

# Liver Elimia Snail (*Elimia livescens*)

## Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, Web Version – 9/13/2017



Photo: Amy Benson, USGS

## 1 Native Range and Status in the United States

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### Native Range

From Benson (2016):

“St. Lawrence River drainage from Great Lake to Lake Champlain; tributaries of the Ohio River east of the Scioto River in Ohio; Wabash River, west to the Illinois River.”

From NatureServe (2015):

“Burch (1989) cites the St. Lawrence River drainage from the Great Lakes to Lake Champlain and Quebec; tributaries of the Ohio River, east of Scioto River in Ohio; Wabash River and branches, west to the Illinois River; [...]”

“Jung and Burch (1994) note its presence in the Great Lakes (Michigan and Huron).”

From Fofonoff et al. (2003):

“It is native to the Great Lakes-St. Lawrence and upper Mississippi basins, from Wisconsin and Iowa to Quebec and West Virginia.”

## **Status in the United States**

The native range of *Elimia livescens* is mostly within the United States (Benson 2016).

From Benson (2016):

“Nonindigenous Occurrences: Lower Hudson River drainage.”

From NatureServe (2015):

“[...] through the Erie Canal it has invaded the Hudson River basin for the nominal subspecies; and lakes of Summit and Stark Cos., Ohio for subspecies *gracilior*; and Lake Erie and possibly Lake Champlain for subspecies *haldemani*.”

From Fofonoff et al. (2003):

“The first tidal record for *Elimia livescens* occurred in the Mohawk River, New York in 1872 (Lewis 1872, cited by Strayer 1987). In 1985, Strayer (1987) found *E. livescens* at sites along the Mohawk River to Albany, and as far downriver as Kingston, New York (NY) in the Hudson River. It was most abundant in the vicinity of Troy and Albany, NY (Strayer 1987). No specimens of this snail were collected in a 2008 survey (Coote and Strayer 2009), but this snail may have been missed or overlooked.”

## **Means of Introductions in the United States**

From Benson (2016):

“Migrated via the Erie Canal to the Hudson River.”

## **Remarks**

From NatureServe (2016):

“*Elimia livescens* is known to hybridize with the invasive *E. virginica* in the Lake Ontario drainage (Bianchi et al. 1994) and several new, large populations of the hybrid were discovered during surveys for the invasive New Zealand mudsnail, *Potamopyrgus antipodarum* in streams and rivers draining into Lake Ontario (Levri et al. 2012). These two species were formerly completely geographically isolated during glaciation by the Alleghenian Divide, with *E. livescens* only in the Interior Basin drainages and *E. virginica* only in the Atlantic Slope drainages (Bianchi et al. 1994). Hybridization and introgression have the potential to jeopardize

the genetic integrity of a species, especially when the population is already small (Kipp et al. 2015).

## 2 Biology and Ecology

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### Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2016):

“Taxonomic Status: Current Standing: valid”

“Kingdom Animalia  
Subkingdom Bilateria  
Infrakingdom Protostomia  
Superphylum Lophozoa  
Phylum Mollusca  
Class Gastropoda  
Order Neotaenioglossa  
Family Pleuroceridae  
Genus *Elimia*  
Species *Elimia livescens* (Menke, 1830)”

### Size, Weight, and Age Range

From Benson (2016):

“Size: can reach 20 mm in length”

“[...] can live 5 years.”

From Fofonoff et al. (2003):

“The size of adult shells ranges from 14 to 22 mm in Michigan populations (Dazo 1965).”

### Environment

From Fofonoff et al. (2003):

“This snail is not known from brackish water and appears to be intolerant of pH levels below 7.8 (Dazo 1965). As a group, Pleurocerid snails are associated with clean, well-oxygenated water (Dazo 1965; Harman 1968).”

### Climate/Range

Information on the climate and range of *Elimia livescens* was not available.

## **Distribution Outside the United States**

### **Native**

From NatureServe (2015):

“Burch (1989) cites the St. Lawrence River drainage from the Great Lakes to Lake Champlain and Quebec; [...]”

### **Introduced**

No records of introductions of *Elimia livescens* outside the United States were found.

## **Means of Introduction Outside the United States**

No records of introductions of *Elimia livescens* outside the United States were found.

