SPECIES FACT SHEET

Scientific Name: *Agonum belleri*
Common Name: Beller's Ground Beetle
Phylum: Arthropoda
Class: Insecta
Order: Coleoptera
Family: Carabidae
Subfamily: Harpalinae

Conservation Status:
Global Status (1996): G3 -Vulnerable
Nation: United States
National Status (United States): NNR
State Statuses: S3 (Washington), S1 (Oregon)
(NatureServe 2008)

Technical Description:
A member of the Carabidae (ground beetle) family, this species is distinguished as follows: 6.0 – 7.5 mm (0.24 – 0.29 in.) in length; narrow body; metallic color, typically coppery-bronze, but may reflect green or blue; antennae densely pubescent; elytra striate, punctured and pubescent (Johnson 1979). The even covering of bristles on the dorsal surface is one of the most distinguishing characteristics to use when identifying this species in the field, and is most apparent when the insect is back lit, or held under a hand lens in oblique light (J. LaBonte *in* Martin 2003). Although there is another *Agonum* species possibly found in the region (*A. melanarium*), it is unlikely to be found sympatrically with *A. belleri*, as it prefers dryer habitats (Johnson 1979).

The technical description of this species is as follows: Above shining aeneous or virido-aeneous. Head impunctate; antennae black, pubescent from apical half of third segment; head through eyes wider than apex of pronotum. Pronotum nearly three-fifths as long as wide; side arcuate, feebly oblique behind; margin reflexed, narrowly so in front, more widely so behind; the foveae of hind angles large, their outer edge formed by the reflexed margin; pronotum smooth, impunctate, except for the side margin and the basal foveae which are densely rugose; mid-dorsal impressed line attaining neither base nor apex, crossed by an evident impressed line toward apex. Elytra very finely microreticulate with evident humeri, very feebly wider behind middle; the striae impressed, finely punctate; the first (sutural), third, fifth, and seventh interstriae more or less densely set with coarse seta-bearing punctures, the second interstriae with from four or five to a dozen punctures, the fourth interstria rarely with one or two punctures. Venter and legs viridescent,

shining, finely alutaceous, impunctate; second to fifth visible abdominal sternites with single seta-bearing punctures on either side of the middle towards the hind margin. Protarsal segments feebly dilated and squamose beneath (male) or unmodified and simply setose beneath (female) (Hatch 1933).

Expert determination is suggested to confirm field identifications.

Life History:
Adults breed in the spring, and lay eggs which hatch into larvae that complete development by late summer. Larvae have not been collected or studied. Adults are collected in spring and summer months, April through September. Adults probably live less than a year. Adults will eat seeds, scavenge plant and vegetable material, and prey on small invertebrates. Larvae probably do not eat seeds and may be more specialized on invertebrates (Bergdahl 1997). Invertebrates taken from *Drosera* may be an important food resource (Bergdahl 1997). The species is constantly brachypterous and flightless (Lindroth 1969), and is quite active on *Sphagnum* bogs. It overwinters in upland habitat around wetlands (Bergdahl 1997).

Range, Distribution, and Abundance:
Range-wide: This Pacific Northwest species was historically known from approximately seven *Sphagnum* bogs in northern Oregon, western Washington, and southwestern British Columbia. An extensive 1997-1999 survey for this species in *Sphagnum* bogs between northwest Oregon and southwest British Columbia increased the number of known populations to ~25, including the first records in many Puget Sound counties, the mainland of British Columbia, and Vancouver Island (unpublished data, Bergdahl 2008, *pers. comm.*). Patches of suitable habitat are small and scattered throughout range, and abundance estimates are not available for existing sites.

Washington: Known records are from Skagit, Snohomish, King, Kitsap, and Mason Counties (Bergdahl 1997). Although the species was believed to be extirpated from the Washington type locality (Chase Lake) due to suburban residential development (Applegarth 1995), recent surveys (1996-1997) by James Bergdahl have revealed low numbers of this species at Chase Lake (Bergdahl 2009, *pers. comm.*).

Oregon: In Oregon the species has been found at two sites: Bear Springs in Wasco Co. where the population may now be extinct, and Little Crater Lake in Clackamas Co. where the population faces serious threats from humans and livestock (Applegarth 1995, LaBonte 1995). The species may be more widely distributed in Oregon than is documented (Applegarth

1995), and surveys of potentially suitable habitat for new populations may be promising.

Federal Land: This species is documented on Mt. Hood National Forest (Bear Springs in Wasco County (one specimen collected in 1942), and Little Crater Lake Meadows near Timothy Lake, Clackamas Co. (1982)) (LaBonte 2006, *pers. comm.*). It is probably present on Mt. Baker/Snoqualmie National Forest, and possibly present on Olympic and Gifford Pinchot National Forests.

