

SPECIES FACT SHEET

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

Common Name: Dalles 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) 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), Washington (S1)

(NatureServe 2015)

IUCN Red List: NE – Not evaluated

Technical Description:

This subspecies was originally described as *Goniobasis hemphilli dallesensis* (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 Dalles juga is large (19-25 mm) and slender, with raised plicae on first three to four whorls, often decollate. This subspecies differs from related taxa by its white nacre and uniform green color, also described as “greenish or brownish yellow” (Henderson 1935; Frest and Johannes 1995). See Henderson (1935) and Burch (1982; 1989) for illustrations of this species.

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: According to Frest and Johannes (2006), the Dalles juga is found only in Oregon and Washington in the central and eastern Columbia Gorge; the original distribution is uncertain but likely the same. Some possible records of this subspecies have been identified in the Cowlitz Basin (Washington) and the Willamette Basin (Oregon).

Distribution: The type locality for this subspecies is recorded as Mill Creek, The Dalles, Wasco County, Oregon (Henderson 1935), and the subspecies has also been reported there more recently (1997, FLMNH:267703; 2014, Van Norman, personal communication). The distribution of this subspecies is not well understood. Isolated populations have been reported in Skamania County, in the Gifford Pinchot National Forest and Columbia Gorge National Scenic Area (Frest and Johannes 1993; 1995).

Specimens have also been collected in Chenoweth Creek (FLMNH:267701), Mosier Creek (FLMNH:267705; FLMNH 267707), Horsetail Falls (Branson and Branson 1984; NCSM:9758), and Latourell Falls (Branson and Branson 1984). Note that Frest and Johannes (2006) consider reports by Branson and Branson (1984) from Curry County to be mistaken (they report 2-3 purplish bands on the body whorl; this record is also far outside other reports of this subspecies' range). They also question reports by Branson and Branson (1984) at Horsetail and Latourell Falls (no reason given). Others have also reported this subspecies at Horsetail Falls (NCSSM:9758).

Two specimens (identified as *Juga* (J) sp. and *Juga* (J.) *hemphilli*) are also located in the OSU Oregon State Arthropod Collection (CRG04-006; MTH02-056). Based on their descriptions (plicate *Juga*; one with white nacre) and collection localities (Skamania and Hood River counties), 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: The Dalles juga is suspected on the Mt. Hood National Forest and the Prineville BLM district in Oregon. It is also suspected on the Columbia River Gorge National Scenic Area.

Abundance: Henderson (1935) originally reported this species as abundant at the type location. No abundance estimates have been made for this subspecies, but according to NatureServe (2015), *Juga hemphilli* is experiencing a 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 Dalles juga is found at low elevations in small to medium creeks and large springs. Sites typically include stable gravel substrate with fast-flowing cold, clean water. *Rorippa* may occur at sites, but few other macrophytes or epiphytic algae are present (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:

In general, habitat loss and alteration, pollution, and increasing urbanization in The Dalles and Hood River areas are major threats to the Dalles juga. Frest and Johannes (1995) also specifically noted diversion and capping of springs for orchard, irrigation, and water supplies, widespread agricultural impacts on Mill Creek, and sewage discharge into Mill Creek in The Dalles. 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 dallesensis* 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 species’ habitat, and populations may be especially affected by activities that disturb the stream banks and bed. As this species is distributed in patchy populations, these activities may inordinately affect species’ 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 species 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 species is documented or suspected may affect populations through impacts to aquatic habitat.

Version 2:

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Date: March 2015

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Date: May 2015

Version 1:

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December 2009

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March 2011

ATTACHMENT 1: References

ATTACHMENT 2: List of pertinent or knowledgeable contacts

ATTACHMENT 3: Maps of subspecies' distribution

ATTACHMENT 4: Photograph of this species

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

ATTACHMENT 1: References

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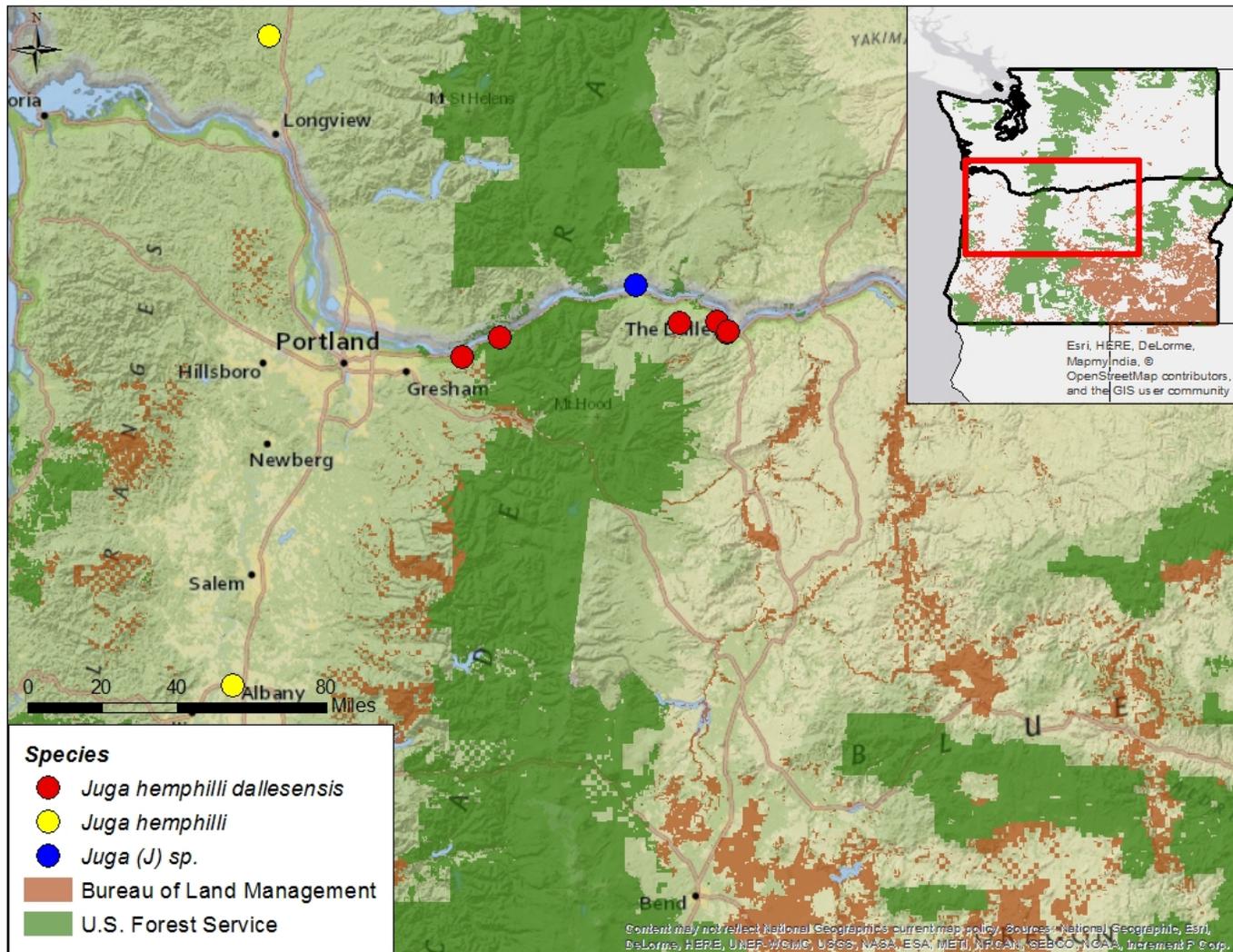
ATTACHMENT 2: List of pertinent or knowledgeable contacts

Ed Johannes, Deixis Consultants

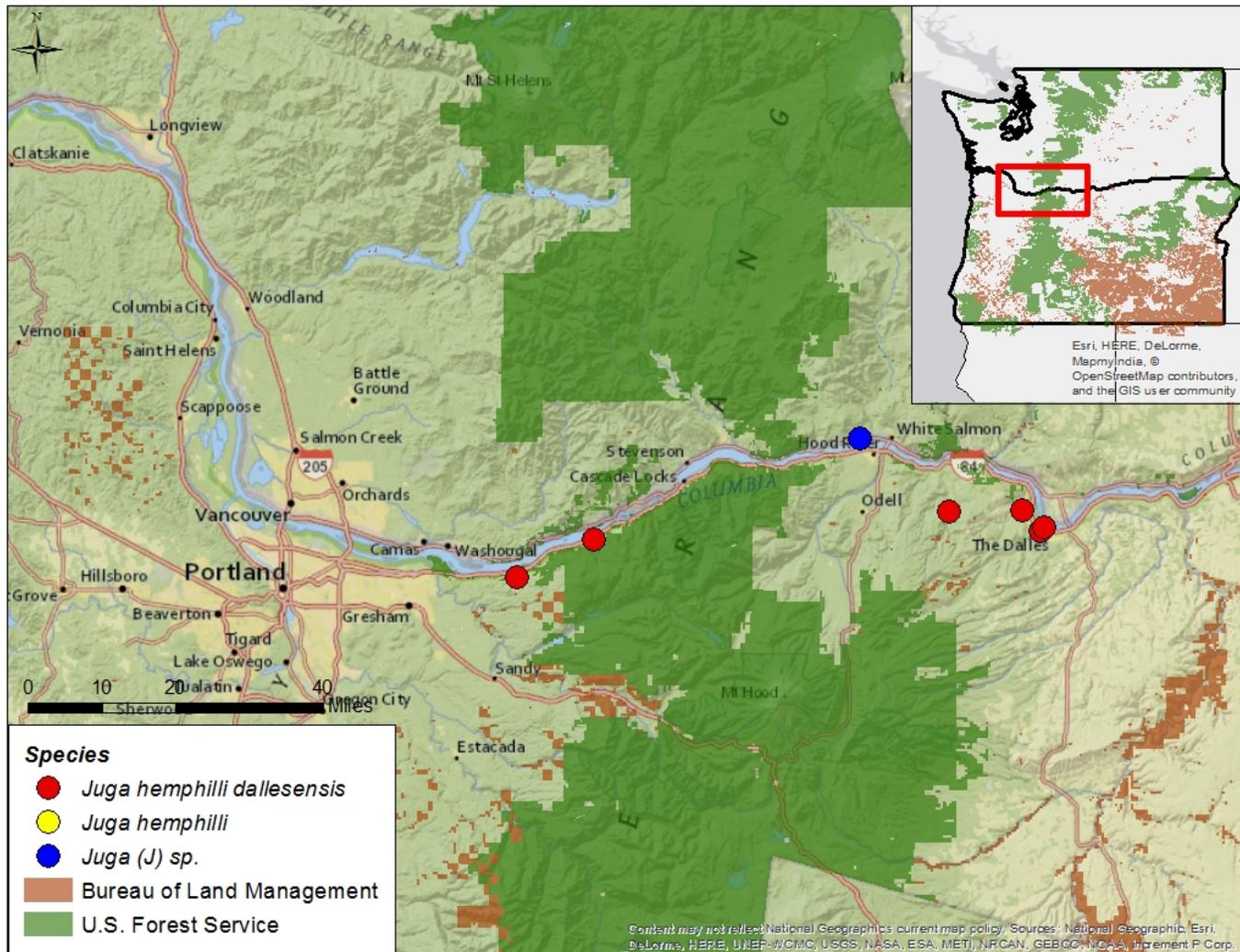
Tom Burke, retired

Joe Furnish, USFS PSW Regional Office

ATTACHMENT 3: Maps of subspecies' distribution



Map 1. Confirmed records (red) and possible records (yellow and blue) for the Dalles juga. *Juga (J)* refers to the subgenus *Juga*, recognized by some taxonomists (Frest and Johannes 2006).



Map 2. Confirmed records (red) and possible records (yellow and blue) for the Dalles juga in the Columbia River Gorge, Oregon and Washington. *Juga (J.)* refers to the subgenus *Juga*, recognized by some taxonomists (Frest and Johannes 2006).

ATTACHMENT 4: Photograph of this species



Juga hemphilli hemphilli shell (length = 17.6 mm) from collection at Oak Creek (Dillon 1989). Note that there are important differences in nacre and periostracum characteristics among subspecies, and this image is not representative of all subspecies. In particular, the periostracum is yellow and the nacre is light purple in *Juga hemphilli maupinensis*. 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 dallesensis

The Dalles juga is found at low elevations in small to medium creeks and large springs (Frest and Johannes 1995). According to Frest and Johannes (2006), the Dalles juga is found only in Oregon and Washington in the central and eastern Columbia Gorge; the original distribution is uncertain but likely the

same. Some possible records of this subspecies have been identified in the Cowlitz Basin (Washington) and the Willamette Basin (Oregon).

Surveys are recommended in typical habitat of good quality, with a priority on areas where land or aquatic management actions may impact this species. Surveys should focus on revisiting known sites to evaluate current population status, as many sites have not been surveyed since the 1980s and 1990s. 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 Horsetail Falls and Latourell Falls (Oregon), the fish hatchery at Spring Creek (Washington), and disjunct sites (near Albany 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.

Surveys for this subspecies have been conducted in summer (June, July, and August). Because this subspecies inhabits swift-flowing water, surveys for this species may be technically difficult or unsafe in periods of high water or flow. Generally, surveys could be conducted from late August 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 species.

The Dalles juga is distinguished from other *Juga* subspecies by its white nacre and uniform green color, also described as “greenish or brownish yellow” (Henderson 1935; Frest and Johannes 1999). No commonly associated mollusk species have been reported.