## **Short Description**

From Fofonoff et al. (2003):

“*Elimia livescens* is a small freshwater snail. The shell is conical to oval, and dextrally coiled with a sharp-pointed spire, but with an oval bulge around the body whorl. Adult shell shape is somewhat variable in a number of traits including, the length of the spire, whether it is tightly or loosely coiled, and varying width from wide to slender. Adult shells have 7-9 whorls. Younger shells have strong keels (carinae) on their whorls, but these may be eroded in older shells. In some populations, the tip of the spire and the early whorls may be eroded, too. The color of shells varies greatly from blue-gray to dark or light brown, black, greenish light-yellow or tan.”

## **Biology**

From Benson (2016):

“Sexes are separate and eggs are usually laid in spring in *Elimia* snails; often sexually mature in a year; [...]”

“Found in freshwater rivers and streams on rock shoals and gravel bars.”

From NatureServe (2015):

“This species is found in rivers, streams and lakes with substrates of silt, sand, gravel, cobble, and boulders (Pyron et al. 2008).”

From Fofonoff et al. (2003):

“Eggs are laid singly or in groups of 2-3, on hard surfaces, in spring through summer. Development is direct and eggs hatch into miniature snails in about 15 days at 22°C (Dazo 1965).”

“Its food consists of green algae and diatoms scraped off substrates by the radula (Dazo 1965).”

## Human Uses

No information on human uses of *Elimia livescens* was found.

## Diseases

From Krist (2000):

“Snails in this population [*Elimia livescens*] are infected by over 10 species of digeneans (data not shown).”

## Threat to Humans

No information on threats to humans from *Elimia livescens* was found.

## 3 Impacts of Introductions

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From Benson (2016):

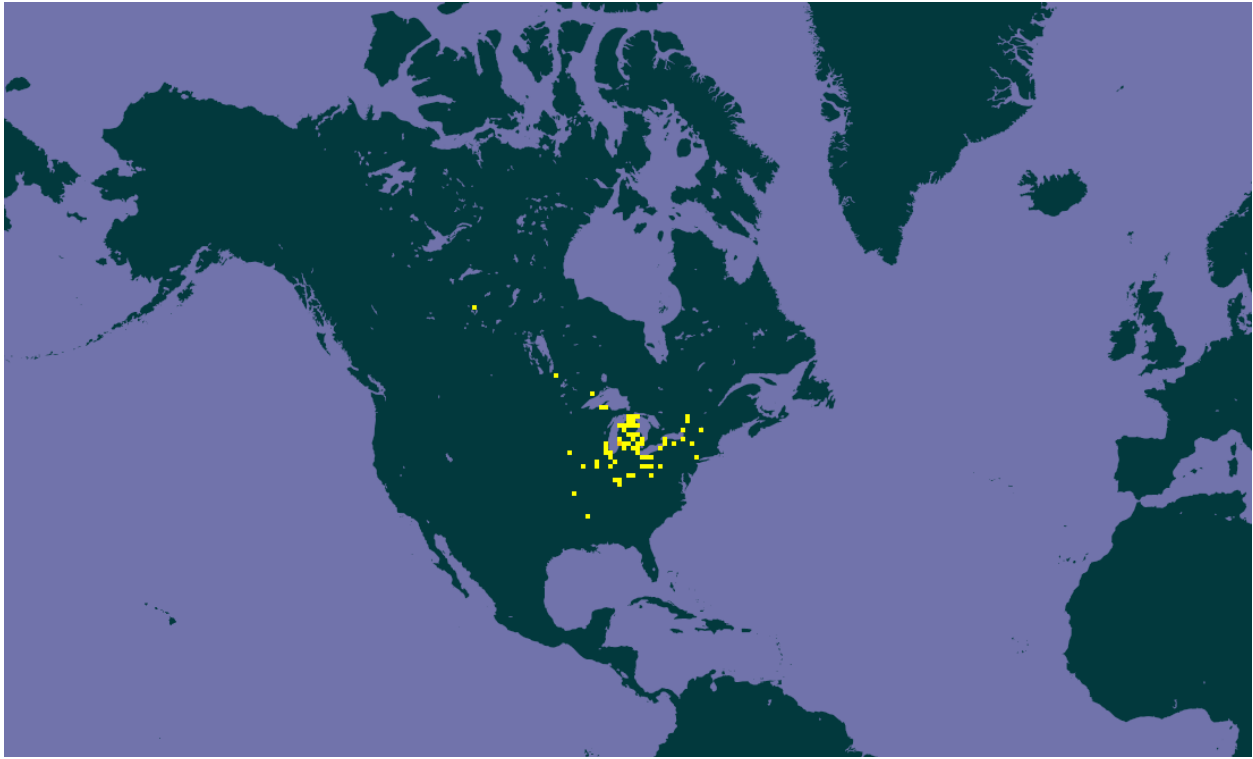
“Unknown”

From Fofonoff et al. (2003):

“No impacts have been reported from the invasion of *Elimia livescens* into the upper Hudson River, New York (NY). However, interactions with the native *E. virginica* are possible. Along the shore of Lake Ontario, NY in several streams, where *E. livescens* is native and *E. virginica* is introduced, hybrids between the two species were very abundant (Levri et al. 2012).”

