Species Fact Sheet

Scientific Name: *Hesperia colorado oregonia* (W. H. Edwards, 1883)
Common Name: Oregon branded skipper
Phylum: Mandibulata
Class: Insecta
Order: Lepidoptera
Family: Hesperiidae

Taxonomic Notes:
Hesperia colorado oregonia (W.H. Edwards 1883) is a valid subspecies based on taxonomy described by Pelham (2008) at the type locality in California. Historically, *Hesperia comma* and *Hesperia colorado* have been considered synonyms by some authors, with the former species serving as an "umbrella species" that encompasses both groups (Dornfeld 1980; Hinchliff 1994, 1996; Guppy & Shepard 2001). Most recent authors, however, recognize the two species as distinct, with subspecies *oregonia* belonging to the *H. colorado* species (Layberry *et al.* 1998; Pyle 2002; Warren 2005; Pelham 2008; Miskelly 2009; Warren *et al.* 2012). According to Miskelly (2009), the two species are distinguished by differences in size and coloration of the ventral hind wings, as well as differences in habitat (*H. comma* is found at high elevation boreal sites, while *H. colorado* generally occurs in lower elevation dry grassland habitat).

Recent molecular work on what was long considered the *oregonia* subspecies in the Puget Sound area (*e.g.,* Hinchliff 1996; Pyle 2002) has revealed that populations of this taxon in Washington and British Columbia are actually more closely related to both *H. comma hulbirti* and *H. comma manitoba* than to *H. colorado oregonia* (type locality: Trinity County, California) or any other *H. colorado* material (Pelham 2012, *pers. comm.*; Guppy 2016, *pers. comm.*). Indeed, in 2013 COSEWIC (citing Guppy 2013) notes that "A taxonomic revision of *Hesperia* is underway that will probably change the species and/or subspecies names applicable to [Vancouver Island] populations." Guppy (2016, *pers. comm.*) reports that he has no *Hesperia* specimens from Oregon or Washington, which are necessary to complete analyses to determine the relationship of Oregon *Hesperia* to other populations, including those of *H. colorado oregonia* in California.

Thus, the name *H. colorado oregonia* does not apply to specimens from Washington or British Columbia, and the Washington populations are now considered an unnamed subspecies of *H. comma,* informally known as the "Puget Trough segregate" (Pelham 2012, *pers. comm.*). The subspecies is currently understood to occur in northern California, the southwestern Oregon Cascades, and the eastern Siskiyous (Warren et al 2012). In Oregon, the distribution of *H. colorado oregonia* has also been re-evaluated in recent years. Historically, the range of this subspecies was described to include all *H.*

colorado/comma sites on the western side of the Cascade Mountains, including sites along the entire length of the Cascades, as well as sites in the Siskiyou Mountains of southwest Oregon (Dornfeld 1980; Pyle 2002; map in Hinchliff 1994). A recent assessment of phenotypic differences across the Oregon range, however, has concluded that the *oregonia* subspecies is limited in distribution to a very small area in the southwest part of the state (Warren 2005; Pelham 2012, *pers. comm;* Pyle 2012, 2015, *pers. comm.*). Specifically, Warren (2005) lists the species as occurring only in southeast Josephine and southern Jackson Counties. Populations to the immediate west of this area (*i.e.*, Curry County and western Josephine County) represent *H. colorado mattoonorum,* and populations in the Cascade Range are treated as "*H. colorado* nr. *oregonia*" based on consistent phenotypic differences (Warren 2005). Note, however, that even within the restricted Oregon range, many *H. c. oregonia* populations intergrade with neighboring subspecies (Warren 2005; Pelham 2012, *pers. comm.*). According to Warren (2005) phenotypically consistent populations (*i.e.,* consisting of all *H. c. oregonia* phenotypes) are found only in southern Jackson County while populations in southeastern Josephine may be phenotypically variable.

Conservation Status:
Global Status (2000): G5T3T4
Rounded Global Status: T3 - Vulnerable
National Status: Canada N1(2013), United States NNR
State/Province Statuses: Washington S2, British Columbia S1
(NatureServe 2015)

Oregon Biodiversity Information Center ranks this species as S2 (2013).
IUCN Red list: NE – Not Evaluated

Technical Description:
Adult: The Oregon branded skipper is a member of the subfamily Hesperiinae, "monocot" or "folded wing skippers." *H. colorado* is highly variable, but the dorsal wing is typically reddish-orange above with brown, broad borders and dark, narrow "stigmata" on the forewing. Borders are not tooth-like in patterning as in *H. juba* (Pyle 2002). Forewing tips are pointed and wingspan ranges from 25-37 mm (COSEWIC 2013). The ventral hindwing is gray or green with an "olive disk" and a crescent-shaped line of sharp spots, silver-white or yellowish in color and lacking a pearly luster. The antennae are clubbed and less than 1/3 the length of the wing (Pyle 2002). The *H. c. oregonia* phenotype near the Cascades Siskiyou National Monument is described as "lacking silver below, although rare individuals are closer to that of *H. c. idaho* or *H. c. mattoonorum*" (Warren 2005). See Attachment 4 below for photographs of the subspecies from Jackson County, Oregon.

