

SPECIES FACT SHEET

Common Name: Gray Blue (butterfly)

Scientific Name: *Plebejus (Agriades) podarce*

Phylum: Mandibulata

Class: Insecta

Order: Lepidoptera

Family: Lycaenidae

Note: Opler and Warren (2002) treat *Agriades* as a subgenus within the “supergen” *Plebejus*. All populations in Oregon are referable to *P. podarce klamathensis* (Warren 2005).

Technical Description:

A member of the Lycaenidae family, this small species has a wingspan of 2.2 to 2.6 cm (Opler *et al.* 2006). The males are a shiny, light grey-blue color above, with a black border on the apical margins breaking into a row of black dots on the hind wing (Dornfeld 1980). Females are russet-brown above with blue and sometimes orange highlights and often ghostly white spots across the wings (Pyle 2002, Opler and Wright 1999, Dornfeld 1980). Both sexes have prominent dorsal forewing and dorsal hindwing cell bars and often submarginal black rings on the dorsal hindwing. Beneath, the ventral hindwing spots are fused and occluded by heavy white blotches against a dark tan background. Prominent black pupils occur in all of the white spots except one (in the hindwing cell) (Pyle 2002). See Attachment 4, below, for photographs of this species and its host plant in California. Additional photographs of pinned specimens from Crater Lake, Oregon are available at: <http://www.nearctica.com/butter/plate11/Apodar.htm> (Last accessed 11 September 2009). The *klamathensis* subspecies is the only representative of this species in Oregon, and is readily identified using the wing characteristics noted above (Pyle 2002).

The larvae in this species are dark green with pink stripes, banded bluish and yellow. The pupae are rusty brown. (Pyle 2002).

Life History:

Adults of this species fly in a single annual brood, from late June to early August, depending on local conditions (Warren 2005). Pyle (2002) notes that this species rarely flies in June or September. In Oregon, it has been documented from June 21st to August 10th, with the vast majority of records in July. Males visit mud and both sexes visit flowers, often nectaring on flowers of small plants including yellow composites and bistort (Opler *et al.* 2006). The eggs of this species are laid singly on leaves, bracts, or sepals of the host plant

(Opler *et al.* 2006). Hibernation takes place in the caterpillar or chrysalis stage (Opler *et al.* 2006). Larval foodplants in Oregon have not been reported, but shooting stars (*Dodecatheon jeffreyi* and *D. alpinum*) are the larval foodplants in the Trinitities and Sierra Nevada of California (Pyle 2002, Warren 2005).

Range, Distribution, and Abundance:

Rangewide: A Sierra Nevada/Klamath endemic, this species occurs from southern Oregon to northwest California and west-central Nevada (Pyle 2002).

Oregon: Found in the southern Cascades and eastern Siskiyou in Douglas, Jackson, and Klamath counties, including Mt. Ashland, Diamond Lake, Crater Lake, and Old Man Camp west of Mt. Bailey. Adults can be abundant where they occur but populations are locally distributed (Warren 2005). This species was very common and reliable just east of the Grouse Gap Shelter on the south side of Mt. Ashland in the 1990's and early 2000's (Runquist 2009, *pers. comm.*), but additional localities in the Siskiyou and northern Klamaths are not known (Runquist 2009, *pers. comm.*, Pyle 2009, *pers. comm.*). Although they have been collected on Ball Mountain (far northern California Cascades), intensive surveys (1999-2004) of butterfly diversity in adjacent Cascade-Siskiyou National Monument (Jackson Co, Oregon) did not reveal this species, probably due to the lack of host plant and suitable subalpine wet meadows (Runquist 2009, *pers. comm.*).

BLM/Forest Service Lands: This species is documented from the Rogue River, Fremont-Winema, and Umpqua National Forests, and is suspected to occur on BLM land in the Medford and Lakeview Districts. It is also documented in Crater Lake National Park.

