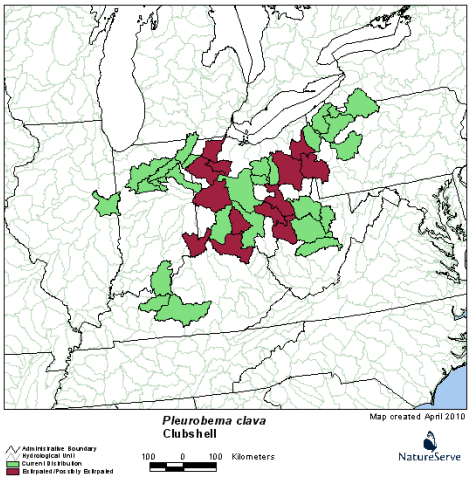
Primary Habitat Type
Small River; Low Gradient; Moderately Buffered, Neutral; Transitional Cool

Distribution:

P. clava currently only exists in one waterbody in New York. In a recent survey of the Allegany basin, The Nature Conservancy documented *P. clava* at only one of the 105 excavation survey sites. At the site, two live individuals were found in Cassadaga Creek at a rate of 0.4 per hour. Two additional individuals were found alive during quantitative sampling of a site further downstream on Cassadaga Creek. Unfortunately, at both sites, no recently recruited individuals were found. The long-term viability of this species remains in question given the very low numbers of only older animals (The Nature Conservancy 2009).



P. clava post-1970 distribution in New York (The Nature Conservancy 2009, Harman and Lord 2010, Mahar and Landry 2013, NY Natural Heritage Program 2013, White et al. 2011).



NatureServe (2013)

Threats to NY Populations				
Threat Category	**Threat**	**Scope**	**Severity**	**Irreversibility**
1. Human Intrusions & Disturbance	Work & Other Activities (bridge projects and other instream work)	P	M	H
2. Natural System Modifications	Other Ecosystem Modifications (levees, channelization, dredging, impassable culverts)	P	L	M
3. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (zebra mussels)	P	L	V
4. Pollution	Agricultural & Forestry Effluents (pesticides, fertilizers, sediment)	P	L	M
5. Pollution	Household Sewage & Urban Waste Water (road runoff of salts and metals, other regulated discharges)	P	L	H
6. Pollution	Household Sewage & Urban Waste Water (septic overflows)	P	L	H
7. Climate Change & Severe Weather	Droughts	P	M	V
8. Natural System Modifications	Dams & Water Management/Use (lowering of water table from agriculture, etc…, causing drying of habitat)	P	L	H
9. Climate Change & Severe Weather	Storms & Flooding (extreme storms)	P	H	V
10. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (die offs from unknown disease)	P	L	H

11. Invasive & Other Problematic Species & Genes	Problematic Native Species (beaver dams influencing hydrology)	P	M	M

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U.S. Fish and Wildlife Service. 1994. Clubshell (*Pleurobema clava*) and Northern Riffleshell (*Epioblasma tondosa rangiana*) Recovery Plan. Hadley, Massachusetts. 68 pp.

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Common Name: Deertoe
Scientific Name: *Truncilla truncata*
Taxon: Freshwater Mollusks

SGCN – High Priority

Federal Status: Not Listed
New York Status: Not Listed

Natural Heritage Program Rank:
Global: G5
New York: S1
Tracked: Yes

Synopsis:
Truncilla truncata belongs to the subfamily Ambleminae and the tribe Lampsilini, which includes 17 extant and 6 likely extirpated New York species of the genera *Actinonaias*, *Epioblasma*, *Lampsilis*, *Leptodea*, *Ligumia*, *Obovaria*, *Potamilus*, *Ptychobranchus*, *Toxolasma*, *Truncilla*, and *Villosa* (Haag 2012, Graf and Cummings 2011). The *Truncilla* genus is named for its oblique truncation, giving it a sharp posterior ridge and flat posterior slope. This characteristic is typical of *T. truncata* (Watters et al. 2009).

This species is most commonly found in rivers and lakes, rarely occupying smaller streams. It prefers packed sand and gravel and mud substrates (Strayer and Jirka 1997, Watters et al. 2009). Live specimens have been found in Tonawanda Creek in the Lake Erie basin, as well as Honeoye Creek and the Genesee River in the Genesee River basin. Shells have been found at additional sites on the Genesee River, Oak Orchard Creek, and the Erie Canal (Mahar and Landry 2013).

Although rare and ranked as "critically imperiled" in New York, this edge of range species is considered secure throughout its range. In North America, approximately 2/3 to 3/4 of native mussel species are extinct, listed as endangered or threatened, or are in need of conservation status (Williams et al. 1993, Stein et al. 2000). While population trends in New York are unknown, based on sparse historical information it is assumed that they too are declining due to a myriad of environmental stressors.

Distribution (% of NY where species occurs)		**Abundance** (within NY distribution)		**NY Distribution Trend**	**NY Abundance Trend**
0% to 5%		Abundant		Increasing	Increasing
6% to 10%	X	Common			
11% to 25%		Fairly common			
26% to 50%		Uncommon	X		
> 50%		Rare			

Habitat Discussion:
T. truncata prefers medium to large rivers and shallow areas of the Great Lakes, where it can live at depths of 12 to 18 feet, rarely straying into smaller streams. It may be locally abundant in packed sand and gravel, but may also be found in mud substrate (Cummings and Mayer 1992, Metcalfe-Smith et al. 2005, McMurray et al. 2012, Parmalee and Bogan 1998, Watters et al. 2009, Strayer, 1997).

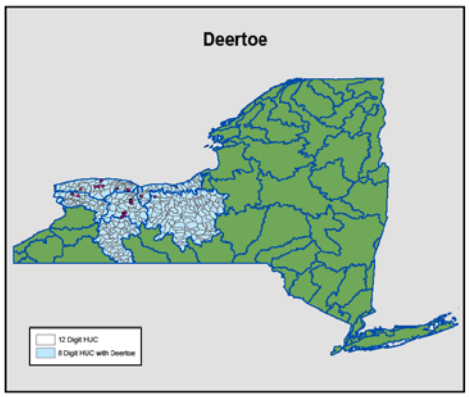
Primary Habitat Type
Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm

Medium River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Medium River; Moderate-High Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm

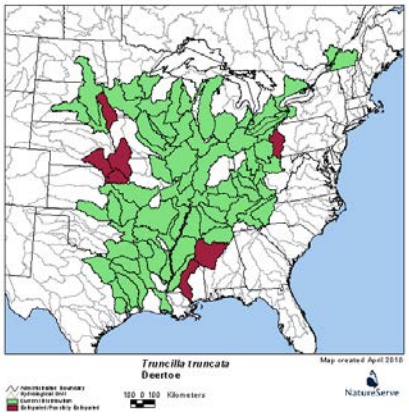
Distribution:

Since 1970, *T. truncata* has been found in five New York State waterbodies.
Between 2010 and 2013, *T. truncata* has been found live in the Erie basin in Tonawanda Creek at Rapids (8 live), and in the Genesee River basin in both lower Honeoye Creek (2 live) and the Genesee River at Mt. Morris (1 live) and Geneseo (at least 1 live). In addition, 238 shells, including fresh and juvenile specimens, were found in the Genesee River between the Honeoye Creek confluence in Rush and Rte 253 Erie Station Rd in Scottsville (Monroe County). Single shells were also found in the Genesee River in Leicester, Geneseo, and York (Livingston County). In the Southwest Lake Ontario basin, three shells were found in Oak Orchard Creek, downstream of the Waterport Reservoir, and one live mussel in Long Pond (Lake Ontario, Monroe Co., near Greece) (Burlakova et al., unpublished data). In addition, 16 shells, including one containing desiccated flesh, were found in the Erie Canal at nine locations between the Sulfur Springs Guard Lock south of Lockport (Niagara County) and Lock 32 in Macedon (Wayne County) (Mahar and Landry 2013).

This species has been found in nearby Presque Isle Bay in Pennsylvania (Masteller et al. 1993) but later likely extirpated due to dreissenid invasion (Zanatta et al., in preparation)., so a few individuals probably live in Lake Erie and the Niagara River in New York (Strayer and Jirka 1997).



T. truncata post-1970 distribution in New York (The Nature Conservancy 2009, Harman and Lord 2010, Mahar and Landry 2013, NY Natural Heritage Program 2013, White et al. 2011).