Larvae: Larvae of *Hesperia colorado* look similar to larvae of other *Hesperia* and may be difficult to identify. *H. comma manitoba* are similar but also display an "inconspicuous dark dorsal stripe" in the last instar and pupa. Late larval instars of *H. juba* and *H. nevada* have black heads rather than brown and are typically darker in coloration (James & Nunnallee 2011). Larvae of *H. colorado* (subspecies not indicated) were collected from Yakima County, Washington and Wallowa County, Oregon and captive-reared and described by James and Nunnallee (2011). First instar larvae are approximately 3.5 mm in length and may overwinter, appearing yellow-orange overall. First instar larvae that hatch after overwintering as eggs are yellowish green. Heads are shiny and black with a black collar visible dorsally on the first segment, which develops a white edge in the second instar that is maintained until pupation. Fourth instar larvae develop a dark brown head with two "pale vertical parallel stripes and an inverted V at the base" (James & Nunnallee 2011). The sixth may reach 30mm and the pupa 22 mm. Pupae are yellowish-tan to green with brown and black dots and dashes across the abdomen and 2-3 wavy lines on the thorax, of which one forms a W shape (James & Nunnallee 2011).

Eggs: James and Nunnallee (2011) also described eggs of Yakima County, Washington and Wallowa County, Oregon *H. colorado* as "creamy white, textured" with a lip at the base of the egg. The egg "develops a pinkish tint after 5-7 days" (James & Nunnallee 2011). Photographs of the egg, pupa, and each larval instar are provided in James and Nunnallee (2011).

Life History:

The species has a single brood each year, and individual eggs are laid on or near the base of host plants. Hardy (1954) reported 40 eggs laid by a single captive female and 50 by a group of three captive females on Vancouver Island. Eggs generally overwinter, although some captive-reared eggs were reported to hatch and overwinter as dormant first instars (James & Nunnallee 2011). The larval stage lasts approximately four months in *Hesperia* that occur on Vancouver Island (Hardy 1954). James and Nunnallee (2011) also report that all instars of their captive-reared specimens created tubular nests by linking blades of grass with silk, pupating within a silken cocoon in the nest in 18 days. Final instar larvae also entered a dormant stage during which the larva does not feed.

This subspecies has been observed flying as early as May 31 in Josephine County, Oregon and as late as September 20 in Jackson County, Oregon. Most records for the subspecies in southwestern Oregon date between July and August, although Warren (2005) notes that conclusions regarding typical flight period may be biased due to limited sample effort. Males are often found on hilltops, along roads, or in mud (Warren 2005; Opler *et al.* 2012; Gudehus 2012, *pers. comm.*). This subspecies does not migrate, and skippers are

generally considered strong, fast fliers and are typical nectarers and puddlers (Pyle 2002; COSEWIC 2013).

Range, Distribution & Abundance:

Range: Based on recent information (see taxonomic note, above), the currently-understood distribution of this subspecies stretches from northern California (Trinity County) to southwestern Oregon. Records of this subspecies in Washington are now considered to be a different taxon. In Oregon, the distribution of *H. c. oregonia* has been re-evaluated in recent years and the genus is undergoing molecular study (Guppy 2016, *pers. comm.*). Historically, the range of this subspecies was described to include all *H. colorado/comma* sites on the western side of the Cascade Mountains, including sites along the entire length of the Cascades, as well as sites in the Siskiyou Mountains of southwest Oregon (Dornfeld 1980; Pyle 2002; map in Hinchliff 1994). A recent assessment of phenotypic differences across the Oregon range, however, has concluded that the *oregonia* subspecies is limited in distribution to a very small area in the southwest part of the state (Warren 2005; Pelham 2012, *pers. comm.*). Specifically, Warren (2005) lists the species as occurring in Oregon only in southeast Josephine and southern Jackson Counties. Populations to the immediate west of this area (*i.e.*, Curry County and western Josephine County) represent *H. c. mattoonorum,* and populations in the Cascade Range are treated as "*H. colorado* nr. *oregonia*" based on consistent phenotypic differences (Warren 2005). Note, however, that even within the restricted Oregon range, many *H. c. oregonia* populations intergrade with neighboring subspecies (Warren 2005; Pelham 2012, *pers. comm.*). According to Warren (2005) phenotypically consistent populations (*i.e.,* consisting of all *H. c. oregonia* phenotypes) are found only in southern Jackson County.