Habitat Associations:

This species occurs at high elevation wet montane meadows from 1554 m to over 1981 m (5100 ft. to over 6500 ft.). Appropriate habitat is described as "marshy slopes and meadows that are lushly overgrown with deep grasses and dense stands of false hellebore (*Veratrum viride*)" (Dornfeld 1980). The larval foodplant in Oregon has not been reported, but shooting stars (*Dodecatheon jeffreyi* and *D. alpinum*) are the larval foodplant in the Trinitities and Sierra Nevada of California (Pyle 2002, Warren 2005). Adults are very local and do not appear to wander much beyond their meadow habitat (Opler and Wright 1999).

Threats:

Limited high elevation habitat may be subject to succession, impacts from grazing and recreation (Opler *et al.* 2006), or desiccation due to water diversions. Both Mt. Ashland and Crater Lake are heavily used recreation areas.

Conservation Considerations:

Manage grazing and recreation to minimize impacts to occupied habitat and to maintain diversity and abundance of native vegetation, particularly the larval foodplants (*Dodecatheon* species). Consider treatments to reduce encroachment. Study the impact of hikers and cattle grazing on habitat and populations (Opler *et al.* 2006).

Version 2:

Prepared by: Sarah Foltz Jordan, Xerces Society for Invertebrate Conservation
Date: September 2009

Edited by: Sarina Jepsen, Xerces Society for Invertebrate Conservation
Date: September 2009

Version 1:

Prepared by: Eric Scheuering
Date: January 2006

Edited by: Rob Huff
Date: June 2006

ATTACHMENTS:

- (1) **References**
- (2) **List of pertinent or knowledgeable contacts**
- (3) **Maps of Oregon Distribution**
- (4) **Photographs of the Adult Male, Female, and Host plant.**
- (5) **Lepidoptera Survey Protocol, including specifics for this species**

ATTACHMENT 1: References

Dornfeld, E.J. 1980. The Butterflies of Oregon. Timber Press, Forest Grove, Oregon. 276 pp.

Opler, P. A., and A. D. Warren. 2002. Butterflies of North America. 2. Scientific Names List for Butterfly Species of North America, north of Mexico. C.P Gillette Museum of Arthropod Diversity, Department of Bioagricultural Sciences and Pest Management, Colorado State University, Fort Collins, Colorado. 79 pp.

Opler, P. A., H. Pavulaan, R. E. Stanford, M. Pogue, coordinators. 2006. Butterflies and Moths of North America. Bozeman, MT: Big Sky Institute. 11 Sep. 2009. <<http://www.butterfliesandmoths.org/>>.

Pyle, R.M. 2002. The Butterflies of Cascadia. A Field Guide to all the Species of Washington, Oregon, and Surrounding Territories. Seattle Audubon Society. 420 pp.

Pyle, Robert. 2009. Personal communication with Sarah Foltz, Xerces Society for Invertebrate Conservation.

Runquist, Erik. 2009. Personal communication with Sarah Foltz, Xerces Society for Invertebrate Conservation.

Warren, A.D. 2005. Butterflies of Oregon: Their Taxonomy, Distribution, and Biology. Lepidoptera of North America 6. Contributions of the C.P. Gillette Museum of Arthropod Diversity. Colorado State University, Fort Collins, CO. 408 pp.