Range wide distribution of *T. truncata* in North America (NatureServe, 2013). Note: this map is incorrect, as it does not show the Genesee basin as a current population (Mahar and Landry 2013).

Threats to NY Populations				
Threat Category	**Threat**	**Scope**	**Severity**	**Irreversibility**
1. Human Intrusions & Disturbance	Work & Other Activities (bridge projects and other instream work)	R	L	L
2. Natural System Modifications	Other Ecosystem Modifications (levees and flood walls, channelization, dredging, impassable culverts)	R	M	H
3. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (zebra mussels, round goby)	P	L	H
4. Pollution	Agricultural & Forestry Effluents (pesticides, fertilizers, sediment)	P	L	M
5. Pollution	Household Sewage & Urban Waste Water (road runoff of salts and metals, other regulated discharges)	P	M	H
6. Pollution	Household Sewage & Urban Waste Water (waste water treatment effluent, sewer and septic overflows)	P	M	H
7. Climate Change & Severe Weather	Droughts	R	L	V
8. Natural System Modifications	Dams & Water Management/Use (lowering of water table from agriculture, etc…, causing drying of habitat)	R	L	L
9. Climate Change & Severe Weather	Storms & Flooding (extreme storms)	R	M	V

10. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (die offs from unknown disease)	N	L	H
11. Invasive & Other Problematic Species & Genes	Problematic Native Species (natural predators: muskrat)	R	L	M

References Cited:

Graf, D. and K. Cummings. 2011. MUSSELp Evolution: North American Freshwater Mussels. The MUSSEL Project. The University of Wisconsin. Available: http://mussel-project.uwsp.edu/evol/intro/north_america.html.

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Harman, W.N. and P.H. Lord. 2010. Susquehanna Freshwater Mussel Surveys, 2008-2010. Final report submitted to New York State Department of Environmental Conservation. SUNY Oneonta. Cooperstown, NY. 24 pp + plus appendix.

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Strayer, D.L. and K. J. Jirka. 1997. The Pearly Mussels of New York State. New York State Museum Memoir (26): 113 pp., 27 pls.

The Nature Conservancy 2009. Freshwater Mussel (Unionidae) Distributions, Catches, and Measures of their Viability across the Catches, and Measures of their Viability across the Allegheny River Basin in New York. Report submitted New York State Department of Environmental Conservation. The Nature Conservancy, Central and Western NY Chapter. Rochester, NY. 63 pp.

Watters, G. T., M. A. Hoggarth, and D. H. Stansbery. 2009. The freshwater mussels of Ohio. Columbus: Ohio State University Press.

White, E.L., J.J. Schmid, T.G. Howard, M.D. Schlesinger, and A.L. Feldmann. 2011. New York State freshwater conservation blueprint project, phases I and II: Freshwater systems, species, and viability metrics. New York Natural Heritage Program, The Nature Conservancy. Albany, NY. 85 pp. plus appendix.

Common Name: Dwarf wedgemussel
Scientific Name: *Alasmidonta heterodon*
Taxon: Freshwater Mollusks

SGCN – High Priority

Federal Status: Endangered
New York Status: Endangered

Natural Heritage Program Rank:
Global: G1G2
New York: S1
Tracked: Yes

Synopsis:
Alasmidonta heterodon belongs to the subfamily Unioninae, diagnosed by the presence of subtriangular glochidia with large, medial hooks, and the tribe Anodontini, which includes 16 extant and 1 likely extirpated New York species of the genera *Alasmidonta*, *Anodonta*, *Anodontoides*, *Lasmigona*, *Pyganodon*, *Simpsonaias*, *Strophitus*, and *Utterbackia* (Haag 2012, Graf and Cummings 2011).

Never common, *A. heterodon* is currently known from at least 70 locations in 15 major watersheds, with the largest populations in the Connecticut River watershed in New Hampshire and Vermont (Nedeau 2008). In New York, it is currently found in four waterbodies. It is the only federally endangered mussel in New England and it is listed as endangered in every state where it occurs (Nedeau 2008). *A. heterodon* lives in running waters of all sizes, from small brooks less than 5 m wide to large rivers more than 100 m wide (United Sates Fish and Wildlife Service 1993). It does not show any preference towards a certain microhabitat (Strayer 1993). This species has shown a 50% – 70% decline in abundance both in the short and long term (NatureServe 2013). It is extant in ten states and likely extirpated from Canada (Hanson and Locke 2000, Metcalfe-Smith and Cadmore-Vokey 2004) and possibly Pennsylvania and is nearly extirpated from Massachusetts and Connecticut.

Historically, this species was widespread, though never common, along the Atlantic Slope from New Brunswick to the Carolinas. The species has experienced significant decline including the regional extirpation of the last remaining population in Canada. Of the small number of extant occurrences remaining, long-term viability is questionable given continuing declines and difficult-to-manage threats. Decline has continued, especially over the last 10 years. *A. heterodon* currently occupies only 20-25% of its historic sites, with populations severely fragmented. Declines are even more pronounced, in the southern half of its range, from New Jersey south to North Carolina with individual populations numbering only in the tens to hundreds of individuals. The species continues to face significant threats from habitat loss primarily due to human encroachment throughout its range and, without intervention, may decline to the point of critical imperilment soon (NatureServe 2013).

Distribution (% of NY where species occurs)		**Abundance** (within NY distribution)		**NY Distribution Trend**	**NY Abundance Trend**
0% to 5%	X	Abundant		Stable	Moderate Decline
6% to 10%		Common			
11% to 25%		Fairly common			
26% to 50%		Uncommon	X		
> 50%		Rare			

Habitat Discussion:
A. heterodon is a generalist in terms of its preference for stream size, substrate, and flow conditions. It does not show any strong preference for particular habitats or microhabitats and is found in a variety of

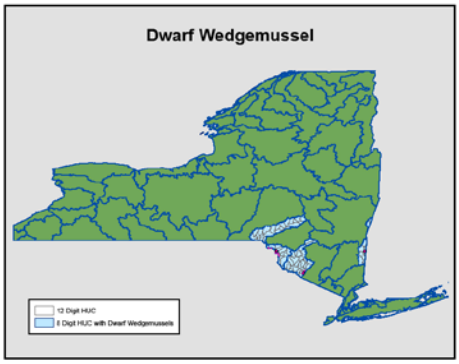
substrate types including clay, sand, gravel, pebble, and often in depositional areas and banks with large amounts of silt (Nedeau 2008). Other habitats included are amongst submerged aquatic plants, and near stream banks underneath overhanging tree limbs (NatureServe 2013). It inhabits very shallow water along stream banks, but has also been found at depths of 25 feet in the Connecticut River. They do not inhabit lakes or reservoirs, but may occur in small impoundments. Stable flow and stable substrate are critical for this species (Nedeau 2008). This species is relatively sensitive to pollution, siltation, and low dissolved oxygen (McLain and Ross 2005). In New York, the habitat for *A. heterodon* is a small (40m wide), coolwater river, where it lives bedded in the fine sediments that accumulate between cobbles (Strayer and Jirka 1997).

Primary Habitat Type
Medium River; High Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Transitional Cool
Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Medium River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Transitio
Medium River; Moderate-High Gradient; Assume Moderately Buffered (Size 3+ rivers); Transiti
Medium River; Moderate-High Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Small River; High Gradient; Moderately Buffered, Neutral; Transitional Cool
Small River; Low Gradient; Moderately Buffered, Neutral; Transitional Cool
Small River; Low-Moderate Gradient; Moderately Buffered, Neutral; Transitional Cool

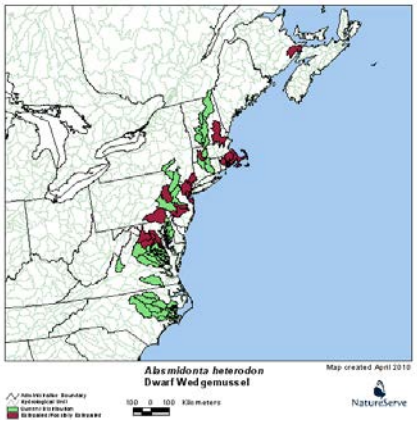
Distribution:

Since 1970, *A. heterodon* has been known to four waterbodies in New York. It is found from a short reach of the lower Neversink River (1997) and its tributary Basher Kill (2000), where approximately 20,000 animals (Strayer et al. 1996, NY Natural Heritage Program 2013), one of the world's largest populations of this rare species, remain (Strayer and Jirka 1997). It has also been found live in the upper Delaware River as recently as 2002 and a sparse population was found in Webatuck Creek in South Amenia in 2007 (NY Natural Heritage Program 2013).