Distribution: The following excerpt from Warren (2005) details the distribution and phenotype of *H. c. oregonia* in Oregon:

> Between Klamath Falls, Klamath County, and the Cascade-Siskiyous National Monument (CSNM), Jackson County, phenotypes of adult *H. colorado* vary from those of *H. c. idaho* to *Hesperia colorado oregonia*, with all types of intermediates. At the CSNM, most *H. colorado* adults are of the *H. c. oregonia* phenotype, lacking silver below, although rare individuals are closer to that of *H. c. idaho* or *H. c. mattoonorum*. The lectotype of *H. c. oregonia* illustrated by Brown & Miller (1977: 292) compares favorably with the commonest phenotype in the eastern Siskiyous and extreme southern Cascades (*e.g.*, CSNM, Jackson Co.) of Oregon, and to some individuals in highly variable populations in Trinity County, California... Brown & Miller (1977: 291-292) restricted the type locality of *H. c. oregonia* to Trinity County, California, which based on our current knowledge, seems quite reasonable. In Oregon, populations composed mostly of phenotypically consistent adults of *H. c. oregonia*

occur only in southern Jackson County. Populations of *H. colorado* in Josephine and Curry counties are mainly of the *H. c. mattoonorum* phenotype (highly reduced dorsal and ventral spotting, and a darker ground color above and below) but some individuals are better maculated, and approach the phenotype of *H. c. oregonia*.

Western Cascadian populations of *H. colorado* previously called *H. c. oregonia* (Hinchliff 1994: 19) are composed of adults that average smaller and darker than those of typical *H. c. oregonia*, and generally have better developed and darker ventral hindwing markings. Until taxonomic studies on *H. colorado* are completed (see above), populations in the western Cascades are called *Hesperia colorado* nr. *oregonia*. These extend from about the Crater Lake area (Douglas and Klamath counties), north to about Mt. Hood (Clackamas Co.). Adults of *H. c.* nr. *oregonia* are fairly uniform in appearance, compared to most other segregates of *H. colorado* in Oregon. Northeastern Cascadian populations of *H. colorado*, situated east of the Cascadian crest (*e.g.*, Camp Sherman, Jefferson Co.), appear to form a broad blend zone with *H. c. idaho* populations below them to the east. Throughout this area, adult phenotypes are highly variable, and average intermediate between those of *H. c.* nr. *oregonia* and *H. c. idaho*. (Warren 2005).

BLM/Forest Service Land: *H. c. oregonia* is documented on the Klamath National Forest. It is also documented on BLM land in the Medford District. Occurrence on the Rogue-River/Siskiyou National Forest is suspected based on the currently-understood distribution of this subspecies and older locations on or near the Forest.

Abundance: Abundance estimates of this species have not been conducted. Known collections range from one to four individuals. A butterfly count conducted by the North America Butterfly Association (NABA) in the Cascades-Siskiyou National Monument found one individual of this species at one site, and six individuals at another site (Gudehus 2012, *pers. comm.*).

Habitat Associations:

In Oregon, males of *H. colorado* are frequently found on hilltops, flying along roads, and at mud (Warren 2005; Opler *et al.* 2012). Gudehus (2012, *pers. comm.*) reports the habitat for a recent *H. c. oregonia* adult sighting as "along the road; the area was somewhat open and sunny with lots of flowers for nectaring butterflies." Pyle (2002) lists chokecherry, gayfeather, goldenweed, and yellow yarrow as the nectaring plants for this species (as a whole). Warren (2005) notes that both male and female *H. colorado* visit a wide variety of flowers, and are especially fond of *Chrysothamnus* (*e.g.*, rabbitbrush).

Known records for this species in Oregon are from 1382 to 4921 ft. (420 to 1500 m), with the exception of two records from Mt. Ashland, including one with elevation provided (7500 ft.; 2286 m) (Hinchliff 1994; Evergreen Aurelians 1996). A record from the west slope Pilot Rock (summit: 5909 ft.) did not include actual elevation.

