

Ohrid Trout (*Salmo letnica*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, May 2011
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1 Native Range and Status in the United States

Native Range

From Fuller (2017):

“The Ohrid trout is native to Ohrid Lake located in the Republic of Macedonia [on the border of Macedonia and Albania] in Europe (formerly Yugoslavia) (Robins et al. [1991]).”

Status in the United States

From Fuller (2017):

“The Ohrid trout was stocked in Parvin Lake, Big Creek Reservoir, and Turquoise Lake in Colorado, in 1969 (Courtenay and Hensley [1979]; Wiltzius 1985; Courtenay et al. 1991), seven lakes in northern Minnesota, including Strawberry Lake, Chester Lake, and Big Trout Lake (MacCrimmon and Campbell 1969; Stroud 1969; Courtenay and Hensley [1979]; Radonski et al. 1984); an unspecified locality in Montana (Courtenay et al. 1991); Watauga Reservoir (= Ripshin

Lake) (Courtenay and Hensley [1979]; Etnier and Starnes 1993) and South Holston Reservoir (Starnes, personal communication), Tennessee; and a few reservoirs in Wyoming, including Viva Naughton Reservoir on the Green River, lakes near Casper, and the North Platte River (MacCrimmon and Campbell 1969; Courtenay and Hensley [1979]; Courtenay et al. 1991; Hubert 1994; Wyoming Game and Fish, Fish Division 1997).”

“Introductions into most of these states failed. Repeatedly stocked in Tennessee with no evidence of reproduction yet (Etnier and Starnes 1993). Courtenay and Hensley ([1979]) report that even though there has been no reproduction, spawning has been observed in Tennessee.”

Fuller (2018) shows an established population of *S. letnica* at Pathfinder Reservoir in Natrona County, Wyoming.

Means of Introduction into the United States

From Fuller (2017):

“The Ohrid trout was brought into the United States by the U.S. Fish and Wildlife Service and shipped to a federal hatchery in Iowa and a state hatchery in Minnesota (Courtenay and Hensley [1979]). In 1965, eggs from Yugoslavia were hatched in the United States; young fish were released into several small lakes in northern Minnesota in 1968 and 1969 (Stroud 1969). Ohrid trout have been stocked in Tennessee since 1971 (Etnier and Starnes 1993). The species was first stocked in Colorado in 1969 (Wiltzius 1985).”

Remarks

From Delling (2010):

“*Salmo letnica* is often subdivided into three or four subspecies (Stefanovic, 1948; Poljakov et al., 1958) and opinions on their relationship and distinctiveness towards each other and other Balkan *Salmo* species varies considerably (e. g., S. Karaman, 1957; M. Karaman 1966; Soric, 1990; Sušnik et al., 2007).”

From Crivelli (2006):

“Taxonomy needs to be confirmed using molecular data. There is also little information on abundance, trend and threats.”

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2017):

“Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata

Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Actinopterygii
Class Teleostei
Superorder Protacanthopterygii
Order Salmoniformes
Family Salmonidae
Subfamily Salmoninae
Genus *Salmo*
Species *Salmo letnica* (Karaman, 1924)”

“Current Standing: valid”

Size, Weight, and Age Range

From Froese and Pauly (2017):

“Max length : 76.0 cm TL male/unsexed; [Crawford 1993]; max. published weight: 6.5 kg [International Game Fish Association 1991]”

Environment

From Froese and Pauly (2017):

“Freshwater; benthopelagic.”

From Crivelli (2006):

“It lives at depths of 60–80 m within the lake.”

Climate/Range

From Froese and Pauly (2017):

“Temperate; 42°N - 40°N, 20°E - 21°E”

Distribution Outside the United States

Native

From Fuller (2017):

“The Ohrid trout is native to Ohrid Lake located in the Republic of Macedonia [on the border of Macedonia and Albania] in Europe (formerly Yugoslavia) (Robins et al. [1991]).”