A. heterodon has been reported from the Passaic River basin in New Jersey and the Housatonic River basin in Connecticut, so it may yet turn up elsewhere in the Atlantic drainage of southeastern New York (Strayer and Jirka 1997).



A. heterodon post-1970 distribution in New York (The Nature Conservancy 2009, Harman and Lord 2010, Mahar and Landry 2013, NY Natural Heritage Program 2013, White et al. 2011).



NatureServe (2013)

Threats to NY Populations				
Threat Category	**Threat**	**Scope**	**Severity**	**Irreversibility**
1. Human Intrusions & Disturbance	Work & Other Activities (bridge projects and other instream work)	N	L	L
2. Natural System Modifications	Other Ecosystem Modifications (levees and flood walls, channelization, dredging, culverts)	N	M	H
3. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (didymo)	N	L	H
4. Pollution	Agricultural & Forestry Effluents (pesticides, fertilizers, sediment)	P	L	M
5. Pollution	Household Sewage & Urban Waste Water (road runoff of salts and metals, other regulated discharges)	P	L	H
6. Pollution	Household Sewage & Urban Waste Water (waste water treatment effluent, sewer and septic overflows)	P	L	H
7. Climate Change & Severe Weather	Droughts	P	L	V
8. Natural System Modifications	Dams & Water Management/Use (lowering of water table from agriculture, NYC water use, etc…, causing drying of habitat)	P	L	M
9. Climate Change & Severe Weather	Storms & Flooding (extreme storms)	P	M	V

10. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (die offs from unknown disease)	N	L	H

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Common Name: Green floater ***SGCN – High Priority***
Scientific Name: *Lasmigona subviridis*
Taxon: Freshwater Mollusks

Federal Status: Not Listed
New York Status: Threatened

Natural Heritage Program Rank:
Global: G3
New York: S1S2
Tracked: Yes

Synopsis:
Lasmigona subviridis belongs to the subfamily Unioninae, and the tribe Anodontini, which includes 16 extant and 1 likely extirpated New York species of the genera *Alasmidonta*, *Anodonta*, *Anodontoides*, *Lasmigona*, *Pyganodon*, *Simpsonaias*, *Strophitus*, and *Utterbackia* (Haag 2012, Graf and Cummings 2011). *L. subviridis* is a member of the *Lasmigona* genus, from the Greek words *elasma*, referring to the "plate-like" lateral tooth. The species name *subviridis* refers to its light green color (Watters et al. 2009).

This species is found in the Atlantic Slope from North Carolina to New York, as well as the Kanawha River basin in North Carolina, Virginia, and West. Virginia. Since 1970, this species has been found live in thirteen New York waterbodies. Most records are from the Susquehanna River drainage, but records from the Mohawk, Hudson, Genesee, and Oswego River basins, and the Erie Canal also exist. The species has declined throughout most of its range, and relatively few populations remain in New York (Strayer and Jirka 1997).

L. subviridis is ranked as "critically imperiled" in New York and "vulnerable" throughout its range. In North America, approximately 2/3 to ¾ of native mussel species are extinct, listed as endangered or threatened, or are in need of conservation status (Williams et al. 1993, Stein et al. 2000). While population trends in New York are unknown, based on sparse historical information, it is assumed that they too are declining due to a myriad of environmental stressors.

L. subviridis has recently been found more infrequently and generally in lower numbers than in the past, with many documented extirpated occurrences. However, this species is easier to overlook than others and might be under-sampled. It still maintains a wide range, although there is considerable confusion as to the taxonomy of this species in the northern part of its range. Although occurrences are still widespread, decline is evident at many localities and historical extirpations have occurred in Georgia and Kentucky (NatureServe 2013).

Distribution (% of NY where species occurs)		**Abundance** (within NY distribution)		**NY Distribution Trend**	**NY Abundance Trend**
0% to 5%		Abundant		Stable	Stable
6% to 10%		Common			
11% to 25%	X	Fairly common			
26% to 50%		Uncommon	X		
> 50%		Rare			

Habitat Discussion:
L. subviridis is considered to be a species of creeks and small rivers (Watters et al. 2009, Strayer and Jirka 1997, Ortman 1919). Watters et al. (2009) noted that it is not typically a large river species. Despite this, in New York, this species has been most commonly found in large and medium sized rivers (Susquehanna River, Chemung River, Chenango River, Unadilla River, Tioghnioga River, Genesee River). *L. subviridis* is most commonly found in gravel or sandy substrate in water depths of one to four feet (NatureServe 2013, Ortmann 1919, Watters et al. 2009). It is thought to be intolerant of strong currents and occurs in pools and other calm water areas (Ortmann 1919, Watters et al. 2009, NatureServe 2013). It seems to occur more often in good condition (Watters et al., 2009), good water quality (NatureServe 2013), hydrologically stable streams than in those subject to severe floods and droughts (Strayer and Jirka 1997).

Primary Habitat Type
Headwater/Creek; Low-Moderate Gradient; Moderately Buffered, Neutral; Transitional Cool
Headwater/Creek; Moderate-High Gradient; Moderately Buffered, Neutral; Cold
Large/Great River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Large/Great River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Medium River; High Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Transitional Cool
Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Medium River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Transitio
Medium River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Medium River; Moderate-High Gradient; Assume Moderately Buffered (Size 3+ rivers); Transiti
Medium River; Moderate-High Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Small River; Low Gradient; Moderately Buffered, Neutral; Transitional Cool
Small River; Low-Moderate Gradient; Moderately Buffered, Neutral; Transitional Cool
Small River; Moderate-High Gradient; Moderately Buffered, Neutral; Transitional Cool

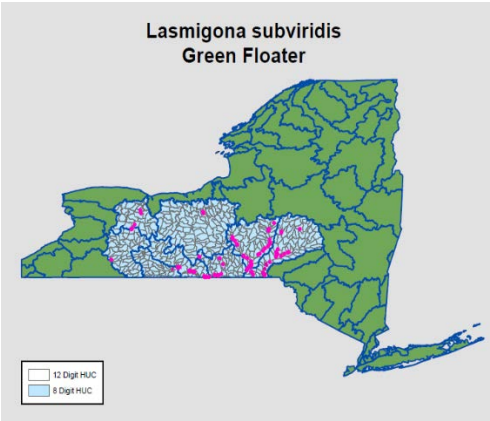
Distribution:
Since 1970, *L. subviridis* has been found in thirteen New York State waterbodies. A recent State Wildlife Grants funded survey of portions of the Susquehanna basin detected live *L. subviridis* at 7 sites in the Unadilla River (79 live), 7 sites in the Chenango River (20 live), 6 sites in the Susquehanna River (155 live), 5 sites in the Tioughnioga River (45 live), 5 sites in the Chemung River (51 live) (8 live – Mahar and Landry 2014), and 2 sites in the Sangerfield River (10 live) (Harman and Lord 2010). There are also reports of live mussels from 3 sites in Catatonk Creek (3 live) (Harman and Lord 2010, NY Natural

Heritage Program 2013). In the Cohocton subbasin, *L. subviridis* was found live in Fivemile Creek (40 live) and in the Cohocton River near Bath (102 live) (Mahar and Landry 2014).

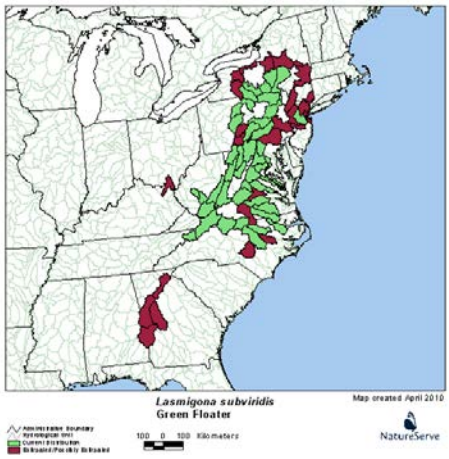
In the Genesee River basin, three live specimens were found in the Genesee River at Mt. Morris and at least one live specimen was found at Geneseo (Livingston Co). Additional live individuals were found in Black Creek (Allegany Co), a tributary to the upper Genesee River. Fresh shells were also found in the Genesee River, including a juvenile specimen just downstream of Honeoye Creek confluence (Rush, Monroe Co.) and an adult specimen just upstream of Oatka Creek confluence (Henrietta, Monroe Co.) (Mahar and Landry 2015).

