Emerald Shiner (*Notropis atherinoides*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, February 2024
Revised, December 2024
Web Version, 7/2/2025

Organism Type: Fish
Overall Risk Assessment Category: Uncertain

Photo: fishecke. Licensed under CC BY-NC 4.0. Available: https://www.gbif.org/occurrence/4076156795 (February 2024).

1 Native Range and Status in the United States

Native Range

From Nico (2024):

"St. Lawrence drainage, Quebec; Hudson River drainage, New York to Mackenzie River drainage (Arctic basin), Northwest Territories, and south through Great Lakes and Mississippi River basins to Gulf; Gulf Slope drainages from Mobile Bay, Alabama, to Galveston Bay, Texas (Page and Burr 1991)."

From Froese and Pauly (2023):

“North America: widely distributed throughout Canada and south to Virginia and Texas, USA.”

Status in the United States

From Froese and Pauly (2023):

“North America: widely distributed [from the Canadian border] south to Virginia and Texas, USA.”

From Nico (2024):

“Introduced populations considered established in Maine, Maryland, Massachusetts, Nebraska, New York, Utah, West Virginia, and Wyoming.”

Nico (2024) also reports *Notropis atherinoides* as established outside its native range in Colorado, Connecticut, Michigan, and Montana; and as stocked in South Dakota.

Notropis atherinoides is available in the bait trade (e.g., Gollon Brothers Wholesale Live Bait 2024).

Regulations

Notropis atherinoides is regulated in New Hampshire (NHFG 2022). Please refer back to state agency regulatory documents for details on the regulations, including restrictions on activities involving this species. While effort was made to find all applicable regulations, this list may not be comprehensive. Notably, it does not include regulations that do not explicitly name this species or its genus or family, for example, when omitted from a list of authorized species with blanket regulation for all unnamed species.

Means of Introductions within the United States

From Nico (2024):

“This species was stocked as forage in Jennings Randolph Reservoir, Maryland (Christmas, personal communicaton [sic]), Lake McConaughy, Nebraska (Bouc 1987), and in certain Wyoming reservoirs (Hubert 1994). Its presence in two reservoirs in New York may be due either to bait bucket releases or to movement through the Old Chenango Canal (Snelson 1968; Smith 1985). Snelson (1968) also hypothesized that the widespread occurrence of this species in the Mohawk-Hudson system of New York may have been a result of dispersal through the Erie Canal system. If records from West Virginia represent introductions, the method of entry was likely by way of bait bucket releases. The species probably was brought to Maine illegally as a baitfish; however, information on the location and exact date of its first occurrence in the state has been lost (Kircheis 1994). It was introduced into Willard Bay Reservoir in Utah in 1983 (Sigler and Sigler 1987). The Emerald Shiner has been stocked for forage in many Colorado reservoirs (Colorado Division of Wildlife).”

“According to Hartel et al. (1996), the Massachusetts specimens have never been examined by specialists. However, this species is sold in bait stores in that state (Hartel 1992; Hartel et al. 1996). Schmidt (1986) listed this species as introduced into the Housatonic and Connecticut drainages, probably in the Massachusetts portion of these waters. Hocutt et al. (1986) regarded it as "introduced, but possibly native" for the Susquehanna River drainage. In their summary table of West Virginia fishes, Stauffer et al. (1995) regarded this species as "native but possibly introduced" for the Kanawha above the falls. This species was found in the Au Sable River in Michigan in 1931 but does not survive to reproduction in most of the inland waters of Michigan (Hubbs 1931). Pflieger (1997) noted that the progressive and dramatic increase in abundance of this sight-feeding minnow in the Missouri River (part of its native range) was the result of decreases in turbidity and other factors relating to the construction of upstream reservoirs.”

Remarks

Notropis atherinoides has been intentionally stocked outside its native range within the United States by State fishery managers to achieve fishery management objectives. State fish and wildlife management agencies are responsible for balancing multiple fish and wildlife management objectives. The potential for a species to become invasive is now one important consideration when balancing multiple management objectives and advancing sound, science-based management of fish and wildlife and their habitat in the public interest.

Mention of commercial products in this Ecological Risk Screening Summary does not entail endorsement by the U.S. Federal Government.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2024):

Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Actinopterygii
Class Teleostei
Superorder Ostariophysi
Order Cypriniformes
Superfamily Cyprinoidea
Family Leuciscidae
Subfamily Pogonichthyinae
Genus *Notropis* Rafinesque, 1818
Species *Notropis atherinoides* Rafinesque, 1818

According to Fricke et al (2024), *Notropis atherinoides* Rafinesque 1818 is the current valid name for this species.

