U.S. Fish & Wildlife Service

Northern Redbelly Dace (*Chrosomus eos*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, February 2024
Revised, April 2024
Web Version, 9/25/2025

Organism Type: Fish
Overall Risk Assessment Category: Uncertain

Photo: Scot Stewart. Licensed under CC BY-NC 4.0 DEED. Available: https://www.inaturalist.org/photos/286033602 (January 2024).

1 Native Range and Status in the United States

Native Range

From NatureServe (2024):

"Range includes Atlantic, Great Lakes, Hudson Bay, upper Mississippi, Missouri, and Peace-Mackenzie river drainages, from Nova Scotia west to Northwest Territories and British Columbia [Canada], and south to northern Pennsylvania, Wisconsin, and Nebraska, with an

isolated population in the South Platte river system, Colorado [United States] (Page and Burr 2011)."

Status in the United States

From NatureServe (2024):

"[Native] Range includes Atlantic, Great Lakes, Hudson Bay, upper Mississippi, Missouri, […] and south to northern Pennsylvania, Wisconsin, and Nebraska, with an isolated population in the South Platte River system, Colorado (Page and Burr 2011)."

From Nico and Fuller (2024):

"Extirpated in Ohio. Reported from Oklahoma."

In addition to the locations above, Nico and Fuller (2025) report nonindigenous occurrences of *Chrosomus eos* in Illinois, Maine, and Michigan, all with unknown status, and a record from Oklahoma with a status of 'failed'.

Chrosomus eos is in live trade within the United States (e.g., AquaBid 2024; Jonah's Aquarium 2024).

Regulations

Chrosomus eos is regulated in Colorado (CPW 2023) and New Hampshire (NHFG 2022). It is regulated at the family (Cyprinidae) level in Alaska (ADF&G 2023). 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 and Fuller (2024):

"In a summary table on fishes liberated in Ohio waters, Trautman (1981) noted that 7,000 Northern Redbelly Dace from Michigan were unsuccessfully introduced into Ohio waters in October 1935, presumably as a forage fish. The report in Oklahoma is apparently based on observations of this species in bait tanks near Ft. Gibson Reservoir in Wagoner County (Heard [1956]). The owner of the bait establishment said the minnows were imported from Minnesota. The retailer had noticed the dace mixed in the primarily fathead minnow bait shipments that he had been purchasing and re-selling for over a year. Although, there are no verified records from open waters, at least some individuals were likely introduced through discarded or escaped bait."

From Nico and Fuller (2025):

"Introduced in northeastern part of the state [Illinois] by South Cook County Mosquito Abatement District personnel; […]"

Remarks

From NatureServe (2024):

"Hybridizes with *C. neogaeus* (Das and Nelson 1989); hybrids between *C. eos* and *C. neogaeus* comprise diploid, triploid, and diploid-triploid mosaic unisexuals; diploids are products of clonal reproduction (Dawley et al. 1987). Aclonal reproduction by polyploids also occurs [Goddard and Schultz 1993]."

Chrosomus eos 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 Laviniinae
Genus *Chrosomus* Rafinesque, 1820
Species *Chrosomus eos* Cope, 1861

According to Fricke et al. (2024), *Chrosomus eos* Cope 1861 is the current valid name for this species.

Phoxinus eos, a synonym of *Chrosomus eos* (Fricke et al. 2024; ITIS 2024), was also used to search for information for this report.

Size, Weight, and Age Range

From Froese and Pauly (2024):

"Max length : 8.0 cm TL [total length] male/unsexed; [Page and Burr 2011]; common length : 4.8 cm TL male/unsexed; [Hugg 1996]; max. reported age: 3.00 years [Hugg 1996]"

Environment

From Froese and Pauly (2024):

"Freshwater; demersal; non-migratory."

"Inhabits lakes, ponds, bogs, and pools of headwaters and creeks. Usually occurs over silt, often near vegetation [Page and Burr 2011]."

From NatureServe (2024):

"Habitat includes boggy lakes, ponds; beaver ponds, and pools of headwaters and creeks; this fish is often in tea colored water over fine detritus or silt; usually near vegetation (Lee et al. 1980, Page and Burr 2011). Spawning occurs among mats of filamentous algae or aquatic plants (Faber 1985)."