In the Seneca basin, *L. subviridis* was found live in Crane Brook (3 live) and Fall Creek (1 live) (Mahar and Landry 2015).

Two specimens of *L. subviridis* were reported from the Grass River drainage in northern New York's St. Lawrence basin (1996), but this record is well out of the known range of the species and must be verified (Strayer and Jirka 1997).



L. subviridis post-1970 distribution in New York (The Nature Conservancy 2009, Harman and Lord 2010, Mahar and Landry 2013, NY Natural Heritage Program 2013, White et al. 2011).



NatureServe (2013)

Threats to NY Populations				
Threat Category	**Threat**	**Scope**	**Severity**	**Irreversibility**
1. Human Intrusions & Disturbance	Work & Other Activities (bridge projects and other instream work)	N	L	L
2. Natural System Modifications	Other Ecosystem Modifications (levees and flood walls, channelization, dredging, impassable culverts)	W	M	H
3. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (zebra mussels, rusty crayfish)	P	M	H
4. Pollution	Agricultural & Forestry Effluents (pesticides, fertilizers, sediment)	P	L	M
5. Pollution	Household Sewage & Urban Waste Water (road runoff of salts and metals, other regulated discharges)	P	M	H
6. Pollution	Household Sewage & Urban Waste Water (waste water treatment effluent, sewer and septic overflows)	P	M	H
7. Climate Change & Severe Weather	Droughts	P	L	V
8. Natural System Modifications	Dams & Water Management/Use (lowering of water table from agriculture, etc…, causing drying of habitat)	R	L	M
9. Climate Change & Severe Weather	Storms & Flooding (extreme storms)	P	M	V

10. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien (die offs from unknown disease)	N	L	H

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Common Name: Rainbow ***SGCN – High Priority***
Scientific Name: *Villosa iris*
Taxon: Freshwater Mollusks

Federal Status: Not Listed
New York Status: Not Listed

Natural Heritage Program Rank:
Global: G5
New York: S2S3
Tracked: Yes

Synopsis:
Villosa iris belongs to the subfamily Ambleminae and the tribe Lampsilini, which includes 17 extant and 6 likely extirpated New York species of the genera *Actinonaias*, *Epioblasma*, *Lampsilis*, *Leptodea*, *Ligumia*, *Obovaria*, *Potamilus*, *Ptychobranchus*, *Toxolasma*, *Truncilla*, and *Villosa* (Haag 2012, Graf and Cummings 2011). *Villosa iris* belongs to the genus *Villosa*, which was originally characterized for their rough periostracum, but has evolved into a clade with many examples of smooth exteriors. Iris refers the iridescent nacre characteristic of this species (Watters et al. 2009).

V. iris is typically a species of creeks and small rivers, but can sometimes occur in lakes and large rivers (Strayer and Jirka 1997). It prefers moving water and highly oxygenated waters (Strayer and Jirka 1997, Mahar and Landry 2013). Since 1970, this species has been found in 27 waterbodies. *V. iris* currently inhabits the lower Genesee, Lake Erie, West and Mid Lake Ontario, and the Oswego basins, as well as the Erie Canal and may occur in the Allegheny basin (Mahar and Landry 2013, NY Natural Heritage Program 2013). Portions of the New York range that have been recently surveyed show abundant populations of V.iris (Strayer and Jirka 1997).

In New York, *V. iris* is ranked as imperiled, although it is apparently secure throughout its range (NatureServe 2013). In North America, approximately ⅔ to ¾ of native mussel species are extinct, listed as endangered or threatened, or are in need of conservation status (Williams et al. 1993, Stein et al. 2000). While population trends in New York are unknown, it is assumed that they too are declining, due to a myriad of environmental stressors.

Distribution (% of NY where species occurs)		**Abundance** (within NY distribution)		**NY Distribution Trend**	**NY Abundance Trend**
0% to 5%		Abundant		Moderate Decline	Moderate Decline
6% to 10%	X	Common			
11% to 25%		Fairly common			
26% to 50%		Uncommon	X		
> 50%		Rare			

Habitat Discussion:
V. iris is typically thought of as a species of creeks and small rivers (Cummings and Mayer 1992, McMurray et al. 2012, Metcalfe-Smith et al. 2005, Strayer and Jirka 1997, Watters et al. 2009), however it also occurs in lakes (e.g. Canandaigua, Seneca, Cayuga, Oneida) and large rivers as well (e.g. Niagara, Seneca, Oswego) (COSEWIC 2006, NatureServe 2013, Strayer and Jirka 1997, Watters et al. 2009). It is often fairly abundant (Strayer and Jirka 1997).

This species is most commonly found in sandy cobble (Watters et al. 2009), coarse sand or gravel substrates (Cummings and Mayer 1992, McMurray et al. 2012, Metcalfe-Smith et al. 2005), in or near riffles and along the edges of emergent vegetation in moderate to strong current (Metcalfe-Smith et al. 2005, Parmalee and Bogan 1998). It becomes most numerous in clean, well-oxygenated stretches at depths of less than three feet (Parmalee and Bogan 1998).

This species is considered a habitat specialist (NatureServe 2013).

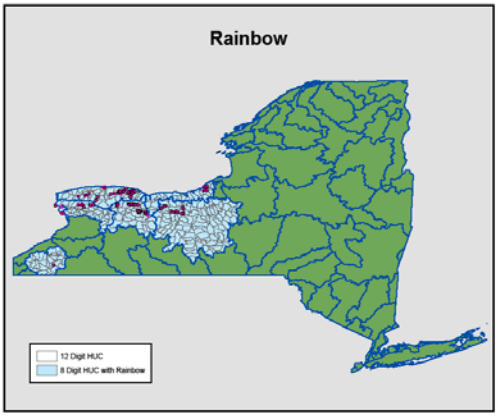
Primary Habitat Type
Headwater/Creek; Low Gradient; Highly Buffered, Calcareous; Transitional Cool
Headwater/Creek; Low Gradient; Highly Buffered, Calcareous; Warm
Headwater/Creek; Low Gradient; Moderately Buffered, Neutral; Transitional Cool
Headwater/Creek; Low-Moderate Gradient; Highly Buffered, Calcareous; Transitional Cool
Headwater/Creek; Low-Moderate Gradient; Moderately Buffered, Neutral; Transitional Cool
Headwater/Creek; Moderate-High Gradient; Highly Buffered, Calcareous; Cold
Medium River; High Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Medium River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Medium River; Moderate-High Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Small River; Low Gradient; Moderately Buffered, Neutral; Transitional Cool
Small River; Low-Moderate Gradient; Highly Buffered, Calcareous; Transitional Cool
Small River; Low-Moderate Gradient; Moderately Buffered, Neutral; Transitional Cool
Small River; Moderate-High Gradient; Highly Buffered, Calcareous; Transitional Cool
Small River; Moderate-High Gradient; Moderately Buffered, Neutral; Transitional Cool

Distribution:
Since 1970, *V. iris* has been found in 27 New York State waterbodies. As part of the Southern Lake Ontario mussel inventory, 423 live *V. iris* have been found to date (Mahar and Landry 2013). In the Lower Genesee basin, *V. iris* has been found in Honeoye Creek, Black Creek, and Black Creek's tributaries: Bigelow, Onion, and Spring Creeks. In the Oswego basin, this species has been found in both Canandaigua Outlet and Ganargua Creek. *V. iris* has been found in tributaries to Lake Ontario including East Branch of Eighteenmile Creek, Johnson Creek, Oak Orchard Creek, Sandy Creek, West Branch of Sandy Creek, East Branch of Sandy Creek, Moorman Creek, West Creek, Brockport Creek, Salmon Creek, Allen Creek, Sterling Creek, Sterling Valley Creek, and Ninemile Creek.