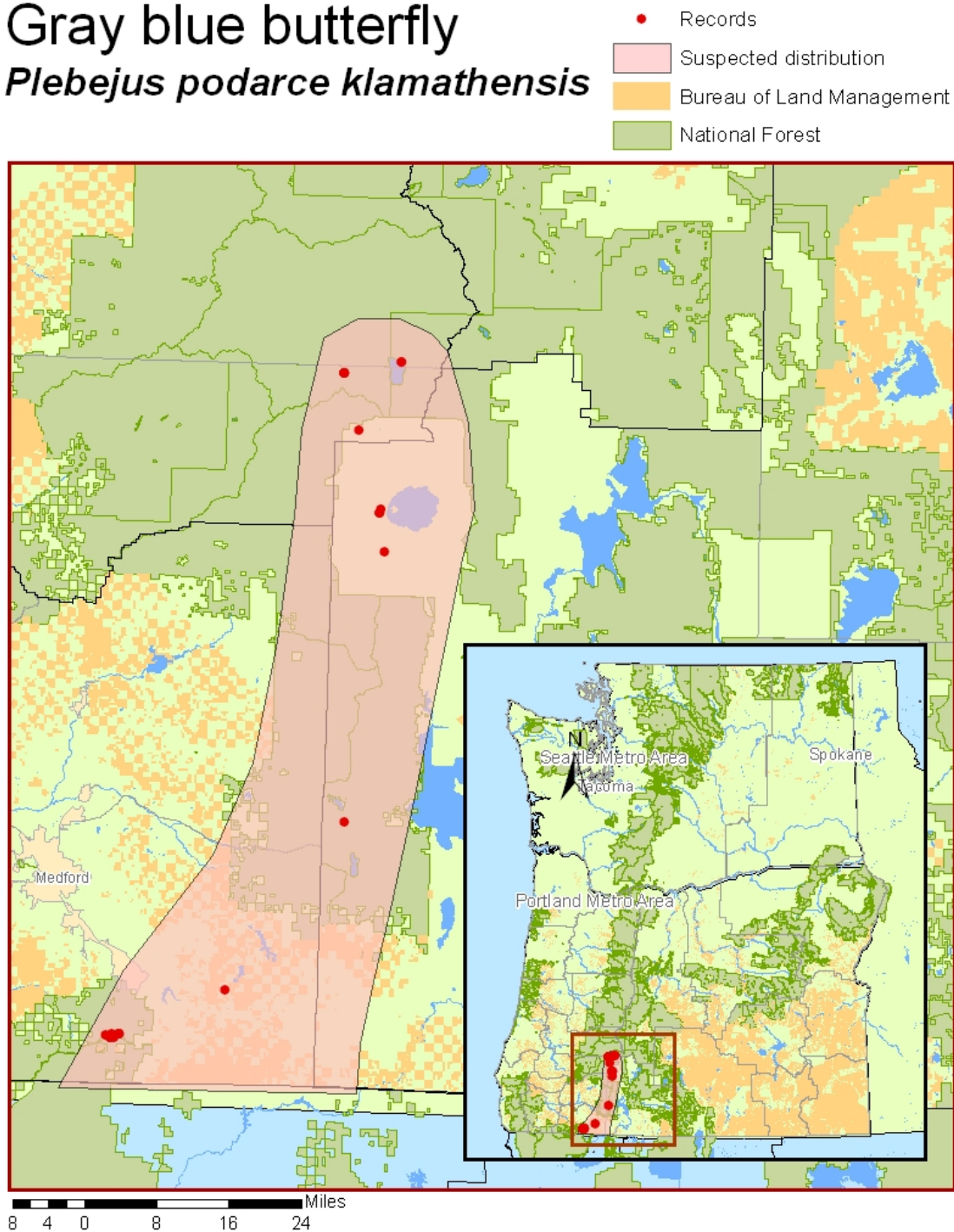
ATTACHMENT 2: List of pertinent or knowledgeable contacts

Robert Pyle
Eric Runquist

ATTACHMENT 3: Map of Oregon Distribution

Gray blue butterfly

Plebejus podarce klamathensis



Records of *Plebejus podarce klamathensis* in Oregon, relative to Forest Service and BLM lands. BLM District boundaries are shown in black, and Resource Area boundaries are shown in grey. The suspected distribution polygon is based on a distribution map of this species in Pyle (2002) and personal communication with Robert Pyle and Erik Runquist (2009).

ATTACHMENT 4: Photographs of the Adult Male, Female, and Host Plant.

Additional photographs from this series (taken in California) are available at:

http://www.kimandmikeontheroad.com/arctic_blue_-_bishop_ca.htm (Last accessed 11 September 2009).

Photographs of pinned specimens from Crater Lake, Oregon are available at: <http://www.nearctica.com/butter/plate11/Apodar.htm> (Last accessed 11 September 2009).



Plebejus podarce male, Inyo County, California. Photograph by Kim Davis and Mike Stangeland, www.kimandmikeontheroad.com).



Plebejus podarce male, Inyo County, California. Photograph by Kim Davis and Mike Stangeland, www.kimandmikeontheroad.com).