Size, Weight, and Age Range

From Froese and Pauly (2023):

"Max length: 13.0 cm TL [total length] male/unsexed; [Page and Burr 1991]; common length: 8.6 cm TL male/unsexed; [Hugg 1996]; max. reported age: 4 years [Hugg 1996]."

From NatureServe (2024):

"Rarely lives beyond 3 years."

Environment

From Froese and Pauly (2023):

"Freshwater; benthopelagic."

"[…]; 0°C - 31°C [Beitinger and Bennett 2000]; […]"

From NatureServe (2024):

"Large open rivers, lakes, and reservoirs; pools and runs of rivers with low or moderate gradient (Burkhead and Jenkins 1991); also mouths of smaller streams. Seemingly tolerant of turbidity in Great Plains streams but avoids turbid streams in Ohio (Trautman 1981). Most common in clear water over sand or gravel (Page and Burr 1991)."

Climate

From Froese and Pauly (2023):

"Temperate; […] 64°N - 30°N."

Distribution Outside the United States

Native

From Nico (2024):

"St. Lawrence drainage, Quebec; Hudson River drainage, New York to Mackenzie River drainage (Arctic basin), Northwest Territories […]."

From Froese and Pauly (2023):

"North America: widely distributed throughout Canada […]."

Part of the native range for this species is within the United States, see section 1 for a complete description of the native range.

Introduced
No records were found for introduction of *Notropis atherinoides* in the wild outside the United States.

Means of Introduction Outside the United States
No records were found of introduction of *Notropis atherinoides* in the wild outside the United States.

Short Description
From Stauffer et al. (1995):

"The emerald shiner is a long, slender minnow which is quite laterally compressed. Its snout is short and rounded; its mouth is terminal and oblique. The eye is moderate in size, its diameter greater than the snout length. The dorsal and anal fin margins are slightly falcate. The dorsal-fin origin is slightly posterior to the pelvic-fin insertions. The emerald shiner has 8 dorsal-fin rays, 10-13 (usually 11) anal-fin rays, 14-16 pectoral-fin rays, and 8 pelvic fin rays. The lateral line is complete; 35-42 cycloid scales lie along the lateral row. The pharyngeal tooth formula is 2,4-4,2. The emerald shiner has a lateral stripe that is prominent posteriorly but fades just anterior to the dorsal- fin origin. The pigmentation on the chin forms a V-shaped pattern. In life, the emerald shiner is olive green dorsally, silver on its sides, and white ventrally."

Biology
From Froese and Pauly (2023):

"Adults inhabit lakes and pools and runs of medium to large rivers. Most common in clear water over sand or gravel. Form schools [Scott and Crossman 1973]. Move to the surface at dusk to feed on microcrustaceans, midge larvae, and algae; descends to deeper waters at daybreak [Scott and Crossman 1973]. Are preyed upon by birds (gulls, terns, mergansers, cormorants) and fishes [Scott and Crossman 1973]. Oviparous [Etnier and Starnes 1993]."

From NatureServe (2024):

"Spawns in late spring and summer when water temperatures reach about 20-23 C (Burkhead and Jenkins 1991). In the north, spawning begins as early as late May, peaks in June-July, sometimes continues into early August (Burkhead and Jenkins 1991). Eggs hatch in about a day. Most first spawn in their second year. […] Millions may gather in breeding schools (Burkhead and Jenkins 1991)."

"Often aggregates in large schools in mid-water or near surface. May move closer to surface at night. In lakes, spawns over detritus-free substrate offshore at night at depths of 2-6 m; eggs sink to bottom (Becker 1983). Spawns over various substrates, typically over gravel."

"Feeds on drifting terrestrial and aquatic insects chiefly in the middle and upper parts of the water column (Burkhead and Jenkins 1991). Young eat mainly rotifers. Older fishes eat largely

insects, especially terrestrial ones in summer, immature aquatic insects, and amphipods in winter. In lakes, eats microcrustaceans, plankton, and insects (see Burkhead and Jenkins 1991)."

From Osborne (2018):

"They exhibit an overall life history strategy that prioritizes growth early in life and has large increases in reproductive effort near the end of the lifespan. Low reproductive investment early in life most likely maximizes somatic growth and development in two-year old emerald shiners, which display higher growth rates than either age 1 or age 3 fish. For age 3 emerald shiners, the decline in growth rates is coupled with significant increases in reproductive effort […]."

Human Uses

From Nico (2024):

"According to Hartel et al. (1996), the Massachusetts specimens have never been examined by specialists. However, this species is sold in bait stores in that state (Hartel 1992; Hartel et al. 1996)."

