Appalachian brook crayfish (*Cambarus bartonii*)
Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, June 2015

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1 Native Range, and Status in the United States

Native Range

From Cordeiro et al. (2010):

"This species is found along the eastern part of North America from the New River north and the Mississippi and Atlantic basins from the New River south following the strike of the Appalachians (R. Thoma pers. comm. 2010). It is found from New Brunswick, Quebec, and Ontario in Canada, south to Georgia, South Carolina, and Alabama in the USA along the Atlantic coast (Hobbs 1989, Taylor et al. 2005)."

Status in the United States

From Cordeiro et al. (2010):

"This species has a wide distribution along the east coast of North America and is known to be abundant throughout of its range."

Means of Introductions in the United States
No known introductions outside the native range of this species.

Remarks
From Cordeiro et al. (2010):

"Two subspecies of this species are recognised, *Cambarus bartonii bartonii* Fabricius 1798 (Common Crayfish) and *C. b. cavatus* Hay 1902 (Appalachian Brook Crayfish)."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing
From ITIS (2015):

"Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Protostomia
Superphylum Ecdysozoa
Phylum Arthropoda
Subphylum Crustacea
Class Malacostraca
Subclass Eumalacostraca
Superorder Eucarida
Order Decapoda
Suborder Pleocyemata
Infraorder Astacidea
Superfamily Astacoidea
Family Cambaridae
Subfamily Cambarinae
Genus Cambarus
Subgenus Cambarus
Species Cambarus bartonii (Fabricius, 1798)"

"Taxonomic Status: valid"

Size, Weight, and Age Range
From Hamr and Berrill (1985):

"With little growing time in their first summer, they measured only 5- 10 mm in carapace length (CPL) before growth ceased for the winter. At the end of their second summer the still immature crayfish measured … 13-20 mm CPL in *C. bartoni*. Maturity was therefore not attained until the end of the third summer, when most … *C. bartoni* [matured] at 25-30 mm CPL. The majority of individuals apparently reproduced for the first time during their fourth summer; a few apparently survived into another summer, reaching carapace lengths greater than … 30 mm in *C. bartoni*."

Environment
From Loughman and Simon (2011):

“first and second order stream habitats, ephemeral wetlands, and roadside ditches”

From Hamr and Berrill (1985):

“typically associated with swift flowing water and rocky substrates”

Climate/Range
From Cordeiro et al. (2010):

“Taylor et al. (2005) noted that it is found in the high elevation lakes in the Canadian Shield, where pH values can be as low as 5.0.”

Distribution Outside the United States
Native
From Cordeiro et al. (2010):

“Canada (New Brunswick, Ontario, Québec)”

Introduced
No known introductions.

Means of Introduction Outside the United States
No known introductions.

Short description
From Galloway (2012):

“It is a small- to medium-sized crayfish, with a generally smooth body and smooth claws which curve slightly inwards. One of the characteristic features which separates it from other similar species is the possession of a smaller-than-average rostrum (the triangle-shaped part of the shell between the eyes). These crayfish are typically orange-brown in color, although blue morphs have been found of this species.”

Biology
From Jenkinson (2000):

“*Cambarus bartonii* dwell on the bottoms of streams, creeks, and small rivers and lakes. They construct burrows, sometimes called "chimneys". Their burrows can be simple hollows under stone or more intricate, with lateral passageways. Chimneys are found along the water's edge. Most of the structure is under water, but the top sticks out and resembles a chimney. Chimneys vary in size, the largest opening being about eight centimeters. (McMan, 1960)”

"*Cambarus bartonii* is a predator and a scavenger. It feeds on decaying organic remains but also catches small animals. Its main sources of food include snails, alga, insect larva, various types of worms, and tadpoles. It finds its food on the bottom of the water source it inhabits or in the soil near the water. (Banister and Campbell, 1985)"

From Cordeiro et al. (2010):

"Spring to autumn delineates the period of reproduction with the offspring hatching in July and August (Taylor et al. 2005)."

From Hamr and Berrill (1985):

"Late summer rather than early spring breeding by [*C. bartonii*] appears to be the key event influencing the rate of growth of new juveniles, the onset of sexual maturity, the timing of molting by adult males and females, and the degree of sexual selection operating. Delayed breeding may be then an adaptation to the seasonal stresses of swift water environments where major fluctuations in physical conditions are a frequent occurrence. The costs of such a delay appear to be smaller broods, less first summer growth, and slower growth to sexual maturity."

Human uses

From Hamr and Berrill (1985):

"With its relatively slow growth and small size, *C. bartoni* has little commercial value."

From Guiaşu (2002):

"Wild populations of cool-water crayfish species such as *C. b. bartonii* and *C. robustus*, which are fairly common and widespread, can be harvested for commercial purposes. The harvesting of wild stocks is the most effective way of using this resource (Momot, 1991)."

