

Redfin Pickerel (*Esox americanus*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, April 2024

Revised, December 2024

Web Version, 9/25/2025

Organism Type: Fish

Overall Risk Assessment Category: Uncertain



Photo: Robert Aguilar. Licensed under CC-BY-2.0. Available:
https://commons.wikimedia.org/wiki/File:Esox_americanus_Zekiah_10-19-19_0650_%2848932874893%29.jpg (April 2024).

1 Native Range and Status in the United States

Native Range

From Fuller (2024):

“Native Range: Atlantic Slope from the St. Lawrence River drainage, Quebec, to Lake Okeechobee, Florida; Gulf drainages east to the Brazos River, Texas; Mississippi River and Great Lakes basins north to Nebraska, Wisconsin, Michigan, and southern Ontario (range for the species). Redfin Pickerel *E. a. americanus* occur on the Atlantic Slope to southern Georgia and intergrade with grass pickerel *E. a. vermiculatus* in the Gulf Slope drainages west to the Pascagoula River. Grass pickerel occupy the rest of the range (Page and Burr 1991).”

Status in the United States

From Fuller (2024):

“Native Range: Atlantic Slope from the [Canadian border] to Lake Okeechobee, Florida; Gulf drainages east to the Brazos River, Texas; Mississippi River and Great Lakes basins north to Nebraska, Wisconsin, Michigan, [...]. Redfin Pickerel *E. a. americanus* occur on the Atlantic

Slope to southern Georgia and intergrade with grass pickerel *E. a. vermiculatus* in the Gulf Slope drainages west to the Pascagoula River. Grass pickerel occupy the rest of the range (Page and Burr 1991).”

“[Status of nonnative introductions:] Extirpated in California; established in Colorado, Pennsylvania, and Washington; established in the Youghiogheny drainage in Maryland (D. Neely); unknown in Oregon and Wisconsin.”

In addition to the locations mentioned above, Fuller (2025) reports nonnative occurrence records with establishment in Oregon, South Carolina, Vermont, and Wisconsin; and unknown status in Florida, Maine, and Texas.

Esox americanus is available in the pet trade in the United States (e.g., Wild Fish Tanks 2024), although no estimates of trade volume are available.

Regulations

Esox americanus is regulated in Arkansas (AGFC 2022). It is regulated at the family level (family Esocidae) in Arizona (Arizona Game and Fish Commission 2022), California (CDFW 2021) and Oregon (ODFW 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 Fuller (2024):

“This species was stocked intentionally and possibly accidentally; it was stocked illegally in Oregon. Probably introduced into Washington as misidentified northern pike *E. lucius* (Chapman 1942); it is also possible that grass pickerel were introduced into Idaho along with northern pike, and that the former species later reached Washington by "some devious means" (Wydoski and Whitney 1979).”

Remarks

From Froese and Pauly (2024):

“Two subspecies were previously recognized: *Esox americanus americanus* in Atlantic Slope drainages to southern Georgia; and *Esox americanus vermiculatus* in rest of range.”

From Fuller (2024):

“This species is sometimes mistaken for the young of other, larger *Esox* species. Smith (1985) mapped several records for the Lake Champlain drainage in New York but did not indicate that these were the result of introductions.”

Esox americanus 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 Protacanthopterygii
Order Esociformes
Family Esocidae
Genus *Esox*
Species *Esox americanus* Gmelin, 1789

According to Fricke et al. (2024), *Esox americanus* Gmelin 1789 is the current valid name for this species.

The following synonyms of *Esox americanus* from Froese and Pauly (2024) and Fricke et al. (2024) were used to search for information for this report: *Esox americanus americanus*, *Esox vermiculatus*, *Esox americanus vermiculatus*, and *Esox cypho*.

Size, Weight, and Age Range

From Fuller (2024):

“Size: 38 cm.”

From Froese and Pauly (2024):

“Max length : 39.4 cm FL [fork length] male/unsexed; [IGFA 2001]; max. published weight: 1.0 kg [IGFA 2001]”

Environment

From Froese and Pauly (2024):

“Freshwater; brackish; demersal; pH range: ? - 10.1; non-migratory. [...]; ? - 26°C [Crossman 1962a]”

From NatureServe (2013):

“Habitat includes small, quiet, heavily vegetated waters: pools and backwaters of streams, canals, ponds, and bays of small lakes; this fish more often occurs in streams than in lakes.”

