

SPECIES FACT SHEET

Scientific Name: *Juga hemphilli hemphilli* (Henderson 1935)

Common Name: barren juga

Phylum: Mollusca

Class: Gastropoda

Order: Neotaenioglossa

Family: Semisulcospiridae

Taxonomic Note:

Past genetic analysis by Lee *et al.* (2006) based on incorrectly identified museum voucher specimens suggested reassignment of the related subspecies *Juga hemphilli dallesensis* (and therefore the *Juga hemphilli* conspecifics, including *Juga hemphilli hemphilli*) to the genus *Elimia*. However, Foighil *et al.* (2009) conducted an additional analysis and determined that *Juga hemphilli* is indeed most closely related to other western *Juga* and should not be reassigned to the genus *Elimia*. Turgeon *et al.* (1998) do not recognize any subspecies of *Juga hemphilli*.

Conservation Status:

Global Status: G2T1 (May 2009)

National Status: United States (N1) (June 2000)

State Statuses: Oregon (S1), Wahington (S1)
(NatureServe 2015)

IUCN Red List: NE – Not evaluated

Technical Description:

This subspecies was originally described as *Goniobasis hemphilli hemphilli* (Henderson 1935). Burch (1982; 1989) revised this subspecies to the genus *Juga* to reflect the distribution of taxa west of the Continental Divide.

Adult: *Juga* is a genus of medium-sized, aquatic, gilled snails traditionally treated as part of the subfamily Semisulcospirinae within the Pleuroceridae family, although the Semisulcospirinae subfamily was recently elevated to family level based on morphological and molecular evidence (Strong and Köhler 2009). The Pleuroceridae and Semisulcospiridae families both differ from the Hydrobiidae family in that the males lack a verge (male copulatory organ). The genus *Juga* is distinct from related pleurocerid snails based on reproductive anatomy and egg mass characters (Taylor 1966), as well as features of the ovipositor pore, radula, midgut, kidney, and pallial gonoduct (Strong and Frest 2007). Members of this genus have a tall, conic shell-shape and thick, heavy

shells. The operculum is present, and they are gill breathing and dioecious (separate sexes) (Henderson 1935).

Members of the species *Juga hemphilli* are distinct from other Pacific Northwest *Juga* based on the presence of costae (rounded ridges on the shell surface) or spiral cords on early whorls only (Dillon 2006). The barren juga is a moderate to large-sized *Juga* (shell height 22-24.5 mm), with a flat-sided shell, colored a uniform light to dark brown with a weak subperipheral band (Henderson 1935; Frest and Johannes 1999). The nacre is white and the shell is typically not decollate (i.e. apex not degraded or broken); plications are present on upper whorls (Frest and Johannes 1999). Henderson (1935) noted a “beaded” appearance on the shell surface. Descriptions and illustrations can be found in Henderson (1935) and Burch (1989).

Egg mass: The *Juga* egg mass generally consists of thick finger-like, elongate, rather weakly coherent gelatinous aggregations, often several centimeters in length and 2 to 4 cm in width, with hundreds to thousands of moderately loosely packed, quite small (< 1 mm) eggs, with individual egg boundaries not very apparent, and without regular arrangement of eggs. The fresh egg mass deteriorates roughly a month after deposition, when the embryos begin to acquire shells and hatch (Frest and Johannes 2006).

Life History:

Juga snails are characterized as rasper-grazers, feeding on both algae and detritus, such as dead alder leaves (Furnish 1989; Allan 1995). Individuals in the *Juga* genus may live for 5 to 7 years, reaching sexual maturity in 3 years and continuing to grow (Furnish 1990). Adults in this genus are gonochoristic (as opposed to hermaphroditic). Reproduction is iteroparous (individuals are capable of having offspring many times), and most *Juga* species appear to breed and lay eggs once a year as adults (Frest and Johannes 2006). The same egg-laying localities are utilized year after year if undisturbed. There is no veliger stage, and juvenile snails emerge from eggs (Frest and Johannes 2006). Knowledge specific to this subspecies' life history is not extensive.

Range, Distribution, and Abundance:

Range: Frest and Johannes (1995) speculate that the barren juga was likely once widespread in the western Columbia River Gorge drainages, including those east and near the mouth of the Willamette River. As few observations exist, the historic and current ranges are unknown, although the current range appears to include tributaries of the Willamette River and Columbia River.