## 4 Global Distribution

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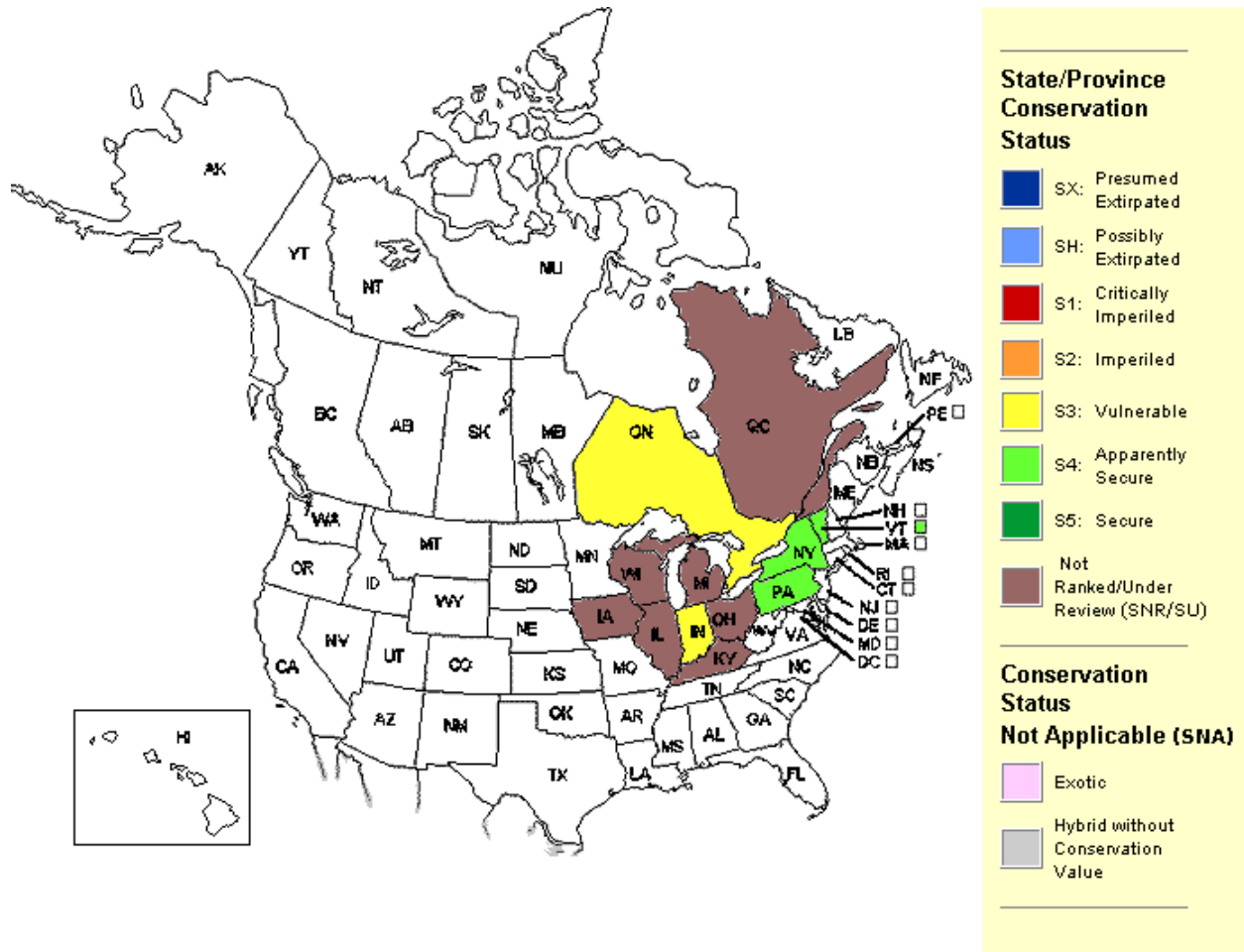