Climate

From Froese and Pauly (2024):

“Subtropical; [...] 50°N - 26°N”

Distribution Outside the United States

Native

According to Froese and Pauly (2024), *Esox americanus* is native to Quebec and Ontario, Canada.

Introduced

No records were found of introduction of *Esox americanus* in the wild outside the United States.

Means of Introduction Outside the United States

No records were found of introduction of *Esox americanus* in the wild outside the United States.

Short Description

From Froese and Pauly (2024):

“Dorsal spines (total): 0; Dorsal soft rays (total): 13-21; Anal spines: 0; Anal soft rays: 13 - 18; Vertebrae: 42 - 51. Body robust, long, cylindrical, cross-section almost circular with flattened to slightly concave dorsal surface. Head large, flat, naked on top. Snout short, broad spatulate, dorsal surface between raised orbits and tip of snout slightly convex. Mouth large, horizontal, reaching at least to middle of pupil or suborbital bar. Teeth moderately large, those in front of upper jaw and several along each side of ramus a little enlarged; cheek and opercle fully scaled. Gill rakers are reduced to patches of sharp denticles. Branchiostegal rays: 19-31. Cardioid scales between pelvic fins 6-32, intergrades 0-26; notched scales in a line between dorsal and anal fin origins 7-25, intergrades 1-22. Submandibular pores 3:2 to 6:5, usually 4:4. Pigmentation: Olivaceous to black above; belly pale amber to white, sometimes mottled with [sic] dark; mid-dorsal band from nape to dorsal fin origin inconspicuous and pale. Sides with 20-36 olive to black wavy vertical bars separated by paler extensions of what had been lateral band in young, pale area between adjacent bars narrower. Suborbital and preorbital black bars pronounced,

suborbital curved back ventrally, postorbital horizontal; lateral edges of jaws heavily pigmented. Pupil yellow to yellow green, iris gold. Dorsal fin darkly pigmented, others orange to red.”

Biology

From Froese and Pauly (2024):

“Live in lakes, swamps, and backwaters, and sluggish pools of streams. Usually occur among vegetation in clear water [Page and Burr 2011]. Also found in brush piles, overhanging brush or rocks and boulders in areas lacking vegetation. Rarely occur in rivers [Jones et al. 1978]. In winter, they are found associated with dead leaf litter (Ming 1968). Juveniles are found in flood pools and rivulets among exposed roots, twigs, leaves, and grass in 7.6-10.2 cm of water [Crossman 1962b]. Larvae are sometimes found in very shallow water in roadside ditches, also in dead leaf litter [Ming 1968]. Oviparous [Breder and Rosen 1966].”

“Spawning takes place in flood plains, grassy banks, sloughs, ditches and overflow ponds in areas of heavy vegetation, sometimes in water less than 30.5 cm deep (Ming 1968).”

From NatureServe (2013):

“Eggs sink and stick to bottom and vegetation. Adults may move upstream to spawn in flooded stream margins or marshes where vegetation is abundant (Scott and Crossman 1973).”

From NatureServe (2024):

“Spawns mainly in spring but also sometimes in fall. Eggs hatch in about 11-15 days. Sexually mature by age 2.”

“Young-of-year eat small crustaceans and immature insects, larger fishes mainly piscivorous but also eat crayfish and other invertebrates (Lee et al. 1980).”

Human Uses

From Froese and Pauly (2024):

“Fisheries: of no interest; gamefish: yes; aquarium: public aquariums”

Diseases

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

Poelen et al. (2014) lists the following as parasites or diseases of *Esox americanus*: *Acanthocephala*, *Acanthocephalus dirus*, *Azygia angusticauda*, *Azygia longa*, *Centrovarium lobotes*, *Crassiphiala bulboglossa*, *Eustrongylides wenrichi*, *Fessisentis friedi*, *Fessisentis necturorum*, *Hedruris*, *Hedruris androphore*, *Macroderoides flavus*, *Neoechinorhynchus*, *Neoechinorhynchus cylindratus*, *Neoechinorhynchus didelphis*, *Pilum pilum*, *Pisciamphistoma stunkardi*, *Plesiocreadium flavum*, *Posthodiplostomum minimum*, *Proisorhynchoides*,

Proisorhynchoides pusillus, *Proteocephalus*, *Proteocephalus ambloplitis*, *Proteocephalus percae*, and *Proteocephalus pinguis*.