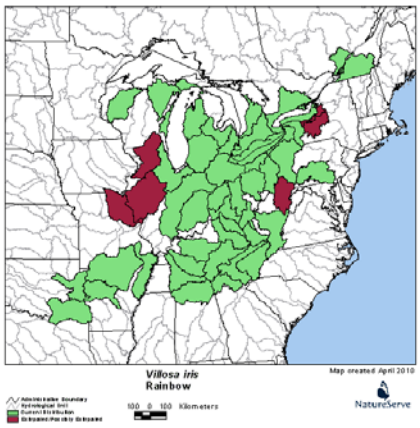
In the Erie basin, *V. iris* shells have been found in Tonawanda Creek and its tributary Beeman Creek (Mahar and Landry 2013). Shells were found at six additional sites and live at a single site in the Tonawanda Creek basin (Marangelo and Strayer 2000). Fresh shells have been found in the Niagara River (NY Natural Heritage Program 2013).

Shells have also been found in the Erie Canal at Lyons (Mahar and Landry 2013). *V. iris* has been reported in the Grass River basin in northern New York, the first report of the species from this basin (Strayer and Jirka 1997). *V. iris* was not found in recent surveys of the Allegheny (The Nature Conservancy 2009) or Susquehanna basins (Harman and Lord 2010). However, recent NY Natural Heritage Program records show an element of occurrence for this species in Conewango Creek in the Allegheny basin. Strayer and Jirka (1997) note that in the parts of its New York range that have been recently surveyed, *V. iris* is still relatively common.

Waterbodies with greatest *V. iris* abundance include Honeoye Creek with 162 live, East Branch Eighteenmile with 65 live, and West Creek with 61 live individuals found during recent surveys (Mahar and Landry 2013).



V. iris post-1970 distribution in New York (The Nature Conservancy 2009, Harman and Lord 2010, Mahar and Landry 2013, NY Natural Heritage Program 2013, White et al. 2011).



NatureServe (2013)

Threats to NY Populations				
Threat Category	**Threat**	**Scope**	**Severity**	**Irreversibility**
1. Human Intrusions & Disturbance	Work & Other Activities (bridge projects and other instream work)	W	L	L
2. Natural System Modifications	Other Ecosystem Modifications (levees and flood walls, channelization, dredging, culverts)	R	L	H
3. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (zebra mussels, rusty crayfish)	P	L	H
4. Pollution	Agricultural & Forestry Effluents (pesticides, fertilizers, sediment)	P	L	M
5. Pollution	Household Sewage & Urban Waste Water (road runoff of salts and metals, other regulated discharges)	P	M	H
6. Pollution	Household Sewage & Urban Waste Water (waste water treatment effluent, sewer and septic overflows)	P	M	H
7. Climate Change & Severe Weather	Droughts	P	M	V
8. Natural System Modifications	Dams & Water Management/Use (lowering of water table from agriculture, etc…, causing drying of habitat)	W	L	M
9. Climate Change & Severe Weather	Storms & Flooding (extreme storms)	W	M	V

10. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (die offs from unknown disease)	N	L	H

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Common Name: Rayed bean ***SGCN – High Priority***
Scientific Name: *Villosa fabalis*
Taxon: Freshwater Mollusks

Federal Status: Endangered
New York Status: Endangered

Natural Heritage Program Rank:
Global: G2
New York: S1
Tracked: Yes

Synopsis:
Villosa fabalis belongs to the subfamily Ambleminae and the tribe Lampsilini, which includes 17 extant and 6 likely extirpated New York species of the genera *Actinonaias*, *Epioblasma*, *Lampsilis*, *Leptodea*, *Ligumia*, *Obovaria*, *Potamilus*, *Ptychobranchus*, *Toxolasma*, *Truncilla*, and *Villosa* (Haag 2012, Graf and Cummings 2011). *V. fabalis* is in the genus *Villosa* meaning shaggy or rough, has evolved into a clade with many examples of smooth exteriors, including the rayed bean. The species name *fabalis*, meaning "faba" or "bean," aptly describes its small, solid, bean-shape and size (Watters et al. 2009).

V. fabalis is most often found in high quality creeks or small rivers, in sand and gravel, often deeply buried among the roots of aquatic vegetation in and near riffles or along the river's edge (Strayer and Jirka 1997, Metcalf-Smith et al. 2005, Watters et al. 2009, NatureServe 2013). However, this species has also been found in the Great Lakes, as well as some larger streams and rivers (Strayer and Jirka 1997). In New York this species is only present in six waterbodies in the Allegheny basin, where it was recently found in 19% of the sites that were surveyed (The Nature Conservancy 2009). *V. fabalis* is federally and state listed as an endangered species.

This species is declining throughout its range to an extent where 78% of streams formerly occupied no longer contain viable populations. Distribution is greatly fragmented and only a small percentage of former populations are known to exist. Remaining *V. fabalis* populations are small and geographically isolated making them susceptible to a single catastrophic event and limiting potential for making natural repopulation or any genetic interchange between disjunct populations. Long-term viability of extant populations is questionable, particularly in the presence of introduced competitors (NatureServe 2013).

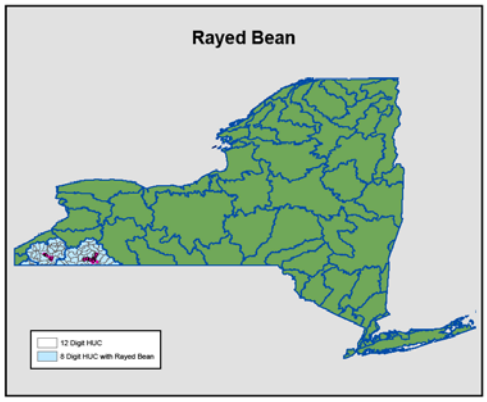
Distribution (% of NY where species occurs)		**Abundance** (within NY distribution)		**NY Distribution Trend**	**NY Abundance Trend**
0% to 5%	X	Abundant		Stable	Unknown
6% to 10%		Common			
11% to 25%		Fairly common			
26% to 50%		Uncommon			
> 50%		Rare	X		

Habitat Discussion:
V. fabalis is most often found in high quality creeks or small rivers in sand and gravel, often deeply buried among the roots of aquatic vegetation in and near riffles or along the river's edge (Strayer and Jirka 1997, Metcalf-Smith et al. 2005, Watters et al. 2009, NatureServe 2013). This species also exists in larger rivers and is known to occur in the shallow wave-washed areas of glacial lakes (NatureServe 2013). In Lake Erie, it is generally associated with islands in the western portion of the lake.

V. fabalis are sensitive to pollution, eutrophication, siltation, habitat perturbation, inundation, and invasive species and loss of glochidial hosts (COSEWIC as sited in NatureServe 2013).

Primary Habitat Type
Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Small River; Low Gradient; Moderately Buffered, Neutral; Transitional Cool
Small River; Moderate-High Gradient; Moderately Buffered, Neutral; Transitional Cool

Distribution:
Since 1970, *V. fabalis* has been found in six New York State waterbodies. In a recent survey of the Allegheny basin, The Nature Conservancy found a total of 79 live *V. fabalis* at 20 of 105 sites surveyed. This species was found primarily in Olean and lower Ischua Creeks, mid-reaches of Cassadaga Creek, and Conewango Creek, and at lower numbers in the Allegheny River upstream of Olean to the confluence with Tunungwant Creek. The greatest catches (up to 3.3 per hr) were in upper Olean Creek, and populations were considered viable at 35% of the sites where *V. favalis* was found (The Nature Conservancy 2009). This species also occurs in Chautauqua Lake (Strayer and Jirka 1997).



V. fabalis post-1970 distribution in New York (The Nature Conservancy 2009, Harman and Lord 2010, Mahar and Landry 2013, NY Natural Heritage Program 2013, White et al. 2011).