Introduced

From Simonović et al. (2015):

“[...] Lake Ohrid trout, *Salmo letnica* (Karaman, 1924), was heavily and repeatedly stocked from a hatchery into the Vlasina Lake in Southern Serbia in 1950s and 1960s [...] (Janković and Raspopović 1960).”

No information was found on the current status of *S. letnica* in Vlasina Lake to confirm establishment.

From Perdikaris et al. (2010):

“The Pestani trout *Salmo letnica* (Karaman, 1924) has been introduced into Lake Prespes [Greece] (Crivelli et al. 1997).”

Perdikaris et al. (2010) report that establishment was unsuccessful for *S. letnica* introduced into Greece.

Means of Introduction Outside the United States

From Simonović et al. (2015):

“[...] for commercial fishing purposes (Janković and Raspopović 1960).”

Short Description

From Froese and Pauly (2017):

“Distinguished from all its congeners in Balkan Peninsula by the combination of the following characters: lacustrine; size reaches up to at least 60 cm SL; in large adults, head and body silvery, with black spots, especially in upper part, red spots (when present) mainly along lateral line; flesh pinkish. Can be diagnosed from at least *Salmo balcanicus* and *Salmo aphelios* by its osteological characters [Kottelat and Freyhof 2007].”

Biology

From Froese and Pauly (2017):

“Inhabits lakes. Juveniles feed on zooplankton. Adults prey on zooplankton and fish, mainly *Alburnus scoranza*. Attains first sexual maturity at 5-6 years. Spawns in January-February in littoral and sublittoral areas [Kottelat and Freyhof 2007]. Threatened by habitat destruction, overfishing and introduction of new species [Crivelli 1996].”

“A single spawner [Jordanova 2004].”

Human Uses

From Froese and Pauly (2017):

“Fisheries: commercial; aquaculture: commercial; gamefish: yes”

Diseases

From Stojanovski et al. (1998):

“In the period from April, 1995 to March, 1996, 131 specimens of the Ohrid trout (*Salmo letnica*, Karaman) 1924 from the Macedonian part of Lake Ohrid were examined parasitologically. A total of 99 fishes (75.57%) were found to be infected. The presence of 6 parasite species: *Diclybothrium* sp., *Eubothrium crassum*, *Eubothrium salvelini*, *Cyathocephalus truncatus*, *Proteocephalus neglectus* and *Pomphorhynchus laevis*.”

Strona et al. (2013) report *Salmo letnica* as a host for the parasites *Raphidascaris acus* and *Cystidicoloides ephemeridarum*.

From Cirkovic et al. (2010):

“In natural waters whirling disease [infection with *Myxobolus encephalicus*] is described by Hristovski and Stojanovski (2005) in [...] the Ohrid trout (*Salmo letnica*).”

Ziętara et al. (2010) report *Salmo letnica* as a host for the parasites *Gyrodactylus salaris* and *Gyrodactylus derjavinoides*.

Infection with *Gyrodactylus salaris* is OIE-reportable.

Threat to Humans

From Froese and Pauly (2017):

“Harmless”

3 Impacts of Introductions

From Fuller (2017):

“**Impact of Introduction:** Unknown.”

From Perdikaris et al. (2010):

“[...] the main problem is the risk of hybridization with the native Prespa trout *Salmo peristericus* Karaman, 1938.”

From Zenetos et al. (2009):

“[...] the introduction of *Salmo trutta* and *Salmo letnica* to Greek freshwaters (where different *Salmo* species exist) has resulted in harmful hybridizations that may prove detrimental to the native trout species in the long term (Crivelli et al., 1997; Economou et al., [2007]).”