Diseases

There are no known OIE-reportable diseases in this species.

Threat to humans

From Jenkinson (2000):

"There are no known adverse effects of *Cambarus bartonii* on humans."

3 Impacts of Introductions

Unknown. This species is not established outside its native range.

4 Global Distribution

Figure 1. Global distribution of *C. bartonii*. Map from GBIF (2015).

5 Distribution within the United States

From Cordeiro et al. (2010):

"Alabama, Connecticut, Delaware, District of Columbia, Georgia, Kentucky, Maine, Maryland, Massachusetts, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, West Virginia"

Figure 2. Native distribution of *C. bartonii*. © K. A. Crandall. Licensed under CC BY-NC-SA 3.0. Available: http://creativecommons.org/licenses/by-nc-sa/3.0/.

6 Climate Matching

Summary of Climate Matching Analysis

The climate match (Sanders et al. 2014; 16 climate variables; Euclidean Distance) was high in the eastern US, excluding Florida and the Gulf Coast. The climate match was low from just west of the Great Lakes all the way to the West Coast. Climate 6 proportion indicated that the contiguous U.S. has a high climate match. The range for a high climate match is 0.103 and greater; the climate match of *C. bartonii* is 0.322.

Crayfishes have been observed to establish populations in climates different from that found within their native range (M. Hoff, U.S. Fish and Wildlife Service, personal communication). The climate match shown here may be an underestimate of climate suitability for the establishment of *C. bartonii*.

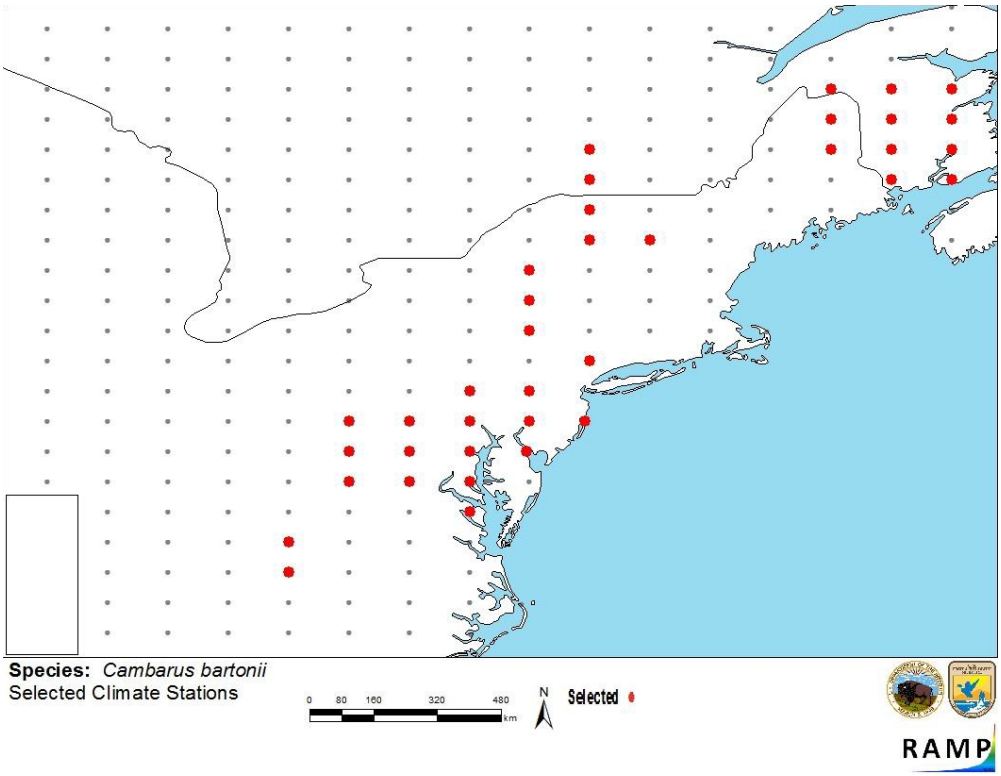

Figure 3. RAMP (Sanders et al. 2014) source map showing weather stations selected as source locations (red) and non-source locations (gray) for *C. bartonii* climate matching. Source locations from GBIF (2015). GBIF (2015) locations mapping to weather stations in Nova Scotia and Florida were removed prior to climate matching because these locations are not within the range of *C. bartonii* (Cordeiro et al. 2010).