Threats to NY Populations				
Threat Category	**Threat**	**Scope**	**Severity**	**Irreversibility**
1. Human Intrusions & Disturbance	Work & Other Activities (bridge projects and other instream work)	P	M	H
2. Natural System Modifications	Other Ecosystem Modifications (levees, channelization, dredging, culverts)	P	L	M
3. Pollution	Agricultural & Forestry Effluents (pesticides, fertilizers, sediment)	P	L	M
4. Pollution	Household Sewage & Urban Waste Water (road runoff of salts and metals, other regulated discharges)	P	L	M
5. Pollution	Household Sewage & Urban Waste Water (septic overflows)	P	L	H
6. Climate Change & Severe Weather	Droughts	P	M	V
7. Natural System Modifications	Dams & Water Management/Use (lowering of water table from agriculture, etc…, causing drying of habitat)	P	M	H
8. Climate Change & Severe Weather	Storms & Flooding (extreme storms)	P	H	V
9. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (die offs from unknown disease)	P	L	H

10. Invasive & Other Problematic Species & Genes	Problematic Native Species (beaver dams influencing hydrology)	R	M	M
11. Energy Production & Mining	Oil & Gas (hydraulic fracturing)	P	M	M

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Common Name: Slippershell mussel ***SGCN – High Priority***
Scientific Name: *Alasmidonta viridis*
Taxon: Freshwater Mollusks

Federal Status: Not Listed
New York Status: Not Listed

Natural Heritage Program Rank:
Global: G4G5
New York: S1S2
Tracked: Yes

Synopsis:
Alasmidonta viridis belongs to the subfamily Unioninae and the tribe Anodontini, which includes 16 extant and 1 likely extirpated New York species of the genera *Alasmidonta*, *Anodonta*, *Anodontoides*, *Lasmigona*, *Pyganodon*, *Simpsonaias*, *Strophitus*, and *Utterbackia* (Haag 2012, Graf and Cummings 2011). *A. viridis* is a member of the genus *Alasmidonta*, named for its lack of lateral teeth. The species name *viridis* refers to the green color of the periostracum (Watters et al. 2009).

In New York, *A. viridis* is found in three Erie basin waterbodies (Mahar and Landry 2012, NY Natural Heritage Program 2013). Although rare in New York, this edge of range species is considered "Apparently Secure" throughout its range. It occupies a wide range of habitats, from small streams to large rivers (Strayer and Jirka 1997), and it is typically found living in a substrate of sand and fine gravel.

In North America, approximately ⅔ to ¾ of native mussel species are extinct, listed as endangered or threatened, or are in need of conservation status (Williams et al. 1993, Stein et al. 2000). While *A. viridis* population trends in New York are unknown, it is assumed that they too are declining, due to a myriad of environmental stressors.

Distribution (% of NY where species occurs)		**Abundance** (within NY distribution)		**NY Distribution Trend**	**NY Abundance Trend**
0% to 5%	X	Abundant		Moderate Decline	Moderate Decline
6% to 10%		Common			
11% to 25%		Fairly common			
26% to 50%		Uncommon			
> 50%		Rare	X		

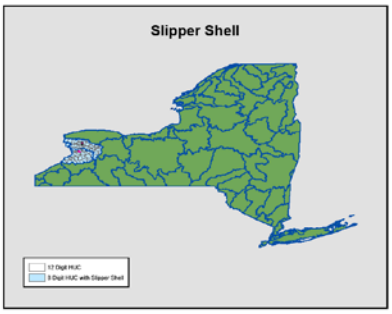
Habitat Discussion:
Throughout its range, this species is typically found in headwater streams but also may occur downstream (NatureServe 2013). In New York, it occupies a wide range of habitats, from small streams to large rivers. In fact, the largest historical collections of this species in New York have come from the Niagara River (Strayer and Jirka 1997). It is found in high to moderate gradient streams, and while it may be found in riffles, it is typically found living in a substrate of sand and fine gravel. In stretches where there is a continuous current it will thrive in a mud and sand bottom among roots of aquatic vegetation (Cummings and Mayer 1992, McMurray et al. 2012, Metcalf-Smith et al. 2005, NatureServe 2013). It is a small sized species that may burrow out of sight in sand or sandy mud, so may be easily overlooked.

It is thought to be a moderate habitat specialist (NatureServe 2013) and is not found in impounded waters (Watters 1995).

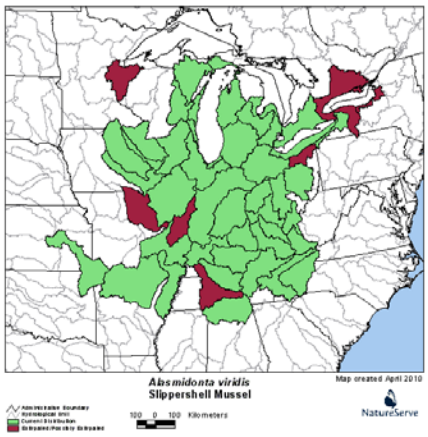
Primary Habitat Type
Headwater/Creek; Low-Moderate Gradient; Moderately Buffered, Neutral; Transitional Cool
Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Transitional Cool
Small River; Moderate-High Gradient; Moderately Buffered, Neutral; Transitional Cool

Distribution:

Post 1970, *A. viridis* has been found in 3 waterbodies in New York State. In the Erie basin, it has been found in Tonawanda Creek (Strayer and Jirka 1997), and as fresh shells in Beeman Creek, a Tonawanda Creek tributary (Mahar and Landry 2013), and Buffalo Creek (NY Natural Heritage Program 2013). In Beeman Creek, 88 shells were found (Mahar and Landry 2013), indicating that a large population still exists in this waterbody. No recent occurrences from the Niagara River or Monroe County have been reported.



A. viridis post-1970 distribution in New York (The Nature Conservancy 2009, Harman and Lord 2010, Mahar and Landry 2013, NY Natural Heritage Program 2013, White et al. 2011).



NatureServe (2013)

Threats to NY Populations				
Threat Category	**Threat**	**Scope**	**Severity**	**Irreversibility**
1. Human Intrusions & Disturbance	Work & Other Activities (bridge projects and other instream work)	W	L	L
2. Natural System Modifications	Other Ecosystem Modifications (culverts)	W	L	H
3. Pollution	Agricultural & Forestry Effluents (pesticides, fertilizers, sediment)	W	L	M
4. Pollution	Household Sewage & Urban Waste Water (road runoff of salts and metals, other regulated discharges)	P	M	H
6. Pollution	Household Sewage & Urban Waste Water (septic overflows)	P	M	H
7. Climate Change & Severe Weather	Droughts	P	L	V
8. Climate Change & Severe Weather	Storms & Flooding (extreme storms)	W	M	V
9. Invasive & Problematic Species & Genes	Invasive Non-Native/Alien Species (die offs from unknown disease)	N	L	H
10. Invasive & Problematic Native Species & Genes	Problematic Native Species (beavers)	W	L	M

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Common Name: Tidewater mucket ***SGCN – High Priority***
Scientific Name: *Leptodea ochracea*
Taxon: Freshwater Mollusks

Federal Status: Not Listed
New York Status: Not Listed

Natural Heritage Program Rank:
Global: G3G4
New York: S1
Tracked: Yes

Synopsis:
Leptodea ochracea belongs to the subfamily Ambleminae and the tribe Lampsilini, which includes 17 extant and 6 likely extirpated New York species of the genera *Actinonaias*, *Epioblasma*, *Lampsilis*, *Leptodea*, *Ligumia*, *Obovaria*, *Potamilus*, *Ptychobranchus*, *Toxolasma*, *Truncilla*, and *Villosa* (Haag 2012, Graf and Cummings 2011). The taxonomic placement of species *L. ochracea* in the genus *Leptodea* is in doubt (Bogan 1996) and it has been suggested that this species might better be placed in the genus *Ligumia*, based on its papilla (Smith 2000).

L. ochracea is a species that is usually found in depositional areas of waterbodies close to the ocean. Since 1970, *L. ochracea* has been found in only three New York waterbodies, but was common only in the freshwater tidal Hudson River (Strayer and Jirka 1997). Since the arrival of the zebra mussel (*Dreissena polymorpha*), its population has declined considerably (Strayer and Smith 1996) and it is expected to stabilize at 8 percent of its pre-invasion densities (Strayer and Malcom 2007). This species has also been reported from a couple of small Hudson River tributaries and from the Grass River in the St. Lawrence basin (Strayer and Jirka 1997). In New York, this species is ranked as "Critically Imperiled," and is considered "Vulnerable" throughout its range.