Diseases

***Notropis atherinoides* is susceptible to viral hemorrhagic septicemia and spring viraemia of carp which are diseases listed by the World Organisation of Animal Health (2025).**

Poelen et al (2024) lists the following parasites and pathogens for *Notropis atherinoides*: *Acanthocephalus dirus*, Viral hemorrhagic septicemia virus, Spring viraemia of carp virus, *Oncorhynchus 2 novirhabdovirus*, *Novirhabdovirus piscine*, *Diplostomum spathaceum*, *Gyrodactylus parvicirrus*, *Neochasmus* sp., *Diplostomum* sp., *Distomum* sp., *Raphidascaris* sp., *Spinitectus* sp., *Centrovarium* sp., *Bothriocephalus* sp., *Proteocephalus* sp., *Contracaecum* sp., *Neoechinorhynchus* sp., *Posthodiplostomum minimum*, *Myxobolus notropis*, *Novirhabdovirus piscine*, Carp sprivivirus.

Threat to Humans

No information was found on threats to humans from *Notropis atherinoides*.

3 Impacts of Introductions

From Nico (2024):

"The impacts of this species are currently unknown, as no studies have been done to determine how it has affected ecosystems in the invaded range. The absence of data does not equate to lack of effects. It does, however, mean that research is required to evaluate effects before conclusions can be made."

Notropis atherinoides is regulated in New Hampshire (NHFG 2022), see section 1.

4 History of Invasiveness

This species is a common bait fish that can be purchased online or in local bait shops. It has been introduced as a forage species in Jennings Randolph Reservoir, Maryland and locations in the western United States. It has established populations in many areas where it was introduced. There was no information found on the impacts of this species where it has been introduced. The History of Invasiveness for *Notropis atherinoides* is classified as Data Deficient.

5 Global Distribution

Figure 1. Reported global distribution of *Notropis atherinoides*. Map from GBIF Secretariat (2024). Observations are reported from the central and eastern United States, in a majority of Canadian Provinces, China, and India. Clustered locations in central China are the result of incorrect coordinates, and do not represent established populations. The point in India was not supported within literature to represent an established population. Points located in California, Florida, and Georgia are singular individual occurrences and do not represent established populations. The observations in China, India, California, Florida, and Georgia were not used in the climate matching analysis.