Habitat Associations:
Acidic *Sphagnum* bogs in forested regions are the primary habitat for this species. It tends to be found in floating mats of *Sphagnum* immediately adjacent to the open water of bogs and lakes (Johnson 1979). Marginal habitat includes small patches of *Sphagnum* at springs and in the backwaters of streams, as well as bogs that are in late stages of succession (becoming meadows) (Gray and Hatch 1941, Hatch 1953, Leech 1935, Lindroth 1969, LaBonte 2006, *pers. comm.*, Kavanaugh 1992). In addition to *Sphagnum* species, such as *S. magellanicum* and *S. sqaurrosum*, this beetle is often found in association with certain plants, including *Eriophorum polystachion, Drosera rotundifolia, Eriophorum polystachion,* and *Vaccinium oxycoccos* (Johnson 1979, LaBonte 1995). The species is known from sea level to high elevation mountain areas (~1005m, 3300 ft.) (Applegarth 1995, LaBonte *et al.* 2001). At sites with a moisture range, individuals are only found in the wettest areas (Bergdahl 1997, Maynard 2004).

One example of *A. belleri* habitat is the Kings Lake Bog in Washington, which is surrounded by a forest of *Acer macrophyllum*, *Alnus* spp., *Abies* spp., *Tsuga heterophylla, Thuja plicata* and *Pseudotsuga mensiesii*. The ecotone consists of dense thickets of *Ledum glandulosum* and *Kalmia occidentalis* with sparse, short (less than 5 m tall) *Thuja* and *Tsuga*, and an understory of *Sphagnum*, reindeer lichen and associated plants including *Sphagnum magellanicum, S. sqaurrosum, Eriophorum polystachion, Drosera rotundifolia, Vaccinium oxycoccos* and a few large rushes. The *Sphagnum* within a few meters of the water at this site is devoid of all but evenly distributed *Eriophorum* and abundant *Drosera* (LaBonte, 2006 *pers. comm.*).

Threats:
Threats to this species include habitat destruction and degradation from urban development, logging, water-level alteration, peat-mining, pesticide application, and livestock grazing and trampling (Applegarth 1995, LaBonte 1995). There are signs that the Kings Lake *Sphagnum* mats may be in decline, possibly due to long-term industrial forest practices nearby

(Bergdahl 1997). Logging and development can negatively impact hydrology and water quality and may be the most serious threats to individual populations of this species, as a substantial number of bogs have been destroyed by these two activities. Global climate change may also threaten populations by altering bog water levels and seasonal duration periods.

Conservation Considerations:
Inventory: Conduct surveys in suitable habitat near known locations.

Management: Manage known sites to protect water quality and quantity as well as the surrounding plant community. Surveys of potentially suitable habitat for other populations, fencing of the sphagnum areas, manually eliminating or reducing encroaching meadow vegetation to retain open sphagnum, and conducting non-destructive demographic surveys of the Little Crater Lake population have all been recommended (LaBonte 1995).

Version 2:
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Date: August 2009

Version 1:
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FS/BLM-Portland
June 2007

ATTACHMENTS:

1. **References**
2. **List of pertinent or knowledgeable contacts**
3. **Survey Protocol**

ATTACHMENT 1: References:

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Bergdahl, J. 2008. Personal communication with Sarah Foltz, Xerces Society for Invertebrate Conservation.

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Gray, B. and M.H. Hatch. 1941. The Coleoptera of Washington. (Carabidae: Agonini). University of Washington Publications in Biology. 10 (1,2,3,): 1-144.

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Johnson, P.J. 1979. Report on a survey for Beller's ground beetle on the North Fork Snoqualmie River, King Co. WA. Report to the US Army Corps of Engineers. 19 pp.

Kavanaugh, D.H. 1992. Carabid beetles (Insecta: Coleoptera: Carabidae) of the Queen Charlotte Islands, British Columbia. Memoirs of the California Academy of Sciences. No. 16. 113 pp.

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LaBonte, James. 2006. Personal communication with John Fleckenstein.

Leech, H.B. 1935. British Columbian records of Carabidae and Hydrophilidae. Pan-Pacific Entomologist. 11(3): 120-124.

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Maynard, C. 2004. Unpublished report on carabid beetles at Sheehan Lake. 11 pp.

NatureServe. 2008. "*Agonum belleri*." *NatureServe Explorer: An online encyclopedia of life [web application]*. Feb. 2008. Version 7.0. NatureServe, Arlington, Virginia. 15 Dec. 2008 <http://www.natureserve.org/explorer/>.