Frest and Johannes (1995) report the species in Johnson Creek, Multnomah County, Oregon, as well as discrete populations in the Washington and Oregon Columbia River Gorge and Clark and Skamania counties in Washington, possibly on the Gifford Pinchot National Forest. Other records have placed this

subspecies as far south as Cottage Grove (FLMNH:286954; FLMNH:286945) and Corvallis, Oregon (Dillon 1989; personal communication). A record for *Juga hemphilli* that may correspond to this subspecies has also been reported near Eugene (FLMNH:192865).

Distribution: The type locality for this species is Portland, Oregon, possibly Johnson Creek (Henderson 1935; Frest and Johannes 1995). There are at least three specimens identified only as *Juga hemphilli* collected by Hemphill in the Portland area (CAS:IZ:60908; CAS:IZ:60909; CAS:IZ:60910). A recent survey has located this subspecies in Waterhouse Creek near Cedar Mills (Van Norman, personal communication). Dillon (1989) reports *Juga hemphilli hemphilli* in Oak Creek, 11 kilometers west of Corvallis. Other records have placed this subspecies as far south as Cottage Grove, Oregon (FLMNH:286954; FLMNH:286945).

One specimen identified as *Juga* (J.) sp is located in the OSU Oregon State Arthropod Collection (CRG04-006), while another specimen (*Juga* (J.) *hemphilli*; MTH02-056) may have been misplaced or in error (there may not have been a collection made). However, based on their descriptions (plicate *Juga*; one with white nacre) and collection localities (Skamania County, Washington), these may be specimens of this subspecies. Similarly, records for *Juga hemphilli* from museum collections include a site in the McKenzie River (FLMNH:192865) and Willamette River at Albany (FLMNH:45944) in Oregon and Olequa Creek in Washington (USNM 181105).

BLM/Forest Service Land: This subspecies is suspected on the Gifford Pinchot, and Mt. Hood National Forests, as well as the Salem, Eugene and Prineville BLM Districts and the Columbia River Gorge National Scenic Area.

Abundance: No abundance estimates have been made for this subspecies, but NatureServe (2015) suggests that *Juga hemphilli* has experienced a short term decline of 10-30%.

Habitat Associations:

The genus *Juga* grazes on rock surfaces and deciduous leaf litter for periphyton, with seasonal migrations both upstream and downstream (Duncan 2008; Frest and Johannes 1995).

The barren juga is found at low elevation, small to medium-sized streams. Habitat typically includes creeks with a level bottom and stable gravel substrate. Water is typically cold, fast-flowing, unpolluted and highly-oxygenated. Aquatic macrophytes and epiphytic algae are generally rare or absent (Frest and Johannes 1995).

The egg masses of *Juga* are most often found in loose (non-cemented) but stable cobble substrate, with free and fairly vigorous flow through at least the upper substrate layers (Frest and Johannes 2006). The egg masses are affixed by a narrow basal stalk to the underside of a firm surface, generally a cobble or boulder, although other stabilized hard substrate objects, such as sunken logs, may also be used (Frest and Johannes 2006).

Threats:

Frest and Johannes (1995) note that habitat loss and pollution are major threats to the species, including the effects of urbanization, increasing recreational usage of the Columbia River Gorge, highway and railroad rights-of-way construction and maintenance, siltation from logging, and water diversions. Nonindigenous species are also linked to gastropod imperilment (Johnson *et al.* 2013), and multiple nonindigenous mollusks are present in the Columbia River Basin (USGS 2015). This subspecies was recommended by Frest and Johannes (1993; 1995) for federal listing as “endangered.”

Conservation Considerations:

Research: Many records in museums have not been identified to subspecies; close examination and identification to subspecies of those specimens would be useful. Detailed specimen observations or collection for genetic analysis should be prioritized, particularly for specimens outside the type locality.

Inventory: Significant range extensions or the identification of large numbers of additional sites are considered very unlikely by Frest and Johannes (1995). However, as many records have been reported for the species and subspecies in Oregon and Washington, these sites and surrounding areas with suitable habitat should be resurveyed and will provide valuable information about the current status, range, and population characteristics of this subspecies. Comparing records of nonindigenous aquatic species to known *Juga hemphilli hemphilli* sites will also provide valuable information for conservation and management.

Management: In areas managed for multiple purposes, avoid or minimize conversion of habitat, whether directly or indirectly through impacts to water quality (temperature, dissolved oxygen) or water quantity. Activities that result in siltation, sedimentation, or reduced flow may also impact this subspecies’ habitat, and populations may be especially affected by activities that disturb the stream banks and bed. As this subspecies is distributed in patchy populations, these activities may inordinately affect subspecies’ occurrence and distribution. Nonpoint source pollution, including urban or agricultural runoff and pesticides, may also reduce water quality. Limit these impacts where possible and monitor their effects. If insecticide or herbicide use is planned for areas where this subspecies occurs, evaluate the toxicity of these compounds to mollusks and if necessary, assess alternatives to their use. Management

actions taken on lands upslope from rivers and creeks where this subspecies is documented or suspected may affect populations through impacts to aquatic habitat.