6 Distribution Within the United States

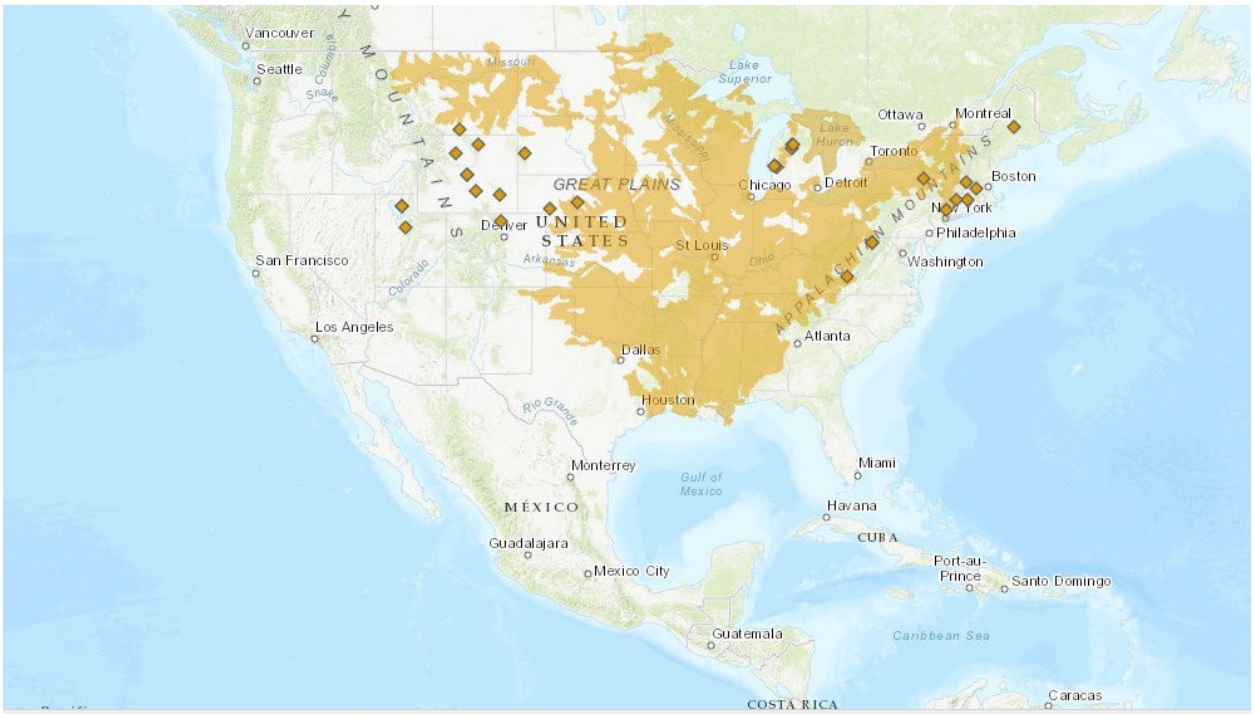

Figure 2. Reported distribution of *Notropis atherinoides* in the United States. Map from Nico (2024). Orange diamonds represent nonnative observations of *Notropis atherinoides*. The orange polygon indicates the native range of the species.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match is high in most of the contiguous United States. Notable areas with high match outside of the native range included the Southern Plains, Northern Plains, and the Northeast. Areas of low climate match included southern Florida, coastal areas of California, Oregon, and Washington, and the Sierra Nevada and Cascade mountains. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.864, indicating that Yes, there is establishment concern for this species outside its native range. The Climate 6 score is calculated as: (count of target points with scores ≥ 6)/(count of all target points). Establishment concern is warranted for Climate 6 scores greater than or equal to 0.002 based on an analysis of the establishment success of 356 nonnative aquatic species introduced to the United States (USFWS 2024).

Projected climate matches in the contiguous United States under future climate scenarios are available for *Notropis atherinoides* (see Appendix). These projected climate matches are provided as additional context for the reader; future climate scenarios are not factored into the Overall Risk Assessment Category.