Distribution (% of NY where species occurs)		**Abundance** (within NY distribution)		**NY Distribution Trend**	**NY Abundance Trend**
0% to 5%		Abundant		Unknown	Severe Decline
6% to 10%	X	Common			
11% to 25%		Fairly common			
26% to 50%		Uncommon			
> 50%		Rare	X		

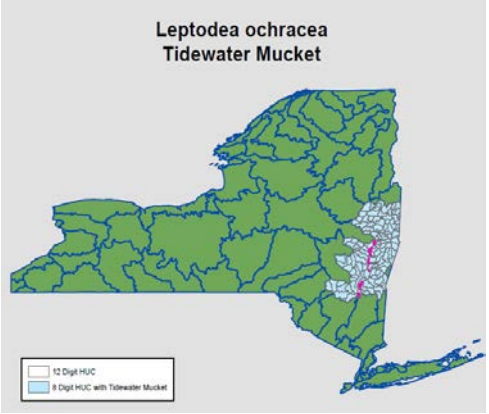
Habitat Discussion:
L. ochracea is a freshwater species that is usually found in waterbodies close to, but not necessarily connected, to the ocean. It occurs in small to large tidal rivers, canals, coastal ponds; including artificial impoundments; and lakes that have connections with coastal waters. It inhibits muddy, sandy, and gravely substrates. *L. ochracea* has been found in water depths of one to more than 25 feet, in a variety of conditions, but seem to prefer depositional areas with slow currents (Nedeau 2008, Strayer and Jirka 1997).

Primary Habitat Type
Large/Great River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm

Large/Great River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Small River; Moderate-High Gradient; Moderately Buffered, Neutral; Transitional Cool

Distribution:
Since 1970, *L. ochracea* has been found in 3 waterbodies in New York. It was common only in the freshwater tidal Hudson River, where its range extended almost continuously from Troy to Kingston (Strayer and Jirka 1997, White et al. 2011). In 1991-1992, it constituted about 5% of the freshwater tidal Hudson River unionoid community of over one billion animals. Since the arrival of the zebra mussel (*Dreissena polymorpha*), the population of *L. ochracea* in the Hudson River declined considerably at a rate of 43 percent per year until 1998 when it was no longer detected in surveys. Populations recovered slightly in 2000–2005 and models suggest that populations will stabilize at 8% of their pre-invasion densities rather than disappearing from the Hudson River (Strayer and Malcom 2007). Also, in 2011, live specimens were found in the South Bay Creek and Marsh area near the City of Hudson.

Erickson and Fetterman (1996) reported a questionable occurrence of this species from the Grass River (Strayer and Jirka 1997). Far from previously known populations of the species, the origins and status of this population are obscure. It may represent a remnant population that survived glaciation in an offshore refugium, or these specimens may have been strays, brought up the St. Lawrence by anadromous fish (Strayer and Jirka 1997).



L. ochracea post-1970 distribution in New York (The Nature Conservancy 2009, Harman and Lord 2010, Mahar and Landry 2013, NY Natural Heritage Program 2013, White et al. 2011).

Threats to NY Populations				
Threat Category	**Threat**	**Scope**	**Severity**	**Irreversibility**
1. Human Intrusions & Disturbance	Work & Other Activities (bridge projects and other instream work)	N	L	L
2. Natural System Modifications	Other Ecosystem Modifications (levees and flood walls, channelization, dredging, impassable culverts)	W	M	H
3. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (zebra mussels)	P	H	H
4. Pollution	Agricultural & Forestry Effluents (pesticides, fertilizers, sediment)	P	L	M
5. Pollution	Household Sewage & Urban Waste Water (road runoff of salts and metals, other regulated discharges)	P	L	H
6. Pollution	Household Sewage & Urban Waste Water (waste water treatment effluent, sewer and septic overflows)	P	L	H
7. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (die offs from unknown disease)	N	L	H

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Common Name: Wabash pigtoe
Scientific Name: *Fusconaia flava*
Taxon: Freshwater Mollusks

SGCN – High Priority

Federal Status: Not Listed
New York Status: Not Listed

Natural Heritage Program Rank:
Global: G5
New York: S2
Tracked: Yes

Synopsis:
Fusconaia flava belongs to the subfamily Ambleminae and the tribe Pleurobemini, which includes four extant and one likely extirpated New York species in the genera *Elliptio*, *Fusconaia*, and *Pleurobema* (Haag 2012). In general, the shells are of this tribe are unsculptured and larvae are brooded only in the outer demibranchs (with exceptions) (Graf and Cummings 2011). *F. flava* belongs to the genus *Fusconaia*, from the Latin word *fuscus*, meaning dark or dusky, and the species name *flava* referring to yellow-brown color of the periostracum (Watters et al. 2009).

In New York, *F. flava* is found in 16 waterbodies from the Erie-Niagara basin eastward to the Oswego basin (Mahar and Landry 2013). The species lives in running waters of all sizes and occasionally occurs in lakes. They can be found in muddy, hydrologically unstable, low gradient streams as well as course sand or gravel substrate (Strayer and Jirka 1997, Parmalee and Bogan 1998).

Although ranked as "imperiled" in New York, this edge of range species is considered secure throughout its range. In North America, approximately 2/3 to ¾ of native mussel species are extinct, listed as endangered or threatened, or are in need of conservation status (Williams et al. 1993, Stein et al.2000). While population trends in New York are unknown, it is assumed that they too are declining, due to a myriad of environmental stressors.

Distribution (% of NY where species occurs)		**Abundance** (within NY distribution)		**NY Distribution Trend**	**NY Abundance Trend**
0% to 5%		Abundant		Moderate Decline	Moderate Decline
6% to 10%	X	Common			
11% to 25%		Fairly common			
26% to 50%		Uncommon	X		
> 50%		Rare			

Habitat Discussion:
Although typically found in medium sized to large rivers (Metcalfe-Smith et al. 2005), this species can be found in running waters of all sizes, from small, headwater creeks to big rivers (i.e., Niagara River), (Strayer and Jirka 1997) and lakes, including the Great Lakes (Metcalfe-Smith et al. 2005). Strayer and Jirka (1997) note that it seems to do well in muddy, hydrologically unstable, low gradient streams, while Parmalee and Bogan (1998) state that a stable substrate composed of coarse sand and gravel appears most suitable. *F. flava* may be found at depths up to 15 feet (NatureServe 2013).

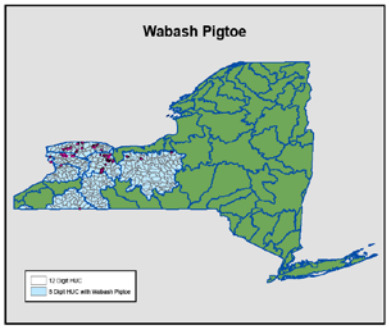
Primary Habitat Type
Headwater/Creek; Low Gradient; Highly Buffered, Calcareous; Warm
Headwater/Creek; Low-Moderate Gradient; Highly Buffered, Calcareous; Transitional Cool
Headwater/Creek; Low-Moderate Gradient; Moderately Buffered, Neutral; Transitional Cool
Headwater/Creek; Moderate-High Gradient; Low Buffered, Acidic; Cold
Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Medium River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Medium River; Moderate-High Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm
Small River; Low Gradient; Moderately Buffered, Neutral; Transitional Cool
Small River; Low-Moderate Gradient; Highly Buffered, Calcareous; Transitional Cool
Small River; Low-Moderate Gradient; Moderately Buffered, Neutral; Transitional Cool
Small River; Moderate-High Gradient; Moderately Buffered, Neutral; Transitional Cool

Distribution:

Since 1970, *F. flava* has been found in 16 New York State waterbodies. It is encountered regularly in western New York (Strayer and Jirka 1997). In the West Lake Ontario basin it has been found live in East Branch Eighteenmile Creek, Johnson Creek, Sandy Creek, East Branch Sandy Creek, and Salmon Creek, with shells found in Oak Orchard Creek. In the Lower Genesee basin, this species has been found live in Black Creek, Conesus Creek, Genesee River, and Honeoye Creek. In the Oswego basin, we have found shells in Ganaragua Creek and Canandaigua Outlet. No evidence of this species has been found in East Lake Ontario basin (Mahar and Landry 2013; Burlakova et al. in preparation). In the Erie basin, live animals have been found in Tonawanda Creek and the Niagara River (Burlakova et al., unpublished data) and shells were found in Cayuga Creek (New York Natural Heritage Program 2013). Shells have also been found in the Erie Canal (Mahar and Landry 2013).

Waterbodies with greatest *F. flava* abundance include Honeoye Creek with 867 live and the Genesee River with 205 live individuals found during recent surveys (Mahar and Landry 2013).