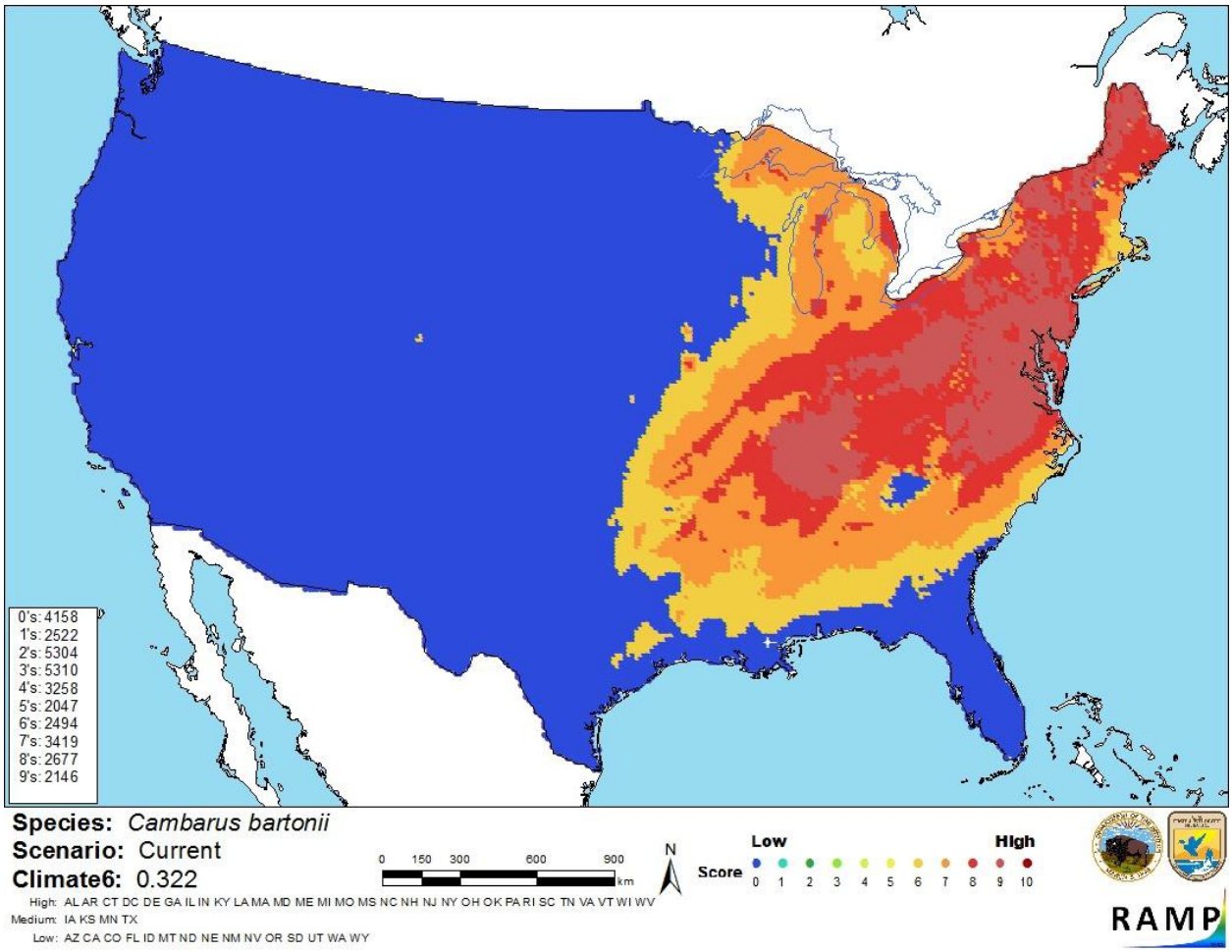

Figure 4. Map of RAMP (Sanders et al. 2014) climate matches for *C. bartonii* in the continental United States based on source locations reported by GBIF (2015). GBIF (2015) locations mapping to weather stations in Nova Scotia and Florida were removed prior to climate matching because these locations are not within the range of *C. bartonii* (Cordeiro et al. 2010). 0= Lowest match, 10=Highest match. Counts of climate match scores are tabulated on the left.

7 Certainty of Assessment

Information on the biology and ecology of *C. bartonii* exists in the scientific literature. However, this species does not appear to be established in any location outside its native range, so potential impacts of its introduction remain unknown. Certainty of this assessment is low.

8 Risk Assessment

Summary of Risk to the Continental United States

C. bartonii is a crayfish species native to eastern North America, with a broad distribution from Alabama and Georgia into eastern Canada. It is typically found in small streams with rocky substrates. To date, the species does not appear to be established in any location outside its native range, so potential impacts of its introduction remain unknown. Climate match to the continental

US is high; most areas of high climate match are within the native range of *C. bartonii*. The overall risk of this species is uncertain.

Assessment Elements

- ☐ **History of Invasiveness (Sec. 3):** Uncertain
- ☐ **Climate Match (Sec.6):** High
- ☐ **Certainty of Assessment (Sec. 7):** Low
- ☐ **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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