Froese and Pauly (2025) list the following as additional parasites or diseases of *Esox americanus*: *Ergasilus megaceros*, *Lernaea cyprinacea*, *Neoechinorhynchus tenellus*, and *Proisorhynchoides pusillus*.

Threat to Humans

From Froese and Pauly (2024):

“Harmless”

3 Impacts of Introductions

From 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 below information discusses potential impacts from an *Esox americanus* introduction:

From Divens et al. (2001):

“The condition of largemouth bass less than 350 mm was below the national average [...] This may be an indication of extensive inter- and/or intra-specific competition for available food resources with young bass, abundant panfish, and possibly grass pickerel [*Esox americanus*].”

“Overall, Eloika Lake [Washington] has one of the highest quality pumpkinseed sunfish populations observed to date in Washington. During our survey, anglers were observed readily harvesting pumpkinseed sunfish in the 170 to 190 mm (6.5 to 7.5 inches) size range. The presence of grass pickerel, a member of the pike family, in the fish community may contribute to the quality of panfish populations by contributing to the overall predation on young fish; thereby minimizing the potential for reduced panfish growth rates and condition.”

Esox americanus is regulated in the following states: Arkansas, Arizona, California, and Oregon. See section 1.

4 History of Invasiveness

The History of Invasiveness for *Esox americanus* is classified as Data Deficient. There are records of nonnative introductions of *Esox americanus* in various localities in the western United States (e.g., Washington, California, Colorado) and eastern United States. Some of these introductions have resulted in established populations. Some information was found indicating that *E. americanus* may affect stock quality of sportfish in a lake in Washington. However, the specific interactions of *E. americanus* were not the focus of the survey and no definitive conclusions can be drawn.

5 Global Distribution

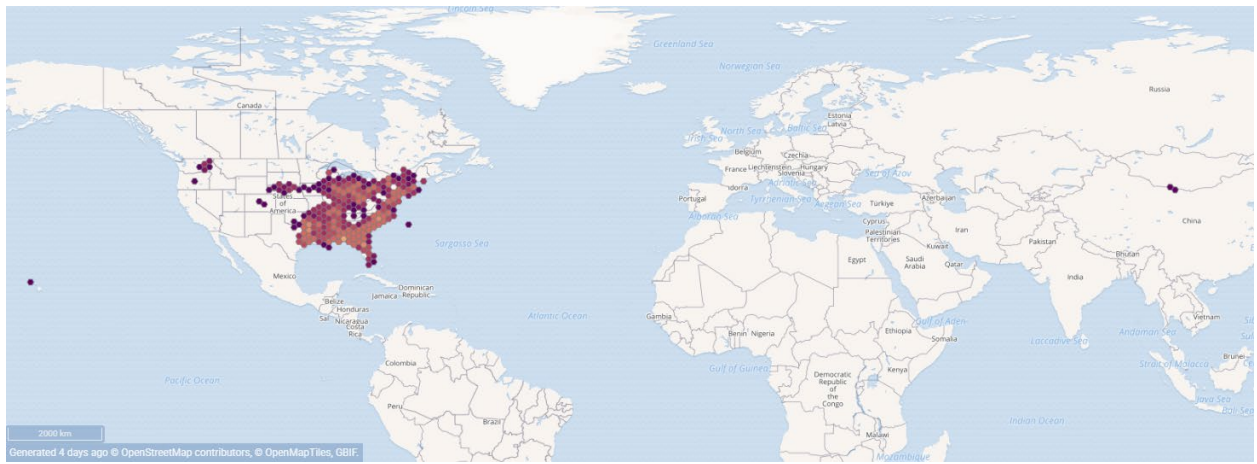


Figure 1. Reported global distribution of *Esoc americanus*. Map from GBIF Secretariat (2023). Observations are reported from across the contiguous United States, Hawaii, Canada, China, and Mongolia. The record information for the points in China and Mongolia indicate the specimens were actually collected in Nebraska, United States; these points were not used in the climate matching analysis. There is no indication of an introduced population in Hawaii; therefore the observation was not included in the climate matching analysis.