Climate

From Froese and Pauly (2024):

"Temperate; 61°N - 41°N"

Distribution Outside the United States

Native

From NatureServe (2024):

"[In Canada, the] Atlantic, Great Lakes, Hudson Bay, […] Peace-Mackenzie river drainages, from Nova Scotia west to Northwest Territories and British Columbia […]."

Introduced

No records were found of introduction of *Chrosomus eos* in the wild outside the United States.

Means of Introduction Outside the United States

No records were found of introduction of *Chrosomus eos* in the wild outside the United States.

Short Description

From Stauffer et al. (2016):

"The Northern Redbelly Dace is a small […], elongate minnow with its snout length shorter than its eye diameter. […] The body is deepest just anterior to pelvic-fin insertions. The small mouth is terminal and oblique, with the chin protruding beyond the upper lip. Body fins and caudal lobes are rounded. Both the dorsal and anal fins are rounded with convex margins. The caudal fin is forked with rounded lobes. From 70–90 cycloid scales lie along the lateral row, forming a decurved and incomplete lateral line. The majority of individuals have 8 anal-fin rays, 8 dorsal-fin rays, 8 pelvic-fin rays, and 13–16 pectoral-fin rays. The pharyngeal tooth formula is 0,5–5,0. There are two distinct lateral stripes, separated by a broad, light lateral band, which converge on the caudal peduncle. The upper stripe is narrower than the lower, and usually separates into a series of black spots behind the dorsal fin. Nuptial coloration of males is brilliant, with a red ventral surface and yellow to red lateral band. Non-breeding specimens are olive or greenish dorsally, and fade to white rather abruptly below the lowermost lateral stripe. Females become yellow on the abdomen. Tubercules are present on the breast and lower portion of the head in breeding males and females."

Biology

From Froese and Pauly (2024):

"Feeds mainly on algae, but also on zooplankton and aquatic insects. Preyed upon by fishes, kingfishers and mergansers [Scott and Crossman 1973]. Spawning occurs in spring or early summer [Scott and Crossman 1973]."

"A female attracts a few males with her darting movements. Together, the group dives into a mass of filamentous algae and release sperm and nonadhesive eggs. The group spawns in several algal masses."

From NatureServe (2024):

"Spawns late May-early August under normal conditions throughout the Great Lakes region; eggs hatch in about 8-10 days at 21-27 C; first spawns at age I or II (Becker 1983, Faber 1985). Spawns mid-June to mid-August in Clear Lake, Ontario; fractional spawner [Powles et al. 1992]."

"Eats mainly diatoms and filamentous algae, also zooplankton and aquatic insects."

From Stauffer et al. (2016):

"Individuals hatching early in the season will spawn the following year, but those that hatch late will likely not spawn until age-2."

Human Uses

From Froese and Pauly (2024):

"Used as bait in parts of Ontario and Quebec [Scott and Crossman 1973]."

From Nico and Fuller (2025):

"Introduced in northeastern part of the state [Illinois] by South Cook County Mosquito Abatement District personnel; […]"

Diseases

No information was found associating *Chrosomus eos* with any diseases listed by the World Organisation for Animal Health (2024).

According to Poelen et al. (2014), *Chrosomus eos* is host to the following parasites: *Cleidodiscus brachus*, *Clinostomum complanatum*, *Clinostomum marginatum*, *Dactylogyrus chrosomi, Dactylogyrus eos, Diplostomulum, Gyrodactylus eos, Gyrodactylus nebraskensis, Gyrodactylus tenesseensis, Myxobolus smithi, Octomacrum microconfibula, Octomacrum semotili, Ornithodiplostomum ptychocheilus, Pomphorhynchus, Posthodiplostomum minimum, Rhabdochona canadensis, Tetracotyle, Uvulifer*

Threat to Humans

From Froese and Pauly (2024):

"Harmless."

3 Impacts of Introductions

From Nico and Fuller (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."

4 History of Invasiveness

Chrosomus eos has been introduced in multiple locations in the United States outside its native range. None of the introductions are known to have resulted in an established population. *C. eos* is in trade but no information on trade volume or duration was available to assess the risk of introduction from that pathway. The History of Invasiveness for *Chrosomus eos* is classified as No Known Nonnative Population.

5 Global Distribution

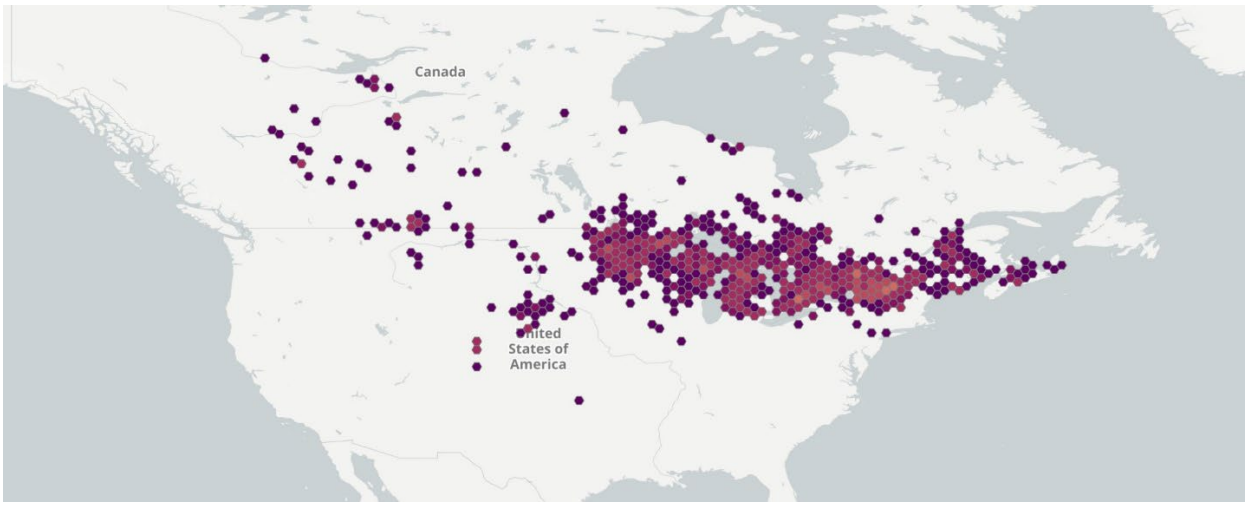

Figure 1. Reported global distribution of *Chrosomus eos*. Map from GBIF Secretariat (2023). Observations are reported from the contiguous United States and Canada. The points in Oklahoma and central Illinois do not represent established populations and were not used in climate matching analysis.

6 Distribution Within the United States

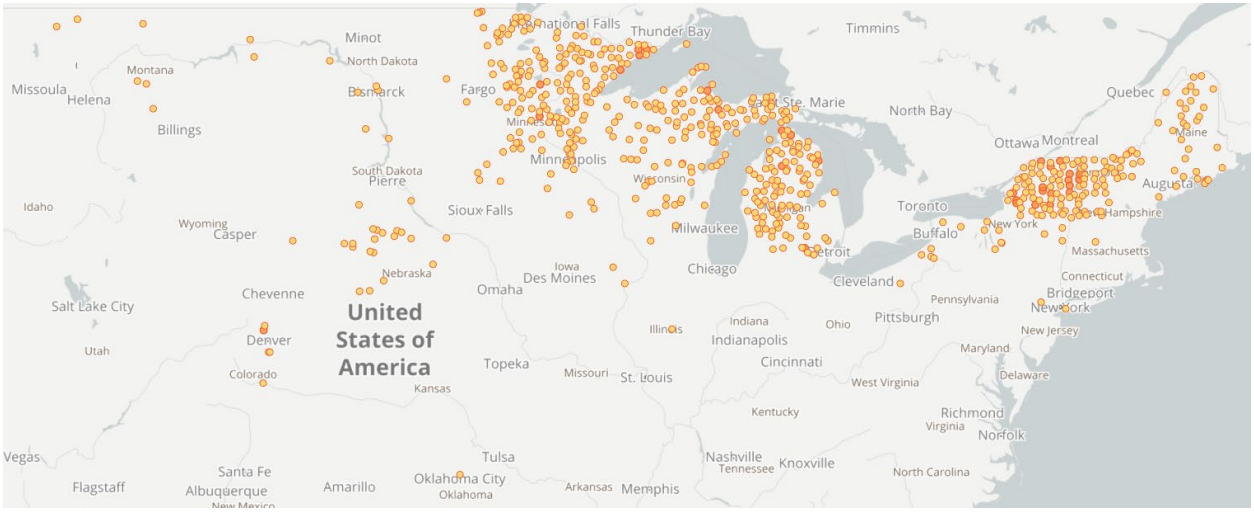

Figure 2. Reported distribution of *Chrosomus eos* in the United States. Map from GBIF-US (2024). Observations are reported from Colorado, Illinois, Iowa, Maine, Massachusetts, Michigan, Minnesota, Montana, Nebraska, New Hampshire, New Jersey, New York, North Dakota, Oklahoma, Pennsylvania, South Dakota, Vermont, Wisconsin, and Wyoming. The points in Oklahoma and central Illinois do not represent established populations and were not used in climate matching analysis.

7 Climate Matching

Summary of Climate Matching Analysis

The climate matching analysis to the contiguous United States for *Chrosomus eos* found areas of high climate match in the Northeast, Mid-Atlantic, Great Lakes Basin, North Central Region, Upper Mississippi River Basin, and Missouri River Basin. Areas of medium climate match included the Great Basin, Western Mountains, Colorado Plateau, Lower Mississippi River Basin, and the Southeast. The rest of the contiguous United States had a low climate match, most notably peninsular Florida, the Desert Southwest, and Pacific Coast. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.725, 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 *Chrosomus eos* (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.

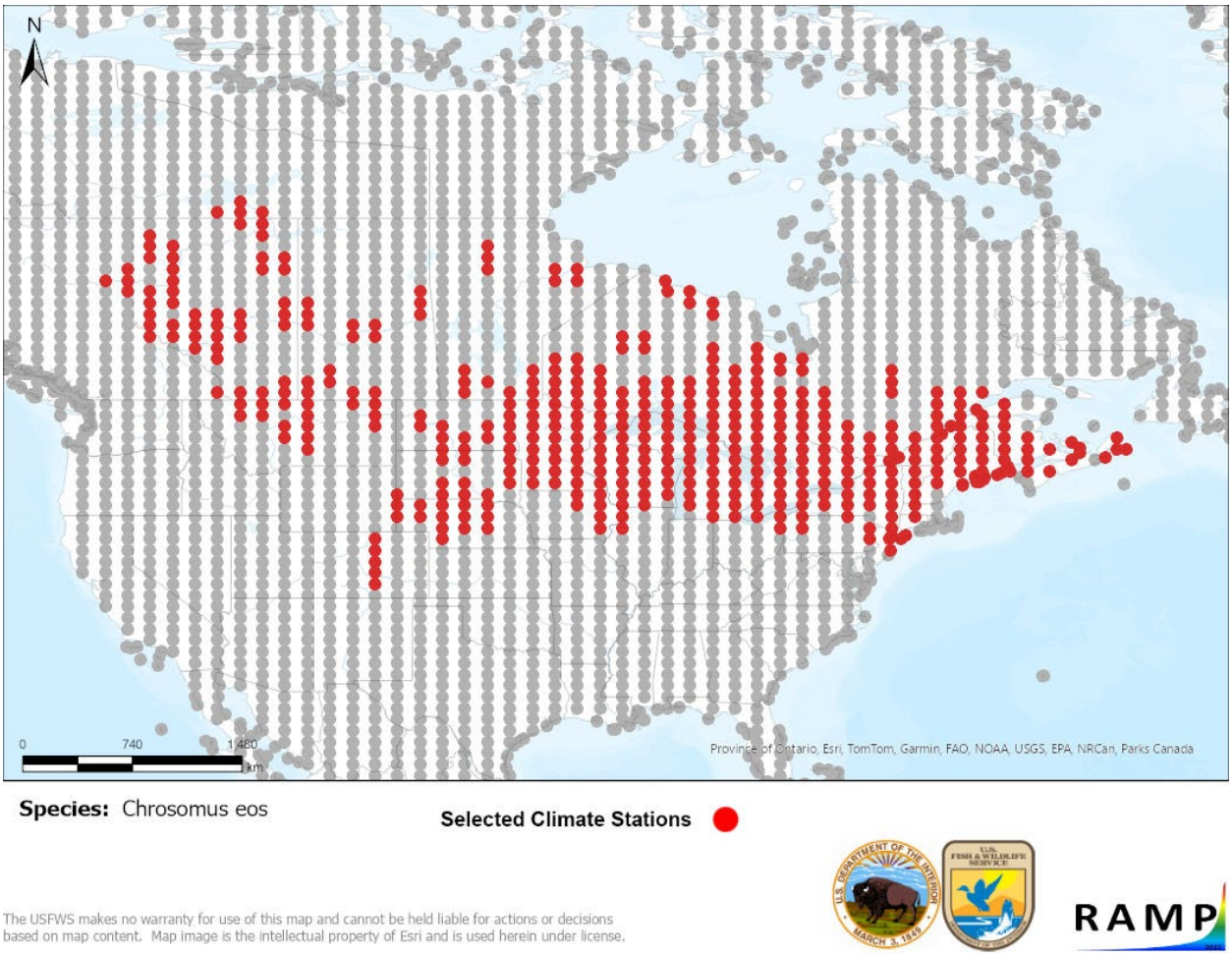

Figure 3. RAMP (Sanders et al. 2023) source map showing weather stations in the United States and Canada selected as source locations (red; United States and Canada) and non-source locations (gray) for *Chrosomus eos* climate matching. Source locations from GBIF Secretariat (2023). Selected source locations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

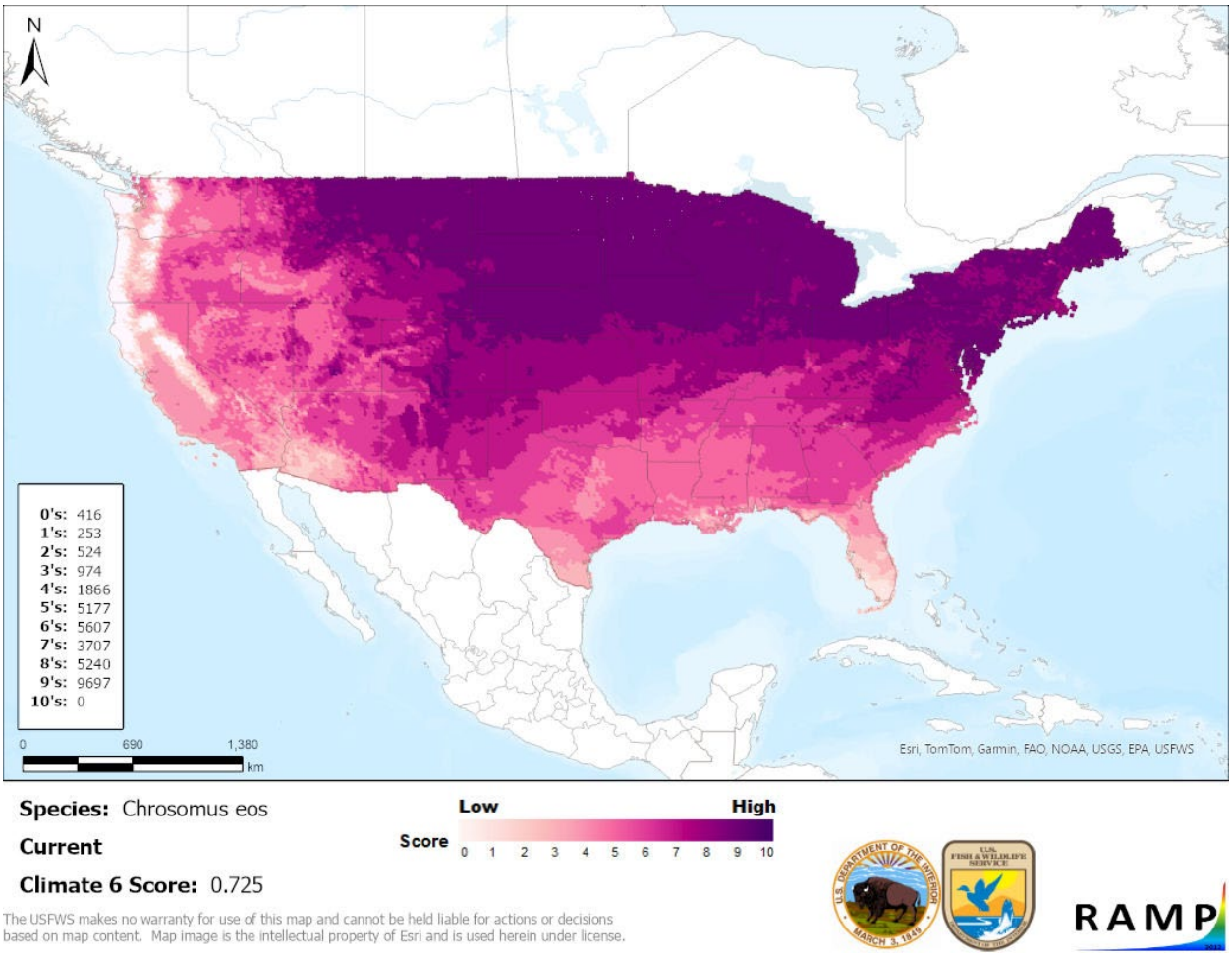

Figure 4. Map of RAMP (Sanders et al. 2023) climate matches for *Chrosomus eos* in the contiguous United States based on source locations reported by GBIF Secretariat (2023). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

Adequate information on the biology and distribution of *Chrosomus eos* was available. Records of introduction were found. However, the current status of most introductions is unknown and no information or peer reviewed research was found assessing the impacts, or lack of impacts, from introductions. The Certainty of Assessment for *Chrosomus eos* is classified as Low.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Chrosomus eos, Northern Redbelly Dace, is a fish native to the northeastern and north central United States, and southeastern, central, and northwestern Canada. *Chrosomus eos* is known to hybridize with other species within *Chrosomus*. There is a history of *Chrosomus eos* being sold in the bait trade as a contaminant of fathead minnow stocks. There is also some evidence for *Chrosomus eos* in the aquarium trade. Introductions outside of the species' native range in the

United States have occurred but none have resulted in a known established population. No information was found regarding any impacts from those introductions. The History of Invasiveness for *Chrosomus eos* is classified as No Known Nonnative Population due to the lack of information supporting the existence of an established nonnative population. The climate matching analysis for the contiguous United States indicates establishment concern for this species outside its native range. Climate matching found areas of high and medium climate match extending south and west from the native range of *Chrosomus eos* into the Great Basin and Southeast. The Certainty of Assessment for this ERSS is classified as Low due to lack of information needed to evaluate the species' history of invasiveness. The Overall Risk Assessment Category for *Chrosomus eos* in the contiguous United States is Uncertain.

Assessment Elements

- **History of Invasiveness (see Section 4): No Known Nonnative Population**
- **Establishment Concern (see Section 7): Yes**
- **Certainty of Assessment (see Section 8): Low**
- **Remarks, Important additional information: None**
- **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 (2023).

Under the future climate scenarios (figure A1), on average, high climate match for *Chrosomus eos* was projected to occur in the Great Lakes, Northeast, and Northern Plains regions of the contiguous United States. The areas of high and medium match contracted northward with time under both SSP3 and SSP5. Areas of low climate match were projected to occur in California, the Gulf Coast, Northern Pacific Coast, and Southern Florida regions. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.236 (model: UKESM1-0-LL, SSP5, 2085) to a high of 0.606 (model: MPI-ESM1-2-HR, SSP5, 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 (0.725, 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, the most extreme climate change scenario. Under all time step and climate scenarios only minor or no increases in the climate match relative to the current match were observed. Under multiple time step and climate scenarios, areas within the Appalachian Range, Great Lakes, Gulf Coast, Mid-Atlantic, Northeast, Northern Plains, Southeast, Southern Plains, and Southwest saw a large decrease in the climate match relative to current conditions. These changes were most pronounced under SSP5 at the 2085 time step. Additionally, areas within California, the Colorado Plateau, Great Basin, Northern Pacific Coast, Southern Atlantic Coast, and Western Mountains saw a moderate decrease in the climate match relative to current conditions. Additional, very small areas of large or moderate change may be visible on the maps (figure A3).