ATTACHMENT 2: List of pertinent, knowledgeable contacts:

- James Bergdahl, Conservation Biology Center
- Paul Johnson, Professor of Entomology, Insect Research Collection, South Dakota State University.
- James LaBonte, Plant Division, Oregon Department of Agriculture

ATTACHMENT 3: Survey Protocol

Agonum belleri

Where:

Distribution: This Pacific Northwest species was historically known from approximately seven *Sphagnum* bogs in northern Oregon, western Washington, and southwestern British Columbia. An extensive 1997-1999 survey for this species in *Sphagnum* bogs between northwest Oregon and southwest British Columbia increased the number of known populations to ~25, including the first records in many Puget Sound counties, the mainland of British Columbia, and Vancouver Island (unpublished data, Bergdahl 2008, *pers. comm.*). The species was believed to be extirpated from the Washington type locality (Chase Lake) due to suburban residential development (Applegarth 1995), although recent surveys (1996-1997) by James Bergdahl have revealed low numbers of this species (Bergdahl 2009, *pers. comm.*). In Oregon the species has been found at two sites: Bear Springs in Wasco Co. where the population may now be extinct, and Little Crater Lake in Clackamas Co. where the population faces serious threats from humans and

livestock (Applegarth 1995, LaBonte 1995). The species may be more widely distributed in Oregon than is documented (Applegarth 1995), and surveys of potentially suitable habitat for new populations may be promising. Non-destructive demographic surveys of existing populations, such as the population at Little Crater Lake, have also been recommended (LaBonte 1995).

Habitat: Acidic *Sphagnum* bogs in forested regions are the primary habitat for this species. It tends to be found in floating mats of *Sphagnum* immediately adjacent to the open water of bogs and lakes (Johnson 1979). Marginal habitat includes small patches of *Sphagnum* at springs and in the backwaters of streams, as well as bogs that are in late stages of succession (becoming meadows). In addition to *Sphagnum* species, such as *S. magellanicum* and *S. sqaurrosum*, this beetle is often found in association with certain plants, including: *Eriophorum polystachion, Drosera rotundifolia, Eriophorum polystachion, Vaccinium oxycoccos* (Johnson 1979, LaBonte 1995). The species is known from sea level to high elevation mountain areas (~1005m, 3300 ft.) (Applegarth 1995, LaBonte *et al.* 2001). At sites with a moisture range, they are only found in the wettest areas (Bergdahl 1997).

When:
This species is collected in spring and summer, April through September. Adults mate and oviposit in the spring, and larval development is completed by late summer. Adults probably live less than a year. Active searching should be done during high light levels, since this species is often found in patches of strong, direct sunlight (Johnson 1979, *reviewed in* Martin 2003). Pitfall trapping requires both morning and evening visits to the site.

How:
The following techniques are used to capture adults (Applegarth 1995, *reviewed in* Martin 2003):

- Pitfall trapping: A wax-coated Dixie cup (or similar container) is positioned in the *Sphagnum* moss, flush with or just below the surface. Beetles that fall into the cup are trapped by their inability to climb back up the steep sides. Ethylene glycol can be added to the bottom of the cup to kill and preserve the insects that fall in (Johnson 1979). If no killing agent is used, screening should be placed over the cup to prevent insect predators (e.g. voles) from consuming the trap catch. It is best to place the cup out early in the morning and collect its contents before dusk.
- Treading and searching: In this method, *Sphagnum* mats are pressed down below the water level by careful treading with the feet. This activity floods the beetles' habitat and causes the beetles to

float to the water's surface or climb to the top of the *Sphagnum* to avoid drowning. The beetles are usually apparent within a few minutes of treading, and can then be hand collected or scooped up with a dip net. This method usually produces about one beetle per hour of searching (Applegarth 1995). Since the metallic green and copper beetles match the appearance of the bog moss quite closely, they can be difficult to see.

Larvae may be obtained by collecting moss samples and washing and filtering them through fine screening in the field or laboratory (Johnson 1979).

Adult specimens should be pinned through the anterior portion of the right elytron or preserved in 70% ethyl alcohol. Larvae should be preserved in 70% ethyl alcohol. Collection labels should include the following information: date, time of day, collector, detailed locality (including geographical coordinates, mileage from named location, elevation, etc.), and detailed habitat data (e.g. temperature, vegetation composition, water quality characteristics, etc.). Complete determination labels include the species name, sex (if known), determiner name, and date determined.

This species is distinguished as follows: 6.0 – 7.5 mm (0.24 – 0.29 in.) in length; narrow body; metallic color, typically coppery-bronze, but may reflect green or blue; antennae densely pubescent; elytra striate, punctured and pubescent (Johnson 1979). The even covering of bristles on the dorsal surface is one of the most distinguishing characteristics to use when identifying this species in the field, and is most apparent when the insect is back lit, or held under a hand lens in oblique light (J. LaBonte *in* Martin 2003). Although there is another *Agonum* species possibly found in the region (*A. melanarium*), it is unlikely to be found sympatrically with *A. belleri*, as it prefers dryer habitats (Johnson 1979). Expert determination is suggested to confirm field identifications.

Notes:

The range and habitat of this species overlap with that of the Washington-strategic click beetle, *Eanus hatchi,* particularly in King Co., Washington, at Snoqualmie Bog, Lake Marie, and Kings Lake Bog. Compared with *A. belleri,* however, *E. hatchi* is relatively difficult to find (Bergdahl 2008, *pers. comm.*), and has a shorter survey period (April to May).