6 Distribution Within the United States



Figure 2. Reported distribution of *Esox americanus* in the United States. Map from Fuller (2025). Orange shading indicates the native range of *E. americanus*. Yellow diamonds represent records of established nonnative populations. Other diamonds indicate nonnative records without establishment of *E. americanus* (orange; no subspecies specified), *E. americanus americanus* (blue), or *E. americanus vermiculatus* (red). Only established locations were used to select source points in the climate matching analysis. The record in Oregon is a state centroid and was not used in the climate matching analysis.



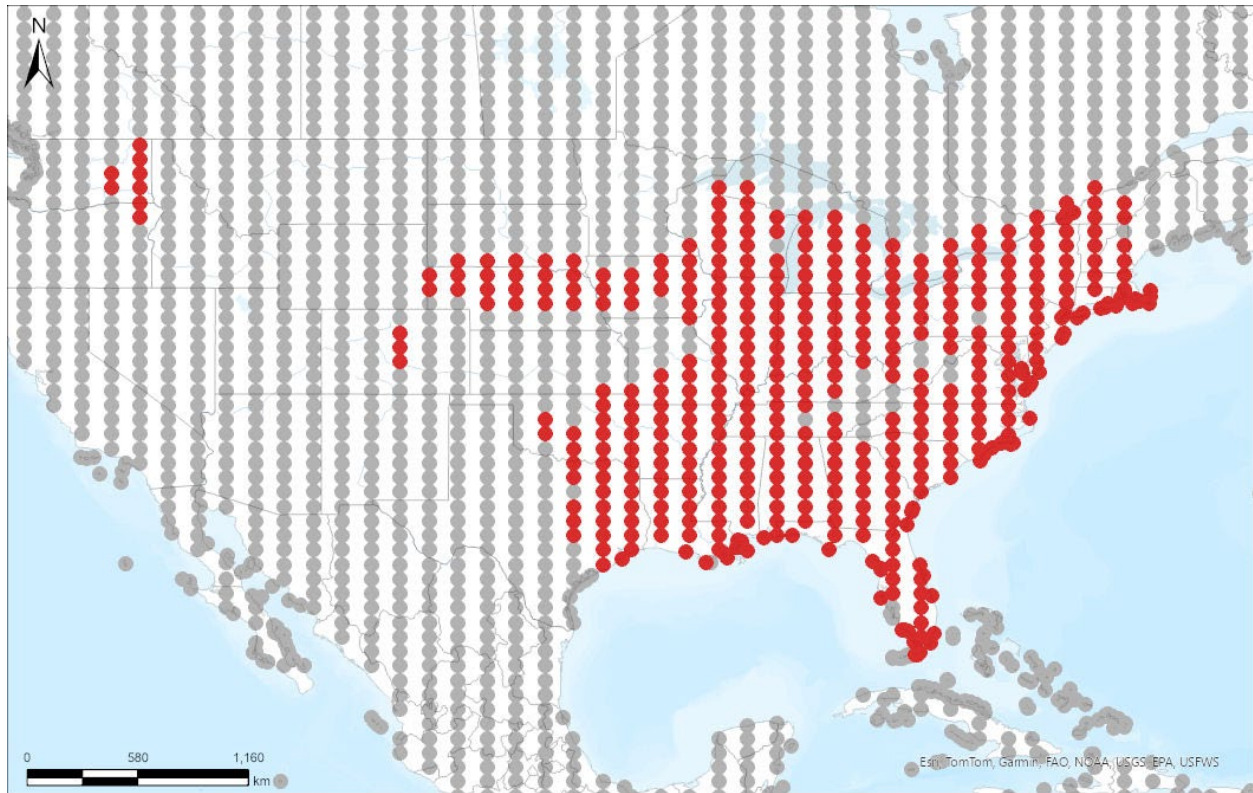
Figure 3. Reported distribution of *Esox americanus* in Hawaii. Map adapted from GBIF-US (2024). Observation is reported from Honolulu. Record information indicates that the specimen was collected in 1900 from a marine environment. No evidence suggests that there is an established population of *Esox americanus* in Hawaii; the observation was not used in the climate matching analysis