4 Global Distribution

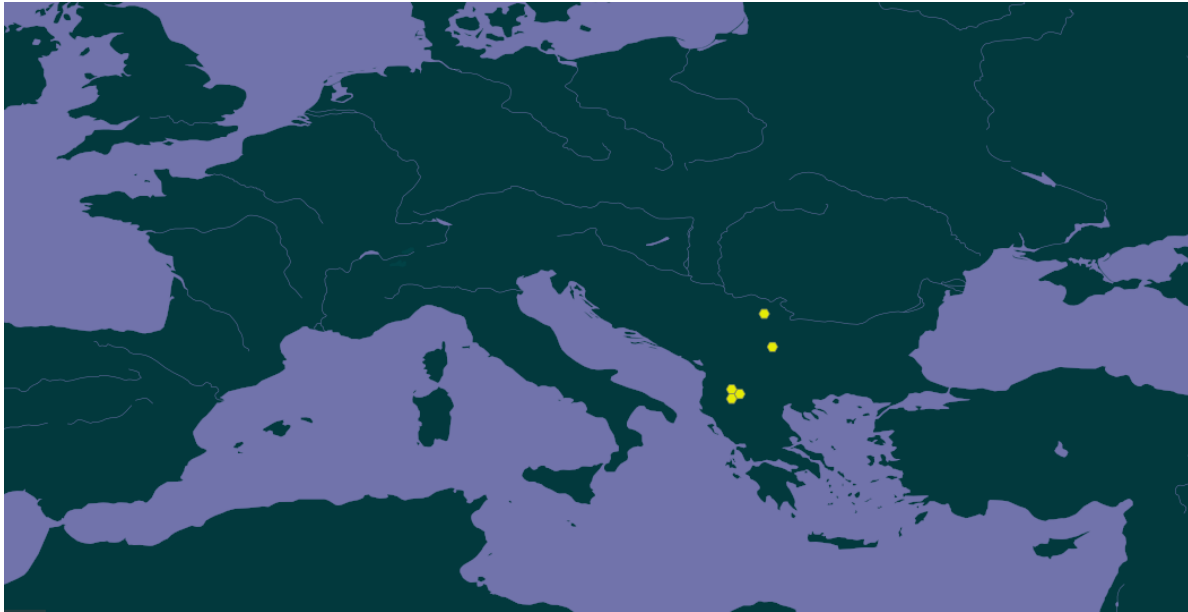


Figure 1. Known global distribution of *Salmo letnica*, reported from Serbia and Macedonia. Map from GBIF Secretariat (2017). The current status of Serbian populations of *S. letnica* are unknown, so these occurrences were not included in the climate matching analysis. Locations reported by GBIF Secretariat (2017) in North America are not shown and were not included in the climate matching analysis because they do not represent established populations (Fuller 2018).