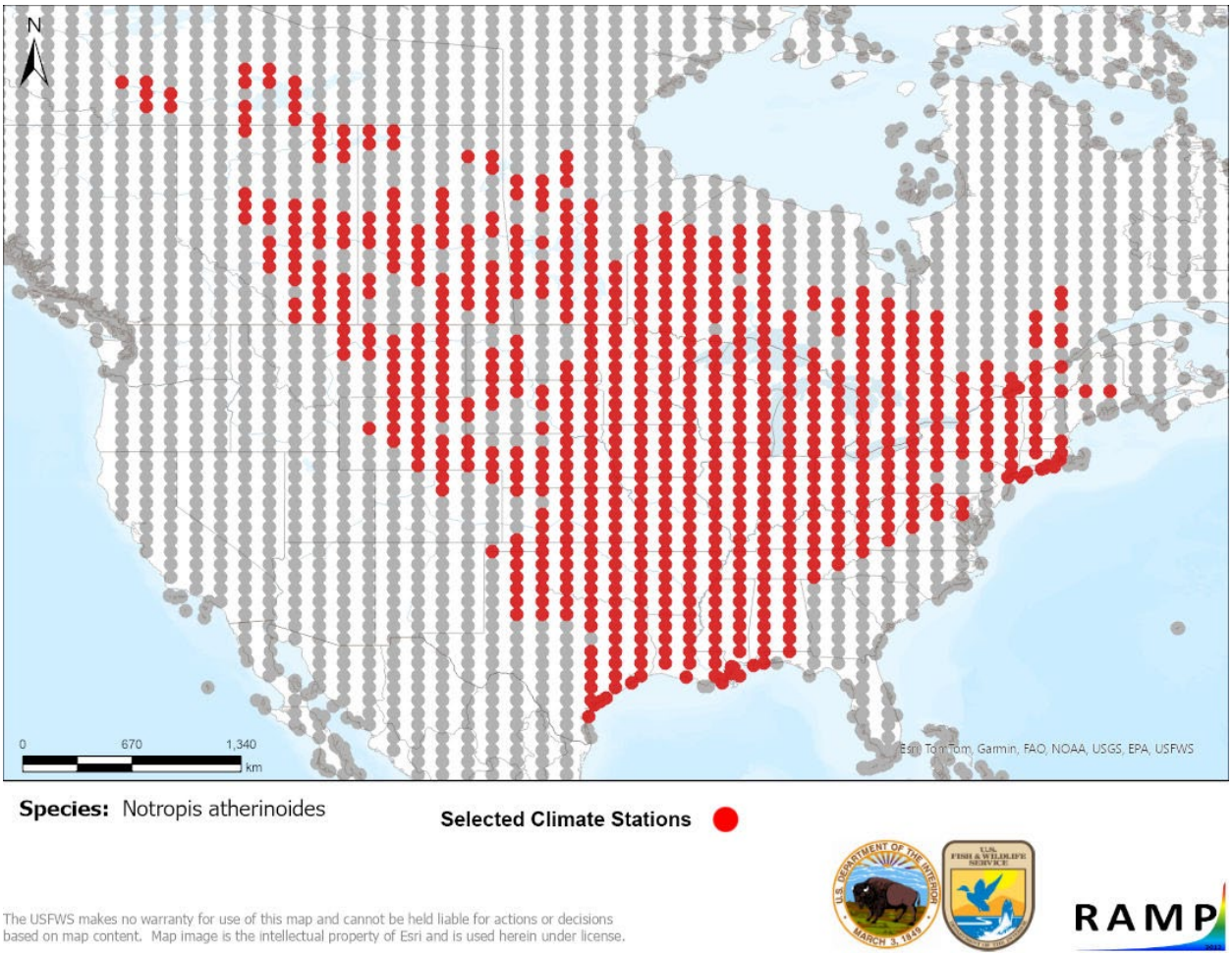

Figure 3. RAMP (Sanders et al. 2023) source map showing weather stations in the eastern part of the United States and Canada provinces selected as source locations (red, United States and Canada) and non-source locations (gray) for *Notropis atherinoides* climate matching. Source locations from GBIF Secretariat (2024). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

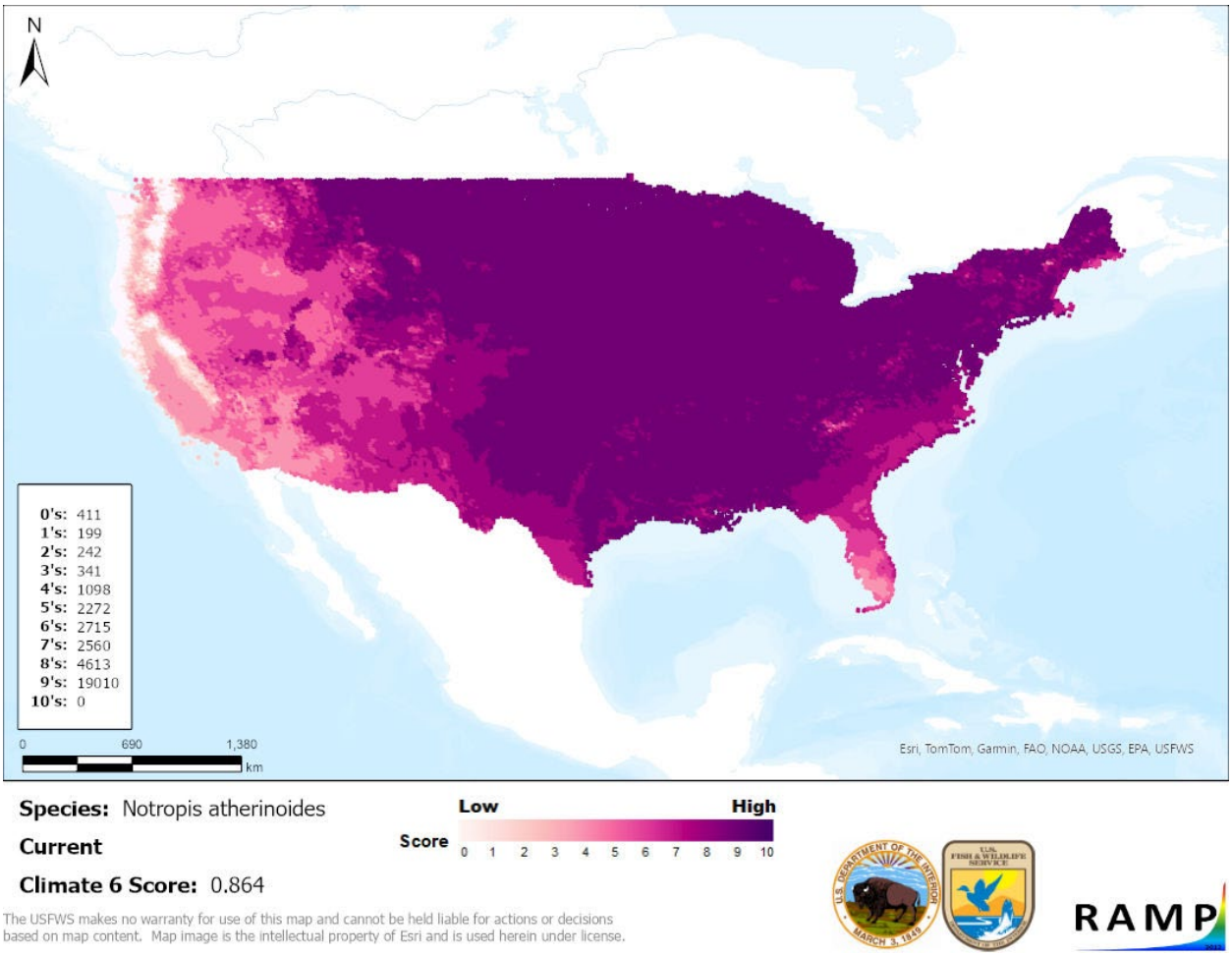

Figure 4. Map of RAMP (Sanders et al. 2023) climate matches for *Notropis atherinoides* in the contiguous United States based on source locations reported by GBIF Secretariat (2024). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