7 Climate Matching

Summary of Climate Matching Analysis

The climate matching analysis for *Esox americanus* to the contiguous United States found high match across much of the eastern and central contiguous United States. This includes the native range of the species. Areas of the Western Mountains and Great Basin regions also had high climate matches. Areas of medium climate match were found in the Colorado Plateau, parts of the Great Basin, and Southwest regions. Areas of low climate match were found in California and the Northern Pacific Coast to the west of the mountains. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.923, indicating that Yes, there is establishment concern outside its native range. The Climate 6 score is calculated as: $(\text{count of target points with scores} \geq 6) / (\text{count of all target points})$. 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 *Esox americanus* (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.



Species: *Esox americanus*

Selected Climate Stations ●



RAMP

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Figure 4. RAMP (Sanders et al. 2023) source map showing weather stations in southern Canada and the contiguous United States selected as source locations (red; Canada and United States) and non-source locations (gray) for *Esox americanus* 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.

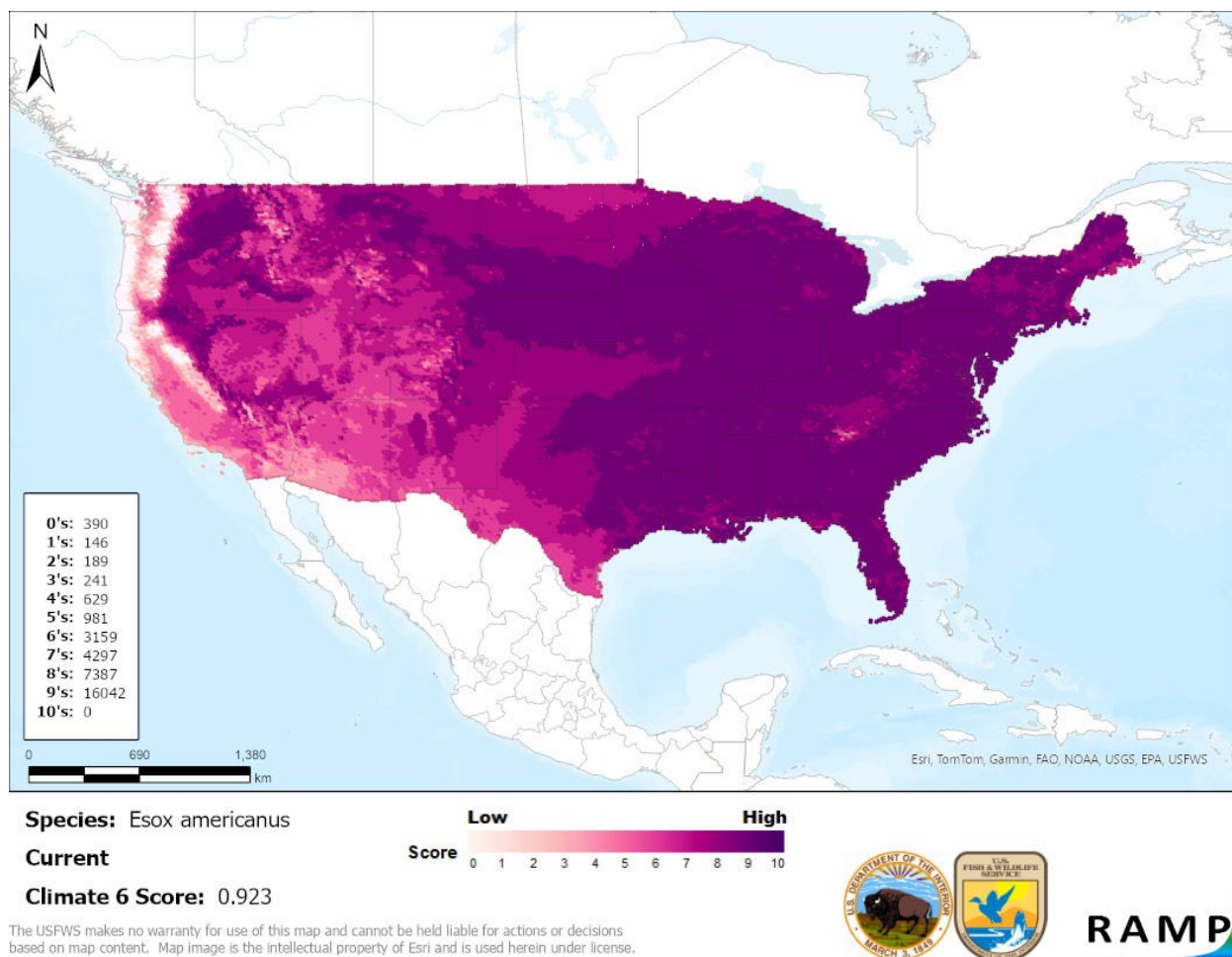


Figure 5. Map of RAMP (Sanders et al. 2023) climate matches for *Esox americanus* in the contiguous United States based on source locations reported by GBIF Secretariat (2023). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

The Certainty of Assessment for *Esox americanus* is classified as Low. There is reasonably complete information on the native distribution of *Esox americanus* and introductions in the United States. However, definitive information regarding the species' impacts from introductions was not available.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Esox americanus, Redfin Pickerel, is a fish that is native to the Atlantic Slope, Gulf, and lower Mississippi drainages of the United States and Canada. Introductions have occurred in areas surrounding the native range as well as in western States. The species has become established in a few locations. *Esox americanus* is available via the pet trade in the United States but no information regarding the quantity or duration of trade was found. Arkansas, Arizona, California,