Version 2:

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Xerces Society for Invertebrate Conservation
Date: March 2015

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Xerces Society for Invertebrate Conservation
Date: March 2015

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Date: May 2015

Version 1:

Prepared by: Theresa Stone
Umpqua National Forest
December 2009

Edited by: Rob Huff
FS/BLM Conservation Planning Coordinator
May 2010

ATTACHMENT 1: References

ATTACHMENT 2: List of pertinent or knowledgeable contacts

ATTACHMENT 3: Map of subspecies' distribution

ATTACHMENT 4: Photograph of this subspecies

ATTACHMENT 5: Aquatic Gastropod Survey Protocol, including specifics for this subspecies

ATTACHMENT 1: References

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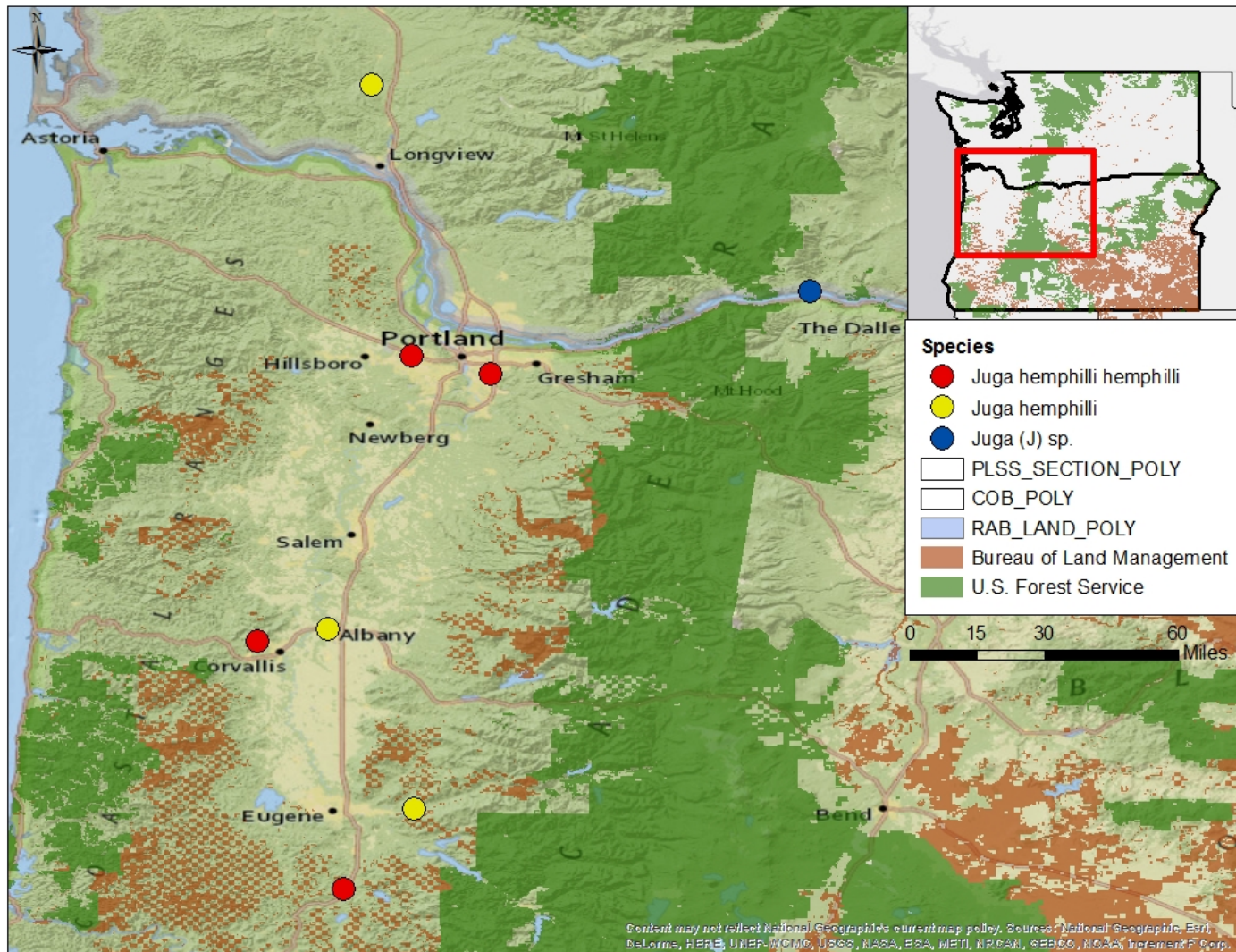
ATTACHMENT 2: List of pertinent or knowledgeable contacts