There is reasonably complete information on the biology, ecology, and distribution of this species. Records of introductions were found but no information on impacts within the introduced range was available. The Certainty of Assessment for *Notropis atherinoides* is classified as Low.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Notropis atherinoides, Emerald Shiner, is a fish that is native to the St. Lawrence, Hudson River, Mackenzie River, Great Lakes, and Mississippi River basins in North America. This species is commonly found in clear water over sand and gravel sediments within lakes and medium to large rivers. *Notropis atherinoides* is commonly stocked as a forage fish species and sold commercially as bait. While this species has been introduced outside its range through stocking

efforts and possibly bait bucket introductions in parts of the western United States, there is no information on impacts of the introduced populations. Therefore, the History of Invasiveness for *Notropis atherinoides* is classified as Data Deficient. The climate matching analysis for the contiguous United States indicates establishment concern for this species outside its native range. There were areas of high and medium match to the east and west of the species' native range. The Certainty of Assessment for this ERSS is classified as Low due to lack of information on the impacts of introductions. The Overall Risk Assessment for *Notropis atherinoides* in the contiguous United States is Uncertain.

Assessment Elements

- **History of Invasiveness (see Section 4): Data Deficient**
- **Establishment Concern (see Section 7): Yes**
- **Certainty of Assessment (see Section 8): Low**
- **Remarks, Important additional information: Susceptible to World Organisation for Animal Health listed diseases viral hemorrhagic septicemia and spring viraemia of carp.**
- **Overall Risk Assessment Category: Uncertain**

10 Literature Cited

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in section 11.

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11 Literature Cited in Quoted Material

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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Appendix

Summary of Future Climate Matching Analysis

Future climate projections represent two Shared Socioeconomic Pathways (SSP) developed by the Intergovernmental Panel on Climate Change (IPCC 2021): SSP5, in which emissions triple by the end of the century; and SSP3, in which emissions double by the end of the century. Future climate matches were based on source locations reported by GBIF Secretariat (2024).

Under the future climate scenarios (figure A1), on average, high climate match for *Notropis atherinoides* was projected to occur in the Appalachian Range, Colorado Plateau, Great Lakes, Mid-Atlantic, Northeast, Northern Plains, Southeast, Southern Atlantic Coast, and Southern Plains regions of the contiguous United States. Those areas encompassed the native range of the species. Areas of low climate match was projected to occur in the Northern Pacific Coast region and continuing into the Sierra-Nevada Range. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.793 (model: UKESM1-0-LL, SSP5, 2085) to a high of 0.843 (model: GFDL-ESM4, SSP3, 2055). All future scenario Climate 6 scores were above the Establishment Concern threshold, indicating that Yes, there is establishment concern for this species under future scenarios. The Climate 6 score for the current climate match (0.864, figure 4) falls above the range of scores for future projections. The time step and climate scenario with the most change relative to current conditions was SSP5, 2085 (figure A3). Under all time step and climate scenarios only minor or no increases in the climate match relative to the current match were observed. Under one or more time step and climate scenarios, areas within the Appalachian Range, Colorado Plateau, Great Basin, Gulf Coast, Mid-Atlantic, Northeast, Northern Plains, Southeast, Southern Plains, Southwest, and Western Mountains saw a moderate decrease in the climate match relative to current conditions. No large decreases were observed regardless of time step and climate scenarios. The degree of change did increase with time and from SSP3 to SSP5, particularly at time step 2085.