**Figure 1.** Known global distribution of *Elimia livescens*. Map from GBIF (2013).

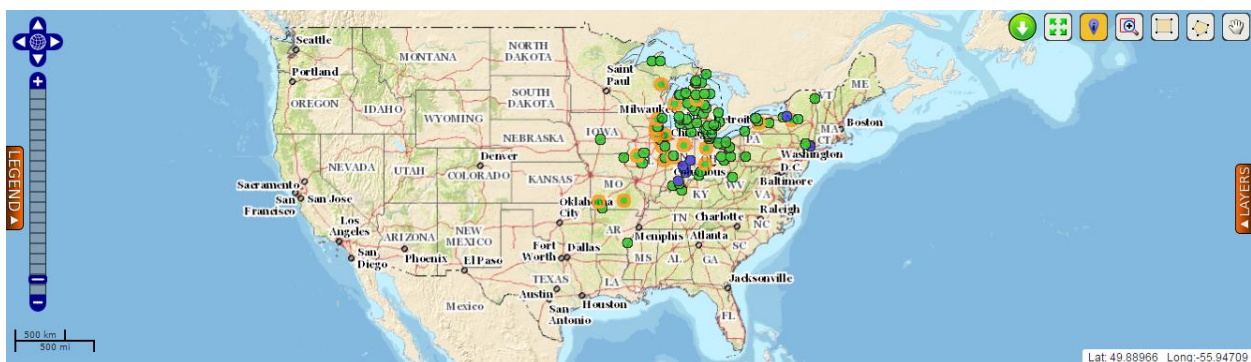
The northernmost observation was not included as a source point for the climate match. The record indicates it was collected from Windmill Island, Ontario, Canada, which is in Ontario between Lake Ontario and Lake Huron, not where indicated on the map.

The location in Manitoba, near Winnipeg, was also not used as a source point. The record indicates the specimen was collected in the province of Quebec, not Manitoba.