Plebejus podarce male, Inyo County, California. Photograph by Kim Davis and Mike Stangeland, www.kimandmikeontheroad.com).



Plebejus podarce female, Inyo County, California. Photograph by Kim Davis and Mike Stangeland, www.kimandmikeontheroad.com).



Plebejus podarce female, Inyo County, California. Photograph by Kim Davis and Mike Stangeland, www.kimandmikeontheroad.com).



Plebejus podarce female on shooting star (*Dodecatheon*), the host plant for this species. Photograph by Kim Davis and Mike Stangeland, www.kimandmikeontheroad.com).



Shooting star (*Dodecatheon*), the host plant for *Plebejus podarce*. Photograph by Kim Davis and Mike Stangeland, www.kimandmikeontheroad.com.

ATTACHMENT 5: Lepidoptera Survey Protocol, including specifics for this species

Taxonomic group:

Lepidoptera

Where:

Lepidopterans utilize a diversity of terrestrial habitats. When surveying new areas, seek out places with adequate larval food plants, nectar sources, and habitat to sustain a population. Many species have highly specific larval feeding preferences (e.g. limited to one or a few related plant species whose defenses they have evolved to overcome), while other species exhibit more general feeding patterns, including representatives from multiple plant families in their diet. For species-specific dietary preferences and habitat information, see the section at the end of this protocol.

When:

Adults are surveyed in the spring, summer, and fall, within the window of the species' documented flight period. Although some butterfly species overwinter as adults and live in the adult stage for several months to a year, the adult life spans of the species considered here are short and adults are available for only

a brief period each year (see species-specific details, below). Larvae are surveyed during the time of year when the larvae are actively foraging on their host plants. Since the foraging period is often quite short (e.g. a couple of weeks) and varies greatly depending on the weather, the timing of these surveys can be challenging (LaBar 2009).

Adults:

Butterflies are predominantly encountered nectaring at flowers, in flight, basking on a warm rock or the ground, or puddling (sipping water rich in mineral salts from a puddle, moist ground, or dung). Adults are collected using a long-handled aerial sweep net with mesh light enough to see the specimen through the net. When stalking perched individuals, approach slowly from behind. When chasing, swing from behind and be prepared to pursue the insect. A good method is to stand to the side of a butterfly's flight path and swing out as it passes. After capture, quickly flip the top of the net bag over to close the mouth and prevent the butterfly from escaping. Once netted, most insects tend to fly upward, so hold the mouth of the net downward and reach in from below when retrieving the butterfly. Since most butterflies can be identified by macroscopic characters, high quality photographs will likely provide sufficient evidence of species occurrences at a site, and those of lesser quality may at least be valuable in directing further study to an area. Use a camera with good zoom or macrolens and focus on the aspects of the body that are the most critical to species determination (i.e. dorsal and ventral patterns of the wings) (Pyle 2002). If collection of voucher specimens is necessary, the captured butterfly should be placed into a cyanide killing jar or glassine envelope as soon as possible to avoid damage to the wings by fluttering. To remove the specimen from the net by hand, grasp it carefully through the net by the thorax, pinching it slightly to stun it, and then transfer it to the killing jar (Triplehorn and Johnson 2005). Small species, such as blues and hairstreaks, should not be pinched. Alternatively, the kill jar may be inserted into the net in order to get the specimen into the jar without direct handling, or spade-tip forceps may be used. Since damage to specimens often occurs in the kill jar, large, heavy-bodied specimens should be kept in separate jars from small, delicate ones, or killed by pinching and placed directly into glassine envelopes. If a kill jar is used, take care to ensure that it is of sufficient strength to kill the insects quickly and is not overcrowded with specimens. Following a sufficient period of time in the kill jar, specimens can be transferred to glassine-paper envelopes for storage until pinning and spreading. For illustrated instructions on the preparation and spreading of lepidopterans for formal collections, consult Chapter 35 of Triplehorn and Johnson (2005).