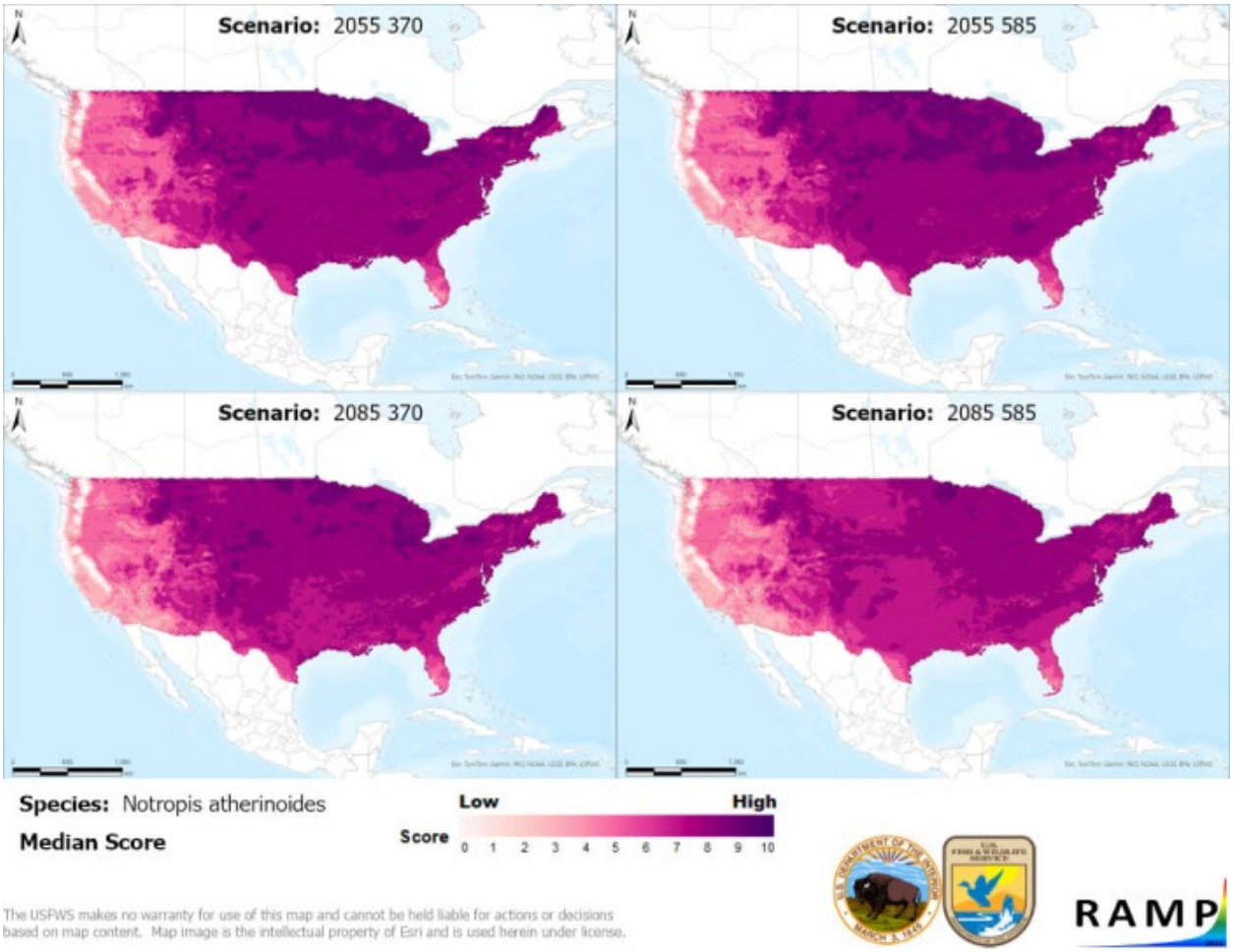

Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Notropis atherinoides* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2024). Shared Socioeconomic Pathways (SSPs) used (from left to right): SSP3, SSP5 (IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global climate models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

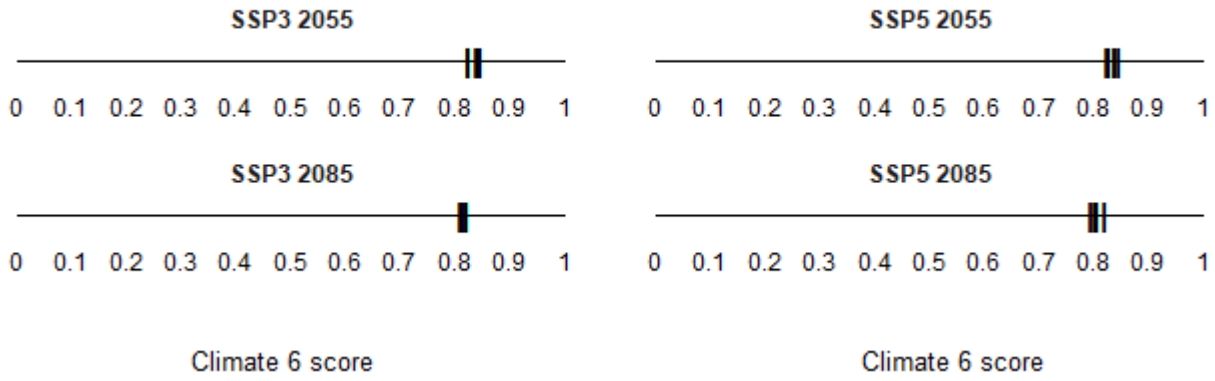

Figure A2. Comparison of projected future Climate 6 scores for *Notropis atherinoides* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 2018; IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global climate models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0.