and Oregon regulate *Esox americanus*. The History of Invasiveness for *Esox americanus* was classified as Data Deficient due to the lack of information demonstrating impacts or lack of impacts of nonnative populations. The climate matching analysis for the contiguous United States indicates establishment concern for this species outside its native range. Areas of high climate match were found within and bordering the native range in the Eastern, Great Lakes, and Central Plains regions. Parts of the Western Mountains and Great Basin regions where *Esox americanus* has become established also had high match. The Certainty of Assessment for this ERSS is classified as Low due to the lack of information regarding impacts from introductions. The Overall Risk Assessment Category for *Esox americanus* 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: 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 *Esox americanus* was projected to occur in the Appalachian Range, Great Lakes, Mid-Atlantic, Northeast, Northern Plains, Southeast, Southern Atlantic Coast, Southern Florida, and Southern Plains regions of the contiguous United States. Areas of low climate match were projected to occur in the Northern Pacific Coast region. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.789 (model: UKESM1-0-LL, SSP5, 2085) to a high of 0.908 (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 (0.923, figure 5) 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. Primarily under the 2085 time-step and SSP5 climate scenario, areas within the Northern Plains saw a large decrease in the climate match relative to current conditions. Also primarily under the 2085 time-step but both SSPs, areas within the Appalachian Range, California, Colorado Plateau, Great Basin, Gulf Coast, Mid-Atlantic, Northeast, Southeast, Southern Atlantic Coast, Southern Florida, Southern Plains, Southwest, 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).