Collection labels should include the following information: date, time of day, collector, detailed locality (including geographical coordinates, mileage from named location, elevation), detailed habitat (including vegetation types, vegetation canopy cover, suspected or documented host plants, degree of

human impact, landscape contours such as direction angle of slopes), and insect behavior (e.g. “puddling”). Complete determination labels include the species name, sex (if known), determiner name, and date determined. Mating pairs should be indicated as such and stored together, if possible.

Relative abundance surveys can be achieved using either the Pollard Walk method, in which the recorder walks only along a precisely marked transect, or the checklist method, in which the recorder is free to wander at will in active search of productive habitats and nectar sites (Royer *et al.* 2008). A test of differences in effectiveness between these two methods at seven sites found that checklist searching produced significantly more butterfly detections per hour than Pollard walks at all sites, but the overall number of species detected per hour did not differ significantly between methods (Royer *et al.* 2008). The study concluded that checklist surveys are a more efficient means for initial surveys and generating species lists at a site, whereas the Pollard walk is more practical and statistically manageable for long-term monitoring. Recorded information should include start and end times, weather, species, sex, and behavior (e.g. “female nectaring on flowers of *Lathyrus nevadensis*”).

While researchers are visiting sites and collecting specimens, detailed habitat data should also be acquired, including vegetation types, vegetation canopy cover, suspected or documented host plant species, landscape contours (including direction and angle of slopes), and degree of human impact. Photographs of habitat are also a good supplement for collected specimens and, if taken, should be cataloged and referred to on the insect labels.

Larvae and pupae:

Lepidoptera larvae are generally found on vegetation or soil, often creeping slowly along the substrate or feeding on foliage. Pupae occur in soil or adhering to twigs, bark, or vegetation. Since the larvae usually travel away from the host plant and pupate in the duff or soil, pupae of most species are almost impossible to find.

Since many lepidoptera species and subspecies have not been described in their larval stage and diagnostic keys for identifying species of caterpillars in the Pacific Northwest are scarce, rearing can be critical in both (1) enabling identification and (2) providing novel associations of larvae with adults (Miller 1995). Moreover, high quality (undamaged) adult specimens, particularly of the large-bodied species, are often best obtained by rearing.

Most species of butterflies can be easily reared from collected eggs, larvae, or pupae, or from eggs laid by gravid females in captivity. Large, muslin-covered jars may be used as breeding cages, or a larger cage can be made from boards and a fine-meshed wire screen (Dornfeld 1980). When collecting caterpillars for

rearing indoors, collect only as many individuals as can be successfully raised and supported without harm to the insect population or to local host plants (Miller 1995). A fresh supply of larval foodplant will be needed, and sprigs should be replenished regularly and placed in wet sand rather than water (into which the larvae could drown) (Dornfeld 1980). Alternatively, the plant cuttings can be placed in a small, sturdy jar of water and either pierced through a tinfoil-plastic wrap layer covering the jar, or positioned with paper towels stuffed between them to fill any spaces that the larvae could slip through (LaBar 2009, *pers. comm.*). The presence of slightly moistened peat moss can help maintain appropriate moisture conditions and also provide a retreat for the caterpillar at the time of pupation (Miller 1995). Depending on the species, soil or small sticks should also be provided as the caterpillars approach pupation. Although rearing indoors enables faster growth due to warmer temperatures, this method requires that appropriate food be consistently provided and problems with temperature, dehydration, fungal growth, starvation, cannibalism, and overcrowding are not uncommon (Miller 1995). Rearing caterpillars in cages in the field alleviates the need to provide food and appropriate environmental conditions, but may result in slower growth or missing specimens. Field rearing is usually conducted in “rearing sleeves,” which are bags of mesh material that are open at both ends and can be slipped over a branch or plant and secured at both ends. Upon emergence, all non-voucher specimens should be released back into the environment from which the larvae, eggs, or gravid female were obtained (Miller 1995).