## 5 Distribution Within the United States



**Figure 2.** Known distribution of *Elimia livescens* in the United States and Canada. Map from NatureServe (2015).

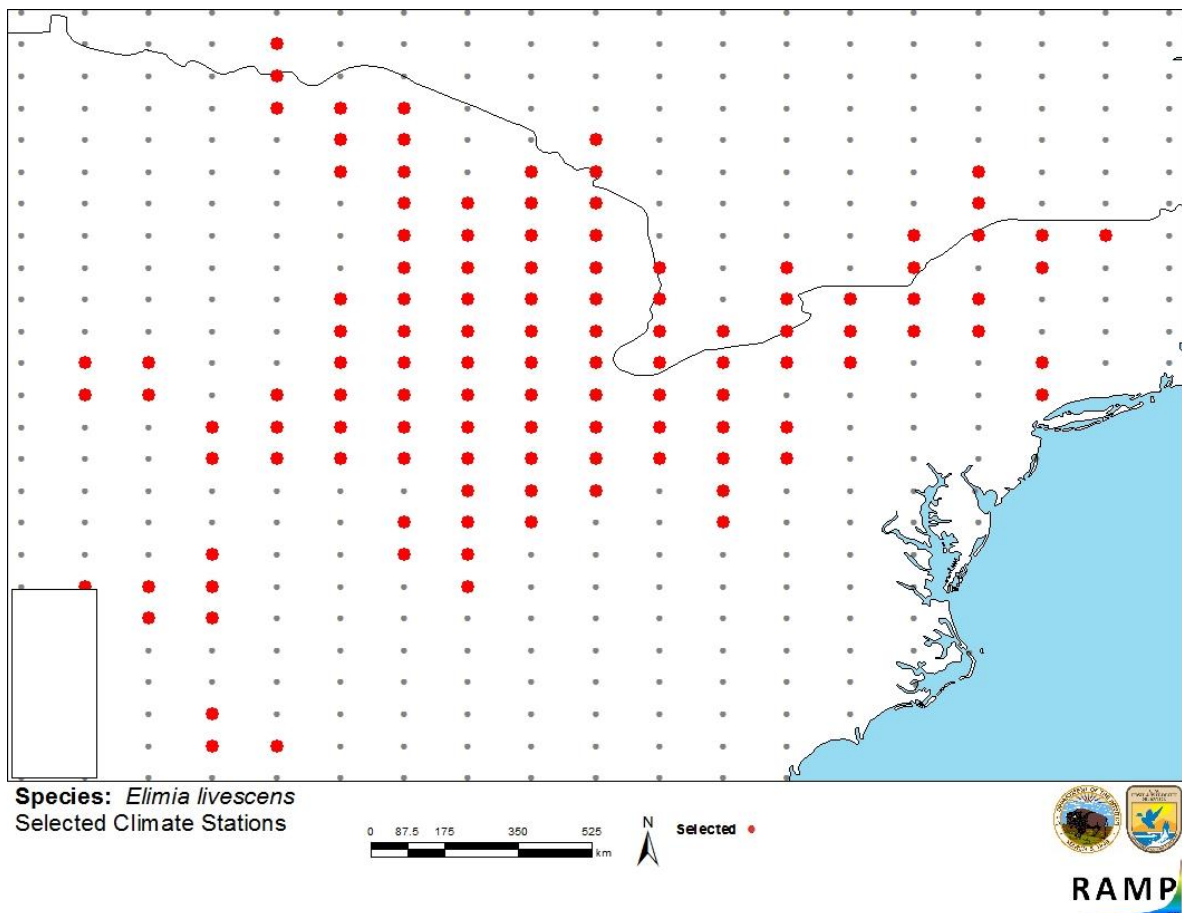


**Figure 3.** Occurrences of *Elimia livescens* in the United States as reported by Florida Museum of Natural History (1854-2001), Field Museum (1935-2011), North Carolina State Museum of Natural Sciences (1966-2012), National Museum of Natural History, Smithsonian Institution (1969-2005), BISON (1993-1995), United States Geological Survey (1996-2000), Academy of Natural Resources (No date).

## 6 Climate Matching

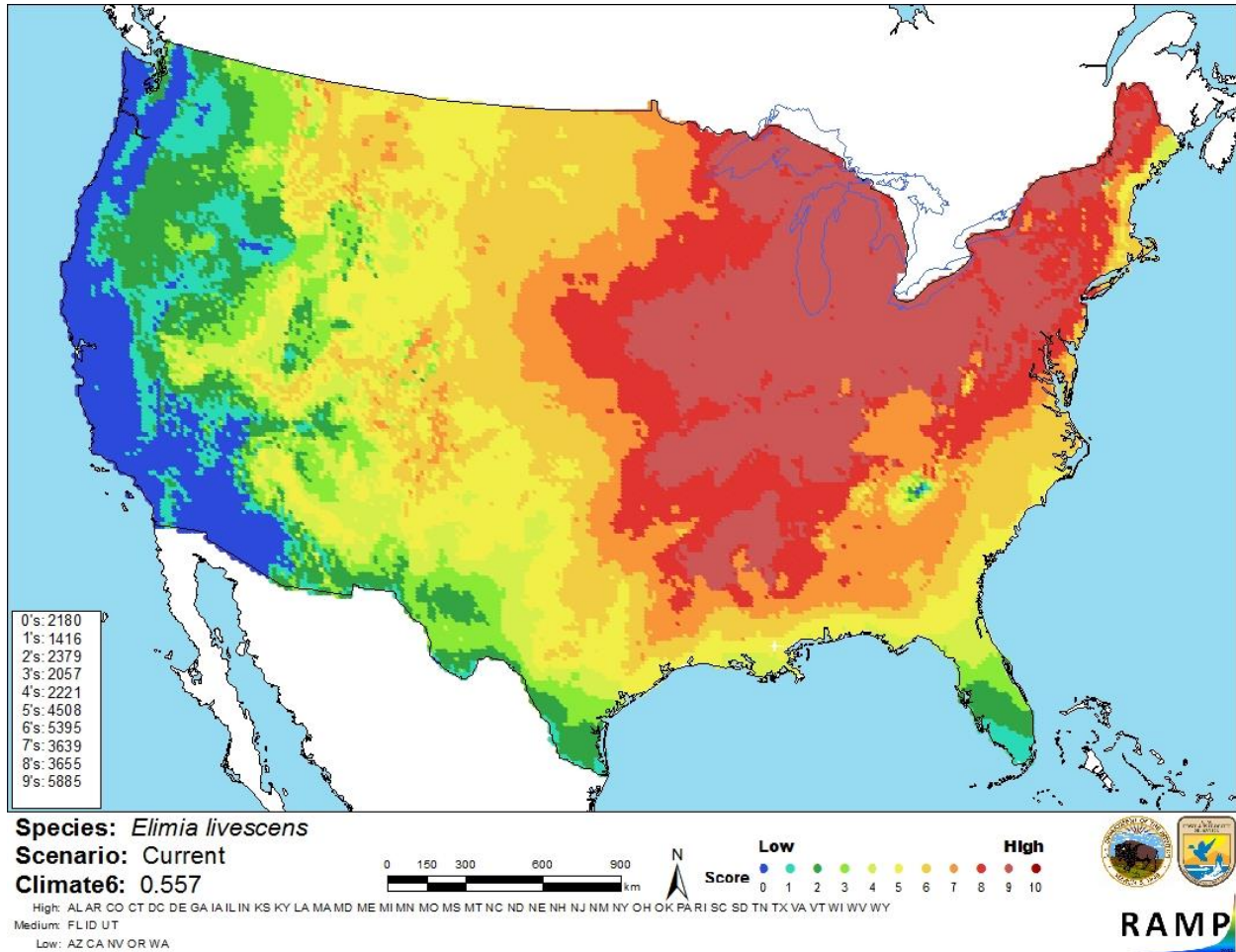
### Summary of Climate Matching Analysis