5 Distribution Within the United States

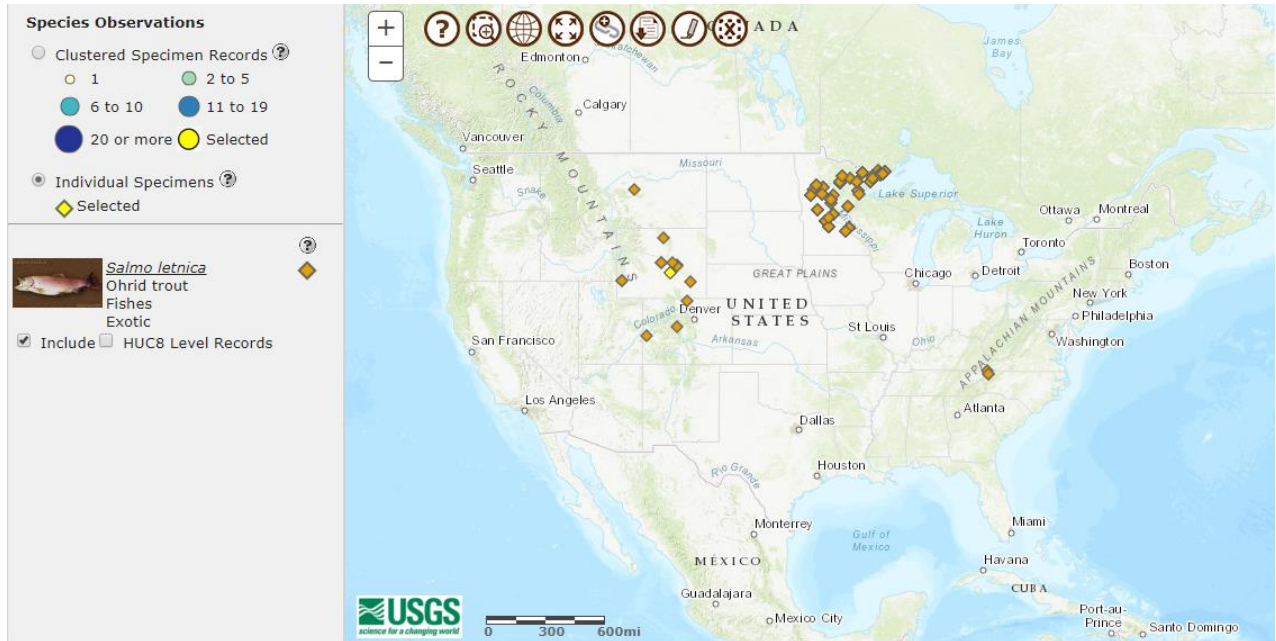


Figure 2. Known U.S. distribution of *S. letnica*. Map from Fuller (2018). According to the occurrence details provided by Fuller (2018), the only established population is at Pathfinder Reservoir in Natrona County, Wyoming, highlighted in yellow. All other locations represent failed populations and were not included in the climate matching analysis.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match (Sanders et al. 2014; 16 climate variables; Euclidean Distance) was high in parts of the Rocky Mountains, particularly around Montana and Wyoming. The climate match was medium over much of the remainder of the Interior West, as well as along the Cascade Range in the Pacific Northwest, and in the coastal Northeast. The climate match was low in the Southeast, Southwest, Mid-Atlantic, southern Midwest, and interior Northeast regions, as well as on the Olympic Peninsula of Washington. Climate 6 score indicated that the contiguous U.S. has a high climate match overall. Scores of 0.103 and greater are classified as high matches; Climate6 score for *S. letnica* was 0.171.