According to Miller (1995), the simplest method for preserving caterpillar voucher specimens is as follows: Heat water to about 180°C. Without a thermometer, an appropriate temperature can be obtained by bringing the water to a boil and then letting it sit off the burner for a couple of minutes before putting the caterpillar in the water. Extremely hot water may cause the caterpillar to burst. After it has been in the hot water for three seconds, transfer the caterpillar to 70% ethyl alcohol (isopropyl alcohol is less desirable) for permanent storage. Note that since this preservation method will result in the caterpillar losing most or all of its color; photographic documentation of the caterpillar prior to preservation is important. See Peterson (1962) and Stehr (1987) for additional caterpillar preservation methods.

Species-specific Survey Details:

Plebejus podarce

This species occurs at high elevation wet montane meadows in the southern Oregon Cascades and eastern Siskiyou Mountains. It is documented from the Rogue River, Winema, and Umpqua National Forests, and suspected to occur on BLM land in the Medford, Lakeview, and Roseburg Districts. It is found from 1554 m to over 1981 m (5100 ft. to over 6500 ft.), where it inhabits marshy slopes and meadows that are lushly overgrown with tall grasses and dense stands of false hellebore (*Veratrum viride*) (Pyle 2002). The larval foodplant in

Oregon has not been reported, but shooting stars (*Dodecatheon jeffreyi* and *D. alpinum*) are the larval foodplant in the Trinities and Sierra Nevada of California (Pyle 2002, Warren 2005).

Surveys should be conducted between July and August, depending on local conditions. Adults of this species rarely fly in June and September (Pyle 2002). Males may be seen visiting mud and both sexes visit flowers of small plants, such as yellow composites.

The *klamathensis* subspecies is the only representative of this species in Oregon, and is readily identified using wing characteristics (Pyle 2002). Distinguishing features are provided in the Species Fact Sheet.

References (Survey Protocol only):

Dornfeld, E. J. 1980. The Butterflies of Oregon. Timber Press, Forest Grove, Oregon. 276 pp.

LaBar, C. 2009. Personal communication with Sarah Foltz.

Miller, J. C. 1995. Caterpillars of Pacific Northwest Forests and Woodlands. U.S. Department of Agriculture, Forest Service, National Center of Forest Health Management, Morgantown, West Virginia. FHM-NC-06-95. 80 pp. Jamestown, ND: Northern Prairie Wildlife Research Center Online. 5 February 2009.

<<http://www.npwrc.usgs.gov/resource/insects/catnw/index.htm>(Version 21APR2000)>.

Opler, P. A., H. Pavulaan, R. E. Stanford, M. Pogue, coordinators. 2006. Butterflies and Moths of North America. Bozeman, MT: Big Sky Institute. 9 Feb. 2009. <<http://www.butterfliesandmoths.org/>>.

Opler, P. A. and A. B. Wright. 1999. Peterson field guide to western butterflies. Houghton Mifflin Co., Boston. 544 pp.

Peterson, A. 1962. Larvae of insects. Part 1: Lepidoptera and Hymenoptera. Ann Arbor, MI: Printed by Edwards Bros. 315 pp.

Pyle, R. M. 2002. The Butterflies of Cascadia. A Field Guide to all the Species of Washington, Oregon, and Surrounding Territories. Seattle Audubon Society, Seattle. 420 pp.

Pyle, Robert. 2009. Personal communication with Sarah Foltz.

Royer, R. A., J. E. Austin, and W. E. Newton. 1998. Checklist and "Pollard Walk" butterfly survey methods on public lands. *The American Midland Naturalist*. 140(2): 358-371. Jamestown, ND: Northern Prairie Wildlife Research Center Online. 18 Feb. 2009.

<<http://www.npwrc.usgs.gov/resource/insects/butsurv/index.htm>>

Stehr, F.W. (ed.). 1987. *Immature insects*. Vol. 1. Dubuque, IA: Kendall Hunt Publishing Co. 754 pp.

Triplehorn, C. and N. Johnson. 2005. *Introduction to the Study of Insects*. Thomson Brooks/Cole, Belmont, CA. 864pp.

Warren, A. D. 2005. *Butterflies of Oregon: Their Taxonomy, Distribution, and Biology*. *Lepidoptera of North America* 6. Contributions of the C.P. Gillette Museum of Arthropod Diversity. Colorado State University, Fort Collins, Colorado. 408 pp.