A New York Natural Heritage Program (2013) record from 1986 lists this species from Oswayo Creek in the Allegheny basin, however, this account is considered suspect for several reasons. There have never been records of the species from this watershed, and *Pleurobema sintoxia* is found in Oswayo Creek and may look very similar to *F. flava*, allowing for the possibility of misidentification. Moreover, recent intensive surveys of the Allegany basin by The Nature Conservancy (2009), which included this waterbody, did not detect this species.



F. flava post-1970 distribution in New York (The Nature Conservancy 2009, Harman and Lord 2010, Mahar and Landry 2013, NY Natural Heritage Program 2013, White et al. 2011).

Threats to NY Populations				
Threat Category	**Threat**	**Scope**	**Severity**	**Irreversibility**
1. Human Intrusions & Disturbance	Work & Other Activities (bridge projects and other instream work)	N	L	L
2. Natural System Modifications	Other Ecosystem Modifications (levees and flood walls, channelization, dredging, culverts)	R	L	H
3. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (zebra mussels, rusty crayfish)	P	L	H
4. Pollution	Agricultural & Forestry Effluents (pesticides, fertilizers, sediment)	P	L	M
5. Pollution	Household Sewage & Urban Waste Water (road runoff of salts and metals, other regulated discharges)	P	M	H
6. Pollution	Household Sewage & Urban Waste Water (waste water treatment effluent, sewer and septic overflows)	P	M	H
7. Climate Change & Severe Weather	Droughts	P	L	V
8. Natural System Modifications	Dams & Water Management/Use (lowering of water table from agriculture, etc…, causing drying of habitat)	W	L	M
9. Climate Change & Severe Weather	Storms & Flooding (extreme storms)	W	M	V

10. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (die offs from unknown disease)	N	L	H

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Common Name: Wavy-rayed lampmussel ***SGCN – High Priority***
Scientific Name: *Lampsilis fasciola*
Taxon: Freshwater Mollusks

Federal Status: Not Listed
New York Status: Not Listed

Natural Heritage Program Rank:
Global: G5
New York: S1
Tracked: Yes

Synopsis:
Lampsilis fasciola belongs to the subfamily Ambleminae and the tribe Lampsilini, which includes 17 extant and 6 likely extirpated New York species of the genera *Actinonaias*, *Epioblasma*, *Lampsilis*, *Leptodea*, *Ligumia*, *Obovaria*, *Potamilus*, *Ptychobranchus*, *Toxolasma*, *Truncilla*, and *Villosa* (Haag 2012, Graf and Cummings 2011).

L. fasciola is mainly found in and around riffle areas of clear, hydrologically stable, fast moving water (Watters et al. 2009). Since 1970, *L. fasciola* has been found in six New York waterbodies. Historically, it has been collected in the Erie, Western Lake Ontario, and Lower Genesee basins (Strayer and Jirka 1997). *L. fasciola* no longer considered abundant in any New York location, however they are most commonly found in the Allegheny River and its tributaries (The Nature Conservancy 2009).

With a state rank of "critically imperiled," *L. fasciola* is listed as Threatened in New York, although it is secure throughout its range (NatureServe 2013). In North America, approximately ⅔ to ¾ of native mussel species are extinct, listed as endangered or threatened, or are in need of conservation status (Williams et al. 1993, Stein et al. 2000). While population trends in New York are unknown, it is assumed that they too are declining, due to a myriad of environmental stressors.

Distribution (% of NY where species occurs)		**Abundance** (within NY distribution)		**NY Distribution Trend**	**NY Abundance Trend**
0% to 5%		Abundant		[Text here]	[Text here]
6% to 10%		Common			
11% to 25%		Fairly common			
26% to 50%		Uncommon			
> 50%		Rare			

Habitat Discussion:
Watters et al. (2009) describes *L. fasciola* as a high-water-quality species of fast moving water. It is mainly found in and around riffle areas of clear, hydrologically stable, small- to medium-sized streams and rivers of various sizes, at depths of up to 1 m with clean substrates of gravel and sand, stabilized with cobble and boulders (Watters et al. 2009, Strayer and Jirka 1997, Metcalfe-Smith et al. 2005, Cummings and Mayer 1992). Although, according to Spoo (2008) this species buries itself in mud, fine sand, or a sand-gravel mix. Its habitat specificity is considered by NatureServe (2013) to be narrow to moderate.

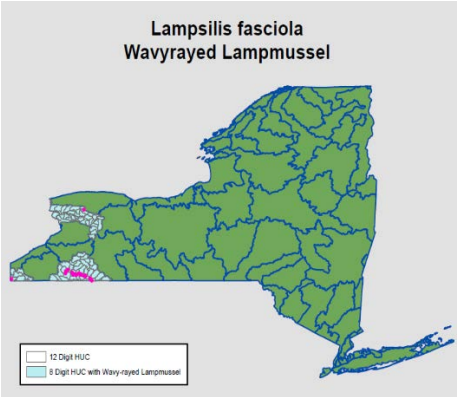
Primary Habitat Type
Headwater/Creek; Moderate-High Gradient; Moderately Buffered, Neutral; Cold

Medium River; Low Gradient; Assume Moderately Buffered (Size 3+ rivers); Transitional Cool
Medium River; Low-Moderate Gradient; Assume Moderately Buffered (Size 3+ rivers); Warm

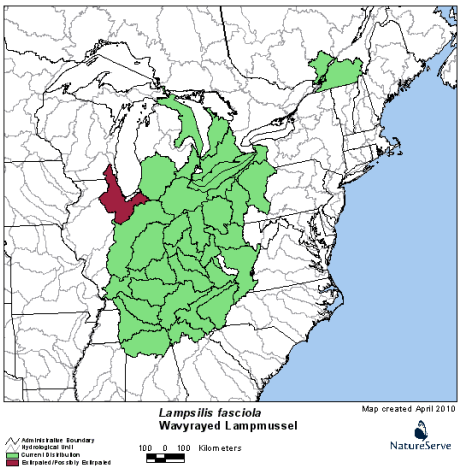
Distribution:

Since 1970, *L. fasciola* has been found in six New York waterbodies. Between 2005 and 2007, 79 live *L. fasciola* were found in the Allegheny River between Olean and Salamanca and in Oswayo Creek, a tributary to the Allegheny River. It was also found as shells in Olean Creek. They were never considered abundant at any sites but greatest catches were in the Allegheny River around Olean and in Oswayo Creek. This species was considered viable at 8 of 22 sites where it was found (The Nature Conservancy, 2009). One more live *L. fasciola* was found in Allegheny River at Olean in 2013 (Burlakova, Karatayev, unpublished data). In 2009, five live individuals and one spent shell found in Red House Brook, a tributary to the Allegheny River (New York Natural Heritage Program 2013). There is also an occurrence recorded for French Creek (NY Natural Heritage Program, 2013; 2 live found in 2013; Burlakova and Karatayev, unpublished data).

In the Erie Basin's Tonawanda Creek, four spent shells, two of which were recently dead, were found in 1998 (New York Natural Heritage Program 2013), and one live mussel in 2011 (Burlakova, unpublished data).



L. fasciola post-1970 distribution in New York (The Nature Conservancy 2009, Harman and Lord 2010, Mahar and Landry 2013, NY Natural Heritage Program 2013, White et al. 2011).



NatureServe (2013)

Threats to NY Populations				
Threat Category	**Threat**	**Scope**	**Severity**	**Irreversibility**
1. Human Intrusions & Disturbance	Work & Other Activities (bridge projects and other instream work)	N	L	L
2. Natural System Modifications	Other Ecosystem Modifications (levees and flood walls, channelization, dredging, culverts)	W	M	H
3. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (zebra mussels, rusty crayfish)	P	L	H
4. Pollution	Agricultural & Forestry Effluents (pesticides, fertilizers, sediment)	P	L	M
5. Pollution	Household Sewage & Urban Waste Water (road runoff of salts and metals, other regulated discharges)	P	M	H
6. Pollution	Household Sewage & Urban Waste Water (waste water treatment effluent, sewer and septic overflows)	P	M	H
7. Climate Change & Severe Weather	Droughts	W	L	V
8. Natural System Modifications	Dams & Water Management/Use (lowering of water table from agriculture, etc…, causing drying of habitat)	R	L	L
9. Climate Change & Severe Weather	Storms & Flooding (extreme storms)	W	M	V

10. Invasive & Other Problematic Species & Genes	Invasive Non-Native/Alien Species (die offs from unknown disease)	N	L	H

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