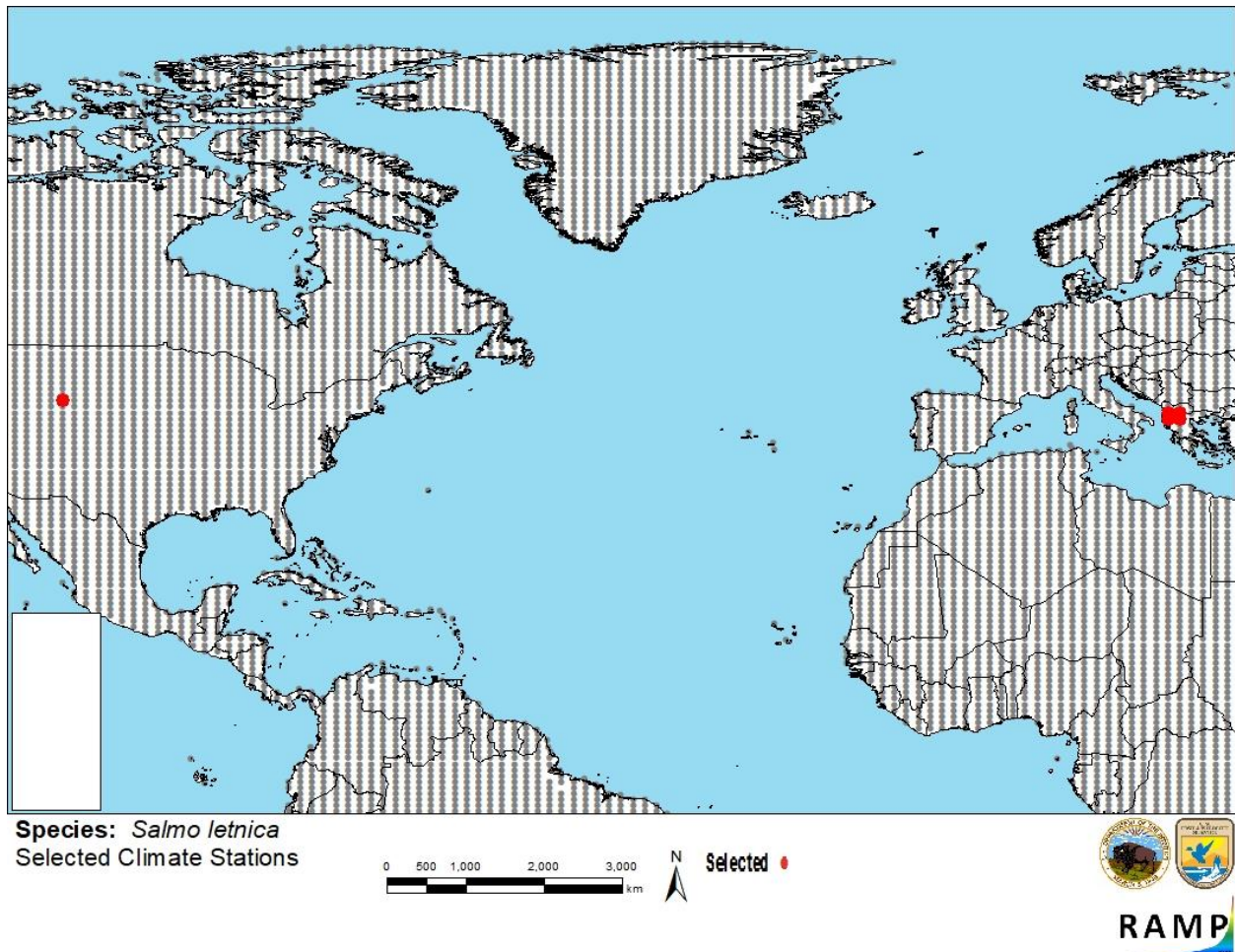


Figure 3. RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red; Albania, Macedonia, Greece, and the State of Wyoming) and non-source locations (gray) for *S. letnica* climate matching. Source locations from GBIF Secretariat (2017) and Fuller (2018). Red source locations represent climate stations within 100 km of reported observations of *S. letnica*, rather than precise occurrence locations.