The climate match for *Elimia livescens* was high in the native range of the species. The matches quickly move from medium at the edge to the native range to low in areas further from the native range. The Climate 6 score (Sanders et al. 2014; 16 climate variables; Euclidean Distance) for the continental United States was 0.557, high. The states within the native range as defined by Benson (2016) had individually high climate matches: Illinois, Indiana, Iowa, Kentucky, Michigan, New York, Ohio, Pennsylvania, Vermont, and Wisconsin. The following states outside of the native range also had individually high climate matches: Alabama, Arkansas, Colorado, Connecticut, Delaware, Georgia, Kansas, Louisiana, Maine, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, North Carolina, North Dakota, Oklahoma, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Virginia, West Virginia, and Wyoming.



**Figure 4.** RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red) and non-source locations (grey) for *Elimia livescens* climate matching. Source locations from Florida Museum of Natural History (1854-2001), Field Museum (1935-2011), North Carolina State Museum of Natural Sciences (1966-2012), National Museum of Natural History, Smithsonian Institution (1969-2005), BISON (1993-1995), United States Geological Survey (1996-2000), GBIF (2013), Academy of Natural Resources (No date).





**Figure 5.** Map of RAMP (Sanders et al. 2014) climate matches for *Elimia livescens* in the continental United States based on source locations reported by Florida Museum of Natural History (1854-2001), Field Museum (1935-2011), North Carolina State Museum of Natural Sciences (1966-2012), National Museum of Natural History, Smithsonian Institution (1969-2005), BISON (1993-1995), United States Geological Survey (1996-2000), GBIF (2013), Academy of Natural Resources (No date). 0 = Lowest match, 10 = Highest match.

The High, Medium, and Low Climate match Categories are based on the following table:

Climate 6: Proportion of (Sum of Climate Scores 6-10) / (Sum of total Climate Scores)	Climate Match Category
$0.000 \leq X < 0.005$	Low
$0.005 < X < 0.103$	Medium
$\geq 0.103$	High

## 7 Certainty of Assessment

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The certainty of assessment is medium. There was adequate biological and ecological information available for *Elimia livescens*. Records of introduction to the Hudson and Mohawk rivers via the Erie Canal were found. There were no records of actual impacts from that introduction.

## 8 Risk Assessment

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### Summary of Risk to the Contiguous United States

The history of invasiveness for *Elimia livescens* is not documented. There are records of introduction into the Hudson and Mohawk rivers via the Erie Canal from its native range in the Great Lakes Basin. There were no records of actual impacts from that introduction, but there could be hybridization between *Elimia livescens* and *E. virginica* which is native to that area. The climate match is high. The highest matches were in or just outside the species native range. If the native range was removed from the results, the overall climate 6 score would decrease. The certainty of assessment is medium. The overall risk assessment category is uncertain. The history of invasiveness is inconclusive and the native range of the species confounds the results of the climate match.

### Assessment Elements

- **History of Invasiveness (Sec. 3): Not Documented**
- **Climate Match (Sec. 6): High**
- **Certainty of Assessment (Sec. 7): Medium**
- **Remarks/Important additional information** No additional remarks.
- **Overall Risk Assessment Category: Uncertain**

## 9 References

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**Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 10.**

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## 10 References Quoted But Not Accessed

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**Note: The following references are cited within quoted text within this ERSS, but were not accessed for its preparation. They are included here to provide the reader with more information.**

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