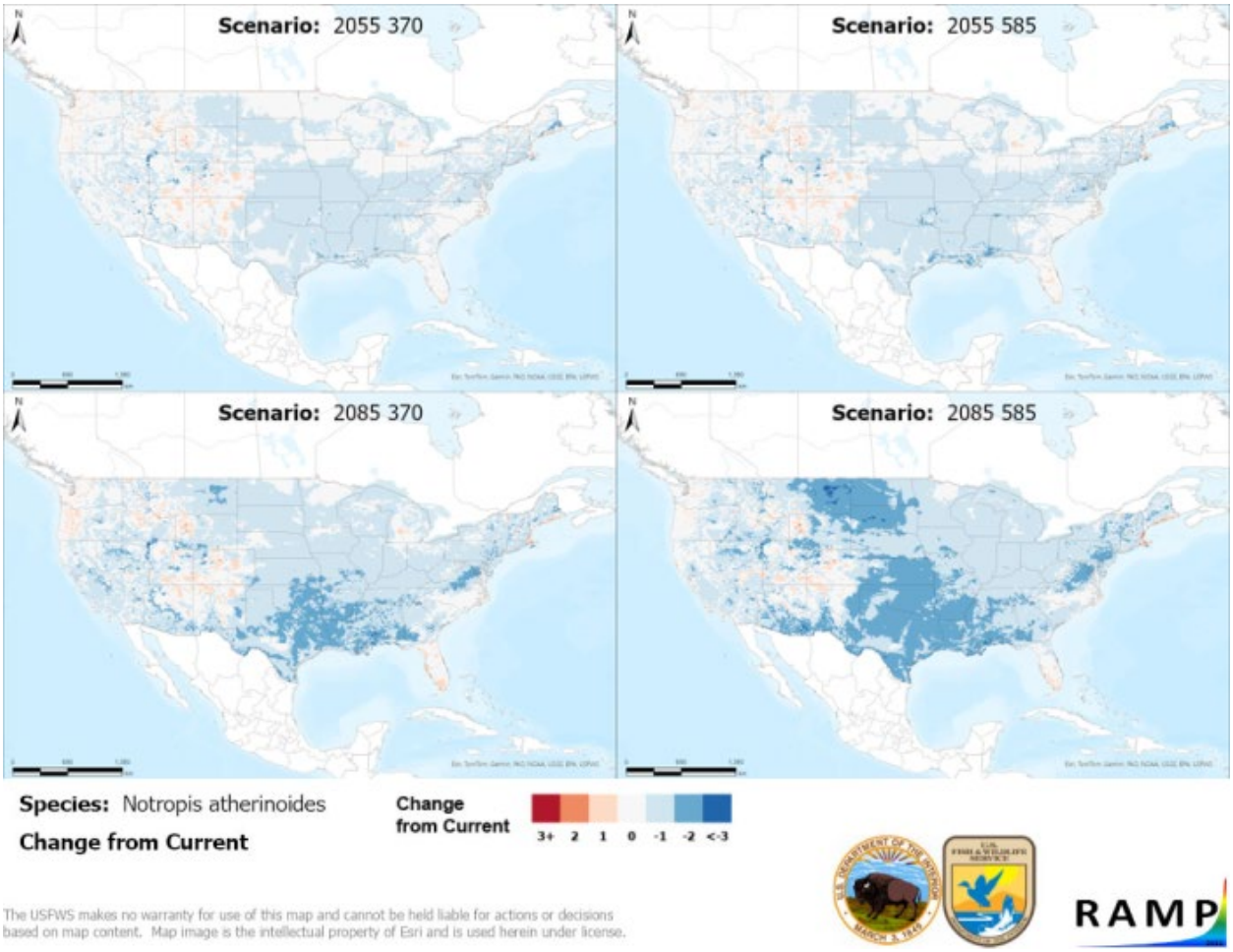

Figure A3. RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 4) and the median target point score for future climate scenarios (figure A1) for *Notropis atherinoides* based on source locations reported by GBIF Secretariat (2024). Shared Socioeconomic Pathways (SSPs) used (from left to right): SSP3, SSP5 (IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0. Shades of blue indicate a lower target point score under future scenarios than under current conditions. Shades of red indicate a higher target point score under future scenarios than under current conditions. Darker shades indicate greater change.

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