Ed Johannes, Deixis Consultants

Tom Burke, retired

Joe Furnish, USFS PSW Regional Office

ATTACHMENT 3: Map of subspecies' distribution



Confirmed records (red) and possible records (yellow and blue) for the barren juga. *Juga (J.)* refers to the subgenus *Juga*, recognized by some taxonomists (Frest and Johannes 2006).

ATTACHMENT 4: Photograph of this subspecies



Juga hemphilli hemphilli shell (length = 17.6 mm) from collection at Oak Creek (Dillon 1989). Photograph by Robert T. Dillon, used with permission.

ATTACHMENT 5: Aquatic Gastropod Survey Protocol, including specifics for this subspecies

Taxonomic group:

Aquatic Gastropoda

How:

Please refer to the following documents for detailed mollusk survey methodology:

1. General collection and monitoring methods for aquatic mollusks (pages 64-71):

Frest, T.J. and E.J. Johannes. 1995. Interior Columbia Basin mollusk species of special concern. Final report: Interior Columbia Basin Ecosystem Management Project, Walla Walla, WA. Contract #43-0E00-4-9112. 274 pp. plus appendices.

2. Standard survey methodology that can be used by field personnel to determine presence/absence of aquatic mollusk species in a given waterbody, and to document species locations and habitats in a consistent format:

Duncan, N. 2008. Survey Protocol for Aquatic Mollusk Species: Preliminary Inventory and Presence/Absence Sampling. Version 3.1. Portland, OR. Interagency Special Status/Sensitive Species Program. U.S. Department of Interior, Bureau of Land Management, Oregon/Washington and U.S. Department of Agriculture, Forest Service, Region 6. 52 pp. [Available at: <http://www.fs.fed.us/r6/sfpnw/issssp/species-index/fauna-invertebrates.shtml>].

Species-specific survey details, including:

1. Identification features
2. Historic and current distribution
3. Federal Units where species is suspected or documented
4. Areas where surveys are recommended
5. Habitat where surveys should take place
6. Commonly associated mollusk species
7. General survey method and instructions (e.g. time of year)

Juga hemphilli hemphilli

The barren juga is found at low elevation, small to medium-sized streams with cold, fast-flowing, unpolluted and highly-oxygenated water (Frest and Johannes 1995). Frest and Johannes (1995) speculate that the barren juga was likely once widespread in the western Columbia River Gorge drainages,

including those east and near the mouth of the Willamette River. As few observations exist, the historic and current ranges are unknown, although the current range appears to include tributaries of the Willamette River and Columbia River. Surveys are recommended in typical habitat of good quality, with a priority on areas where land or aquatic management actions may impact this subspecies. Many records have been reported for the species and subspecies in Oregon and Washington, and these sites should be resurveyed to evaluate current population status and distribution. In particular, estimates of abundance at sites would improve understanding of these populations.

In particular, surveys are recommended at sites where records are questionable or unresolved, such as the fish hatchery at Spring Creek (Washington), disjunct sites (near Albany, Corvallis, Cottage Grove and Eugene in Oregon and Olequa Creek in Washington). Detailed specimen observations or collection for genetic analysis should be prioritized, particularly for specimens outside the type locality.

This subspecies is suspected on the Eugene, Salem, and Prineville BLM Districts. It is suspected on the Gifford Pinchot and Mt. Hood National Forests, as well as the Columbia River Gorge National Scenic Area.

Surveys for this subspecies have been conducted in summer (July). Because this subspecies inhabits swift-flowing water, surveys for this subspecies may be technically difficult or unsafe in periods of high water or flow. Generally, surveys could be conducted from July to early October, but conditions may vary seasonally and depend on recent weather events. Caution should be taken when conditions are sub-optimal. Dip net and hand collection are suggested collection methods for this subspecies.

The barren juga is distinguished from other *Juga* by its larger size (shell height 22-24.5 mm), flat-sided shell, weak subperipheral band, and white nacre (Henderson 1935; Frest and Johannes 1999). No commonly associated mollusk species have been reported.