Knowledge of *H. c. oregonia* larval foodplants is lacking (Warren 2005). Other members of the species feed on various grasses and sedges, including *Festuca* (fescue), *Bromus* (brome), *Poa* (bluegrass), *Stipa* (needlegrass), *Andropogon* (beardgrass), *Bouteloua* (grama), and *Carex* (sedge) species (Opler *et al.* 2012; *reviewed in* Warren 2005). *Festuca* has been reported as the larval foodplant of *H. colorado mattoonorum* in Del Norte County, California, and *Achnatherum thurberianum* is known as a foodplant of what is now called *H. colorado idaho* in Mono County, California (*reviewed in* Warren 2005). COSEWIC (2013 citing Miskelly 2013) report red fescue and Roemer's fescue, both of which occur in the Rogue vicinity (Oregon Flora Project 2016), as likely larval foodplants in B.C.

Threats:

COSEWIC (2013) identified larval host plant availability and appropriate edaphic conditions as the two main limiting factors and application of Btk insecticide for gypsy moth control as the greatest threat to individuals of the *Hesperia colorado* subspecies of Vancouver Island. Disturbance as a result of recreational activities is also considered a threat.

Threats to the Klamath-Siskiyou ecoregion, which spans the currently understood range of *H. c. oregonia* and beyond, include land use conversion, altered fire regimes and invasive species (ODFW 2006). *H. c. oregonia* habitat may be subject to succession as a result of fire suppression and impacts from grazing and recreation. Mt. Ashland and Pilot Rock are also heavily used recreation areas.

Multiple species of Asian and European gypsy moths (genus *Lymantria*) are nonnative invasive pest species that can defoliate and kill many native trees and shrubs. *Bacillus thuringiensis* var. *kurstaki* (Btk) is a Lepidoptera-specific insecticide used to eradicate gypsy moth infestations by targeting larvae, but it is also detrimental to native lepidopterans (Wagner and Miller 1995; Miller 1999; Boulton 2004). From 2013-2015, gypsy moths have been trapped in the vicinity of Grants Pass in Josephine County, Oregon. In response to detection of gypsy moths in Portland and Eugene, Oregon, eradication programs involving aerial sprays of Btk have been implemented in these municipalities (Bai & Burfitt 2015). If an eradication project takes place near or within the range and occurrence of this subspecies in Josephine County, nontarget effects of Btk should be considered a threat.

Conservation Considerations:

Research: The taxonomy and subspecific boundaries of *H. c. oregonia* are currently in flux and should continue to be studied and revised. Improved understanding of the *H. colorado* subspecies distribution will assist in identification of conservation priorities. Guppy (2016, *pers. comm.*) reports that specimens or mtDNA sequences from material collected from Oregon and Washington populations of *Hesperia* are needed to complete genetic analyses that will be used to support taxonomic revisions. Specimens of all phenotypes should be collected from a variety of habitat types for inclusion in a genetic barcoding project that is currently in progress (Guppy 2016, *pers. comm.*).

Research into the larval foodplants of southwestern *H. colorado* subspecies will also improve understanding of potential habitat, which may be important if dispersal among populations is limited, as in *H. colorado* of Vancouver Island (COSEWIC 2013).

Inventory: Most observations of this subspecies within the currently understood range date from the 1970s through the 1990s. The most recent known sites where this subspecies has been observed include Cascade-Siskiyou National Monument (2012) and Pilot Rock (1999). These two sites should be revisited to inventory the existing populations. Repeat surveys at these previously occupied sites, historically occupied sites, and nearby areas are recommended where possible to confirm the current status of this subpecies.

Management: Evaluate the impact of hikers and cattle grazing on habitat and populations and manage these impacts to protect and maintain existing habitat. Consider treatments to reduce shrub or tree encroachment if needed and promote larval and adult resources, such as host and nectaring plants.

Protect all potential and known sites from practices that would adversely affect any aspect of this species' life cycle or habitat, including agriculture, road construction, and building construction. Survey known areas to determine if and where conifer encroachment or invasive species are negatively impacting larval habitat. If proposed, identify whether Btk application has the potential to negatively impact habitat and populations and identify alternatives or mitigation measures that should be implemented.

Version 2 Fact Sheet Prepared by: Emilie Blevins
Xerces Society for Invertebrate Conservation
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Edited by: Sarina Jepsen
Xerces Society for Invertebrate Conservation
Date: June 2016

Version 1 Summary Prepared by: Sarah Foltz Jordan
Xerces Society for Invertebrate Conservation
Date: December 2012
Edited by: Sarina Jepsen
Xerces Society for Invertebrate Conservation
Date: December 2012

ATTACHMENT 1: References
ATTACHMENT 2: List of pertinent or knowledgeable contacts
ATTACHMENT 3: Map of subspecies' occurrence
ATTACHMENT 4: Photographs of subspecies and habitat
ATTACHMENT 5: Lepidoptera Survey Protocol, including specifics for this species

ATTACHMENT 1: References

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