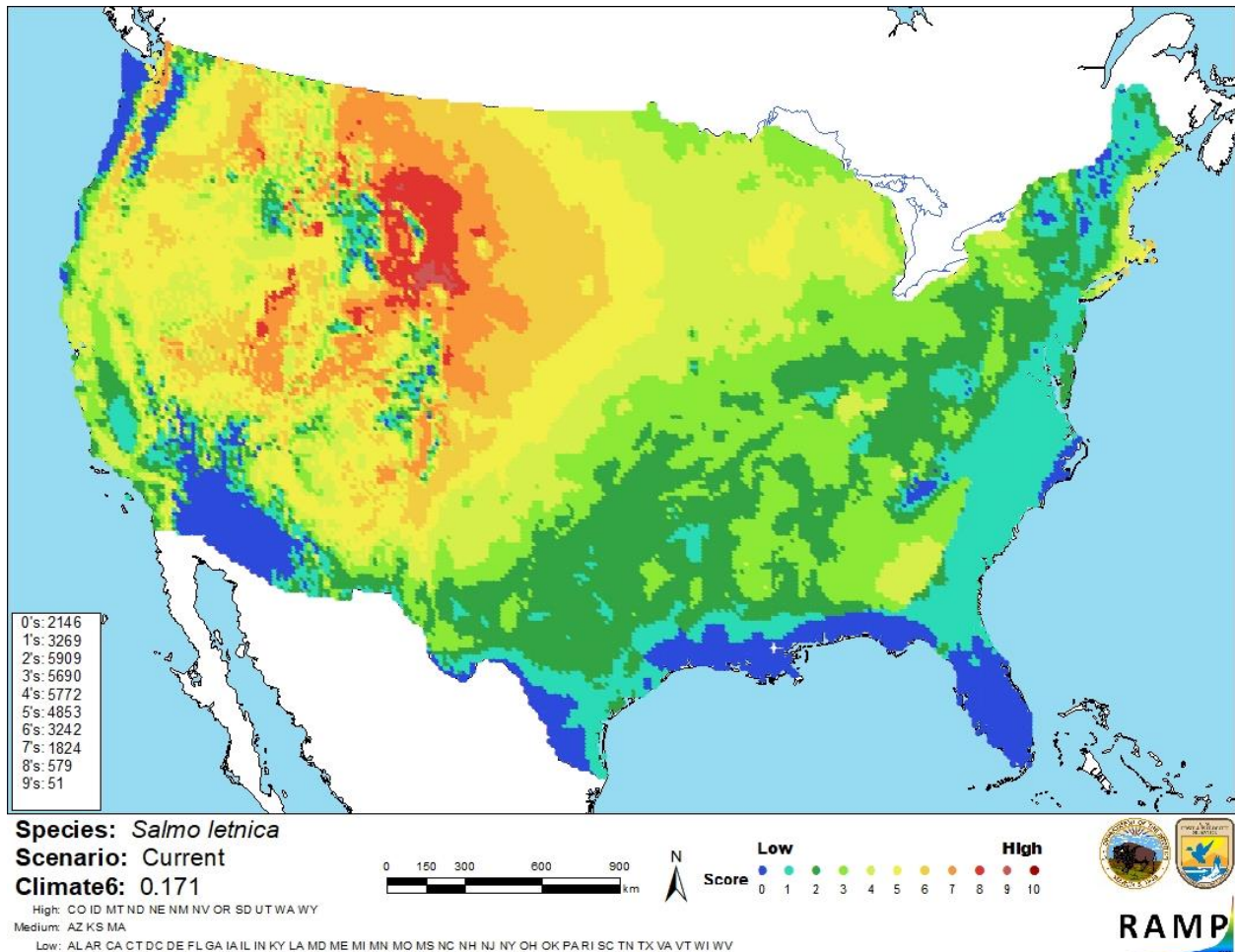


Figure 4. Map of RAMP (Sanders et al. 2014) climate matches for *S. letnica* in the contiguous United States based on source locations reported by GBIF Secretariat (2017) and Fuller (2018). 0=Lowest match, 10=Highest match. Counts of climate match scores are tabulated on the left.

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
$0.000 \leq X \leq 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

7 Certainty of Assessment

Information is available on the biology, ecology, and distribution of *Salmo letnica*, although information is not abundant on any of these topics. The impacts of introduction of *S. letnica* do not appear to be well-studied, and there is a lack of published data to support claims of harmful hybridization with native or other introduced species. Certainty of this assessment is low.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Ohrid Trout (*Salmo letnica*) is a salmonid species native to Ohrid Lake in Macedonia. This species has been stocked in U.S. waters as a game fish many times, but establishment has occurred in only one location in Wyoming. *S. letnica* is fished both commercially and as a gamefish. Multiple authors express uncertainty over the taxonomy of *S. letnica*, and also report concerns over hybridization of introduced *S. letnica* with native or other introduced salmonids. However, data are lacking in the published literature to support claims of harm from *S. letnica* hybrids. *S. letnica* can be infected by multiple parasites, including *Gyrodactylus salaris*, the etiological agent of an OIE-reportable disease. Climate match to the contiguous U.S. is high. Because of the lack of clarity on the impacts of introduction, overall risk posed by *S. letnica* is uncertain.

Assessment Elements

- **History of Invasiveness: None Documented**
- **Climate Match: High**
- **Certainty of Assessment: Low**
- **Remarks/Important additional information: Susceptible to infection with *Gyrodactylus salaris*, an OIE-reportable disease.**
- **Overall Risk Assessment Category: Uncertain**

9 References

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

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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