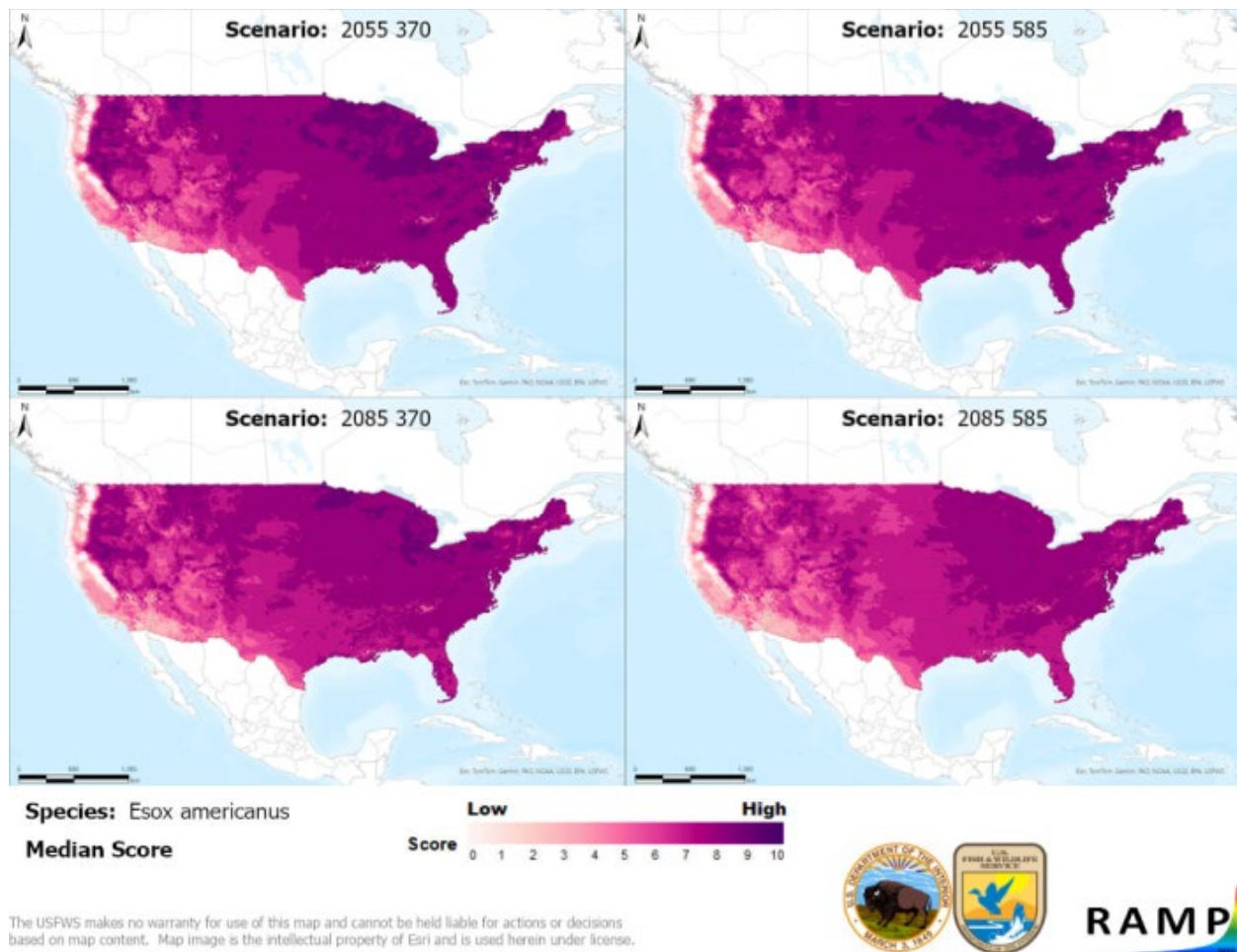


Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Esox americanus* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2023). Shared Socioeconomic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