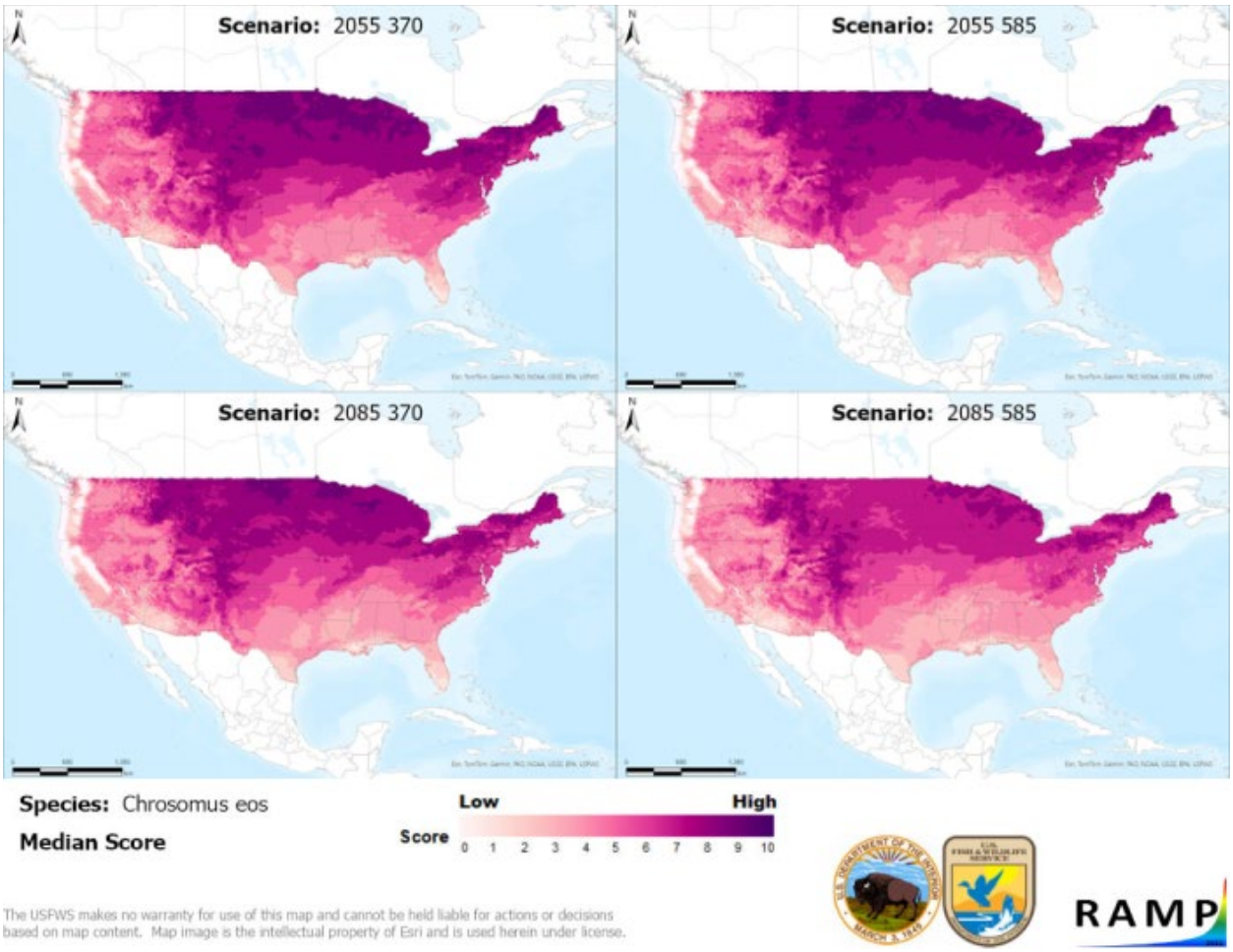

Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Chrosomus eos* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2023). Shared Socioeconomic 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.

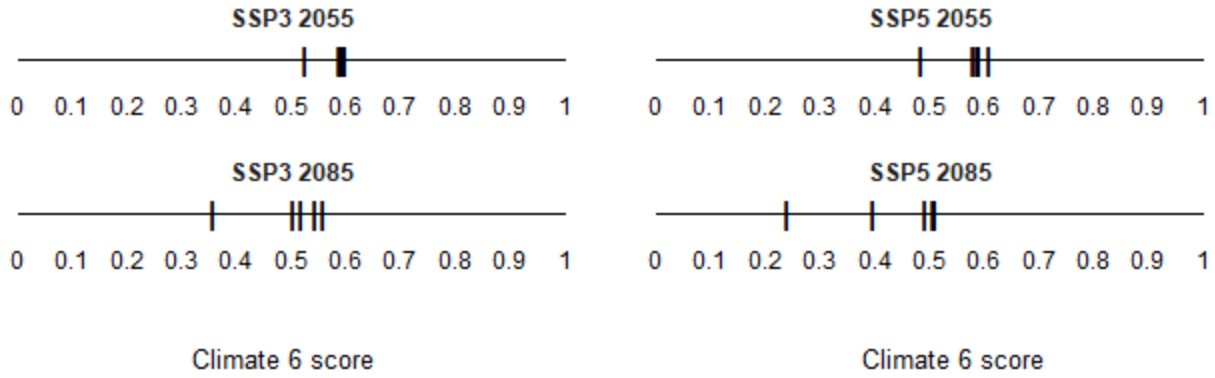

Figure A2. Comparison of projected future Climate 6 scores for *Chrosomus eos* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 2018; IPCC 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.

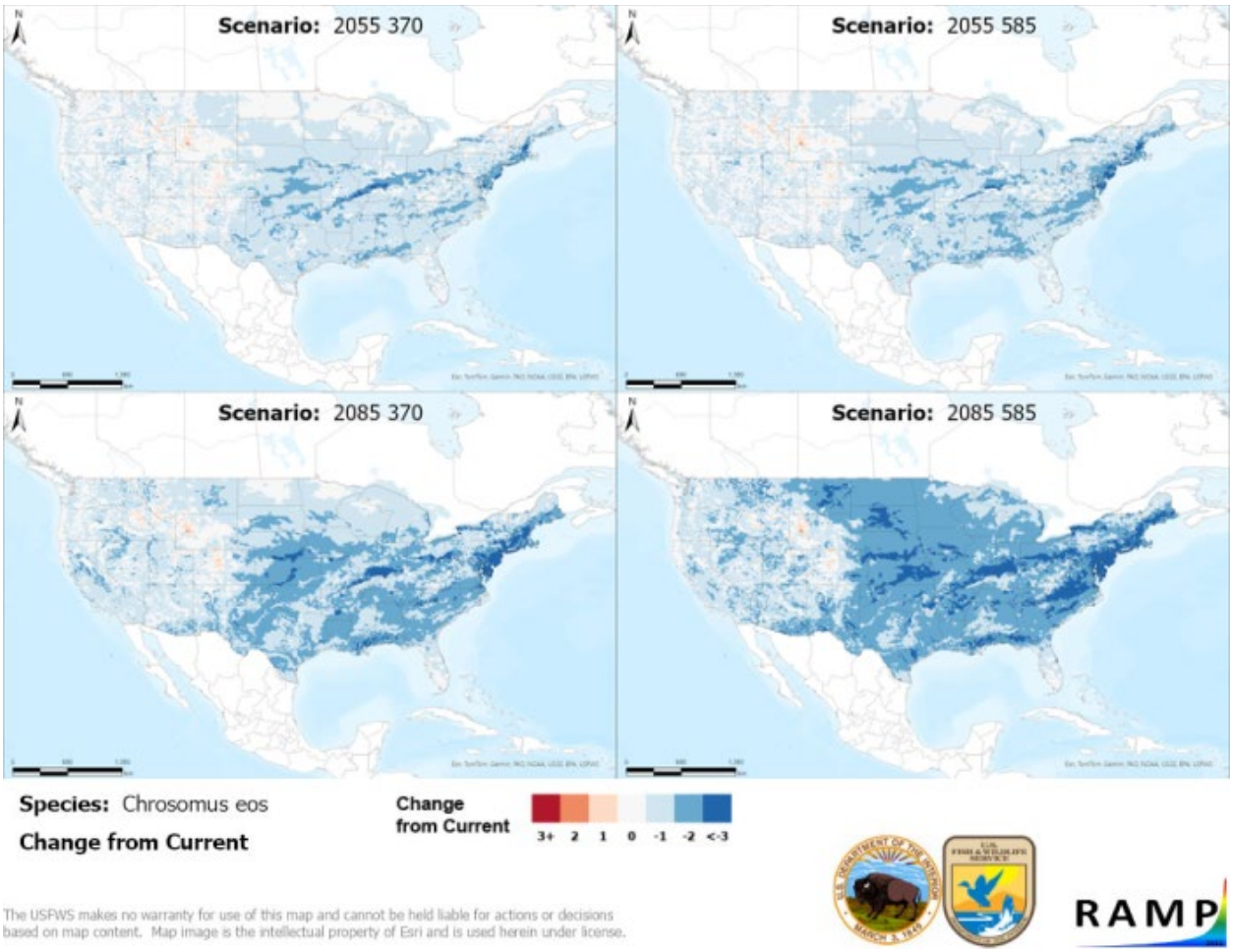

Figure A3. RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 4) and the median target point score for future climate scenarios (figure A1) for *Chrosomus eos* based on source locations reported by GBIF Secretariat (2023). 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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