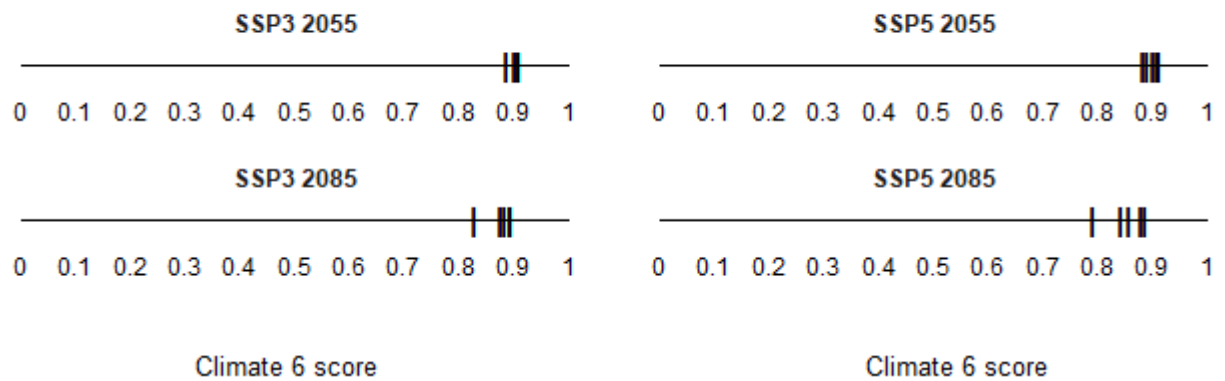
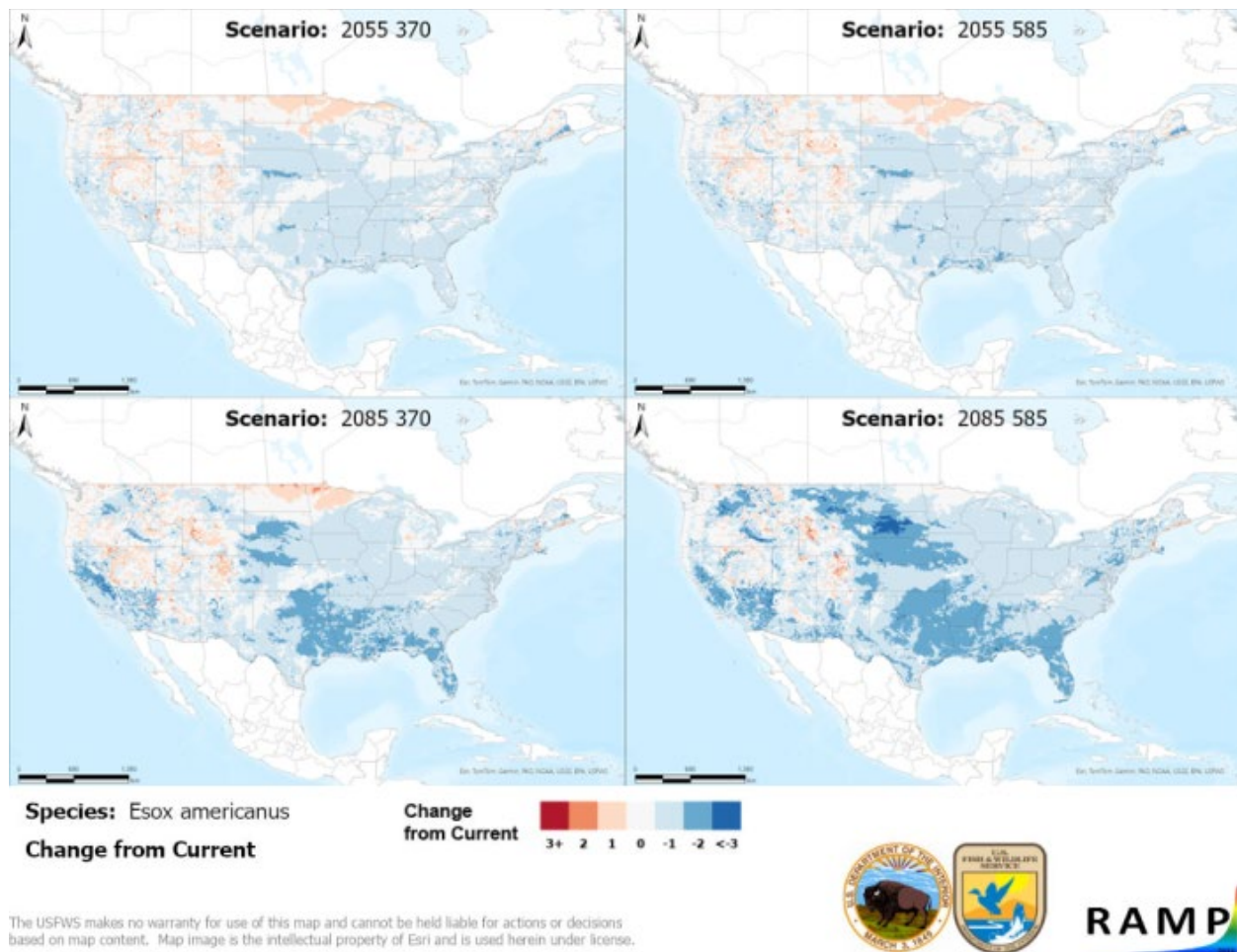


Figure A2. Comparison of projected future Climate 6 scores for *Esox americanus* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 2018; IPCC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



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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 5) and the median target point score for future climate scenarios (figure A1) for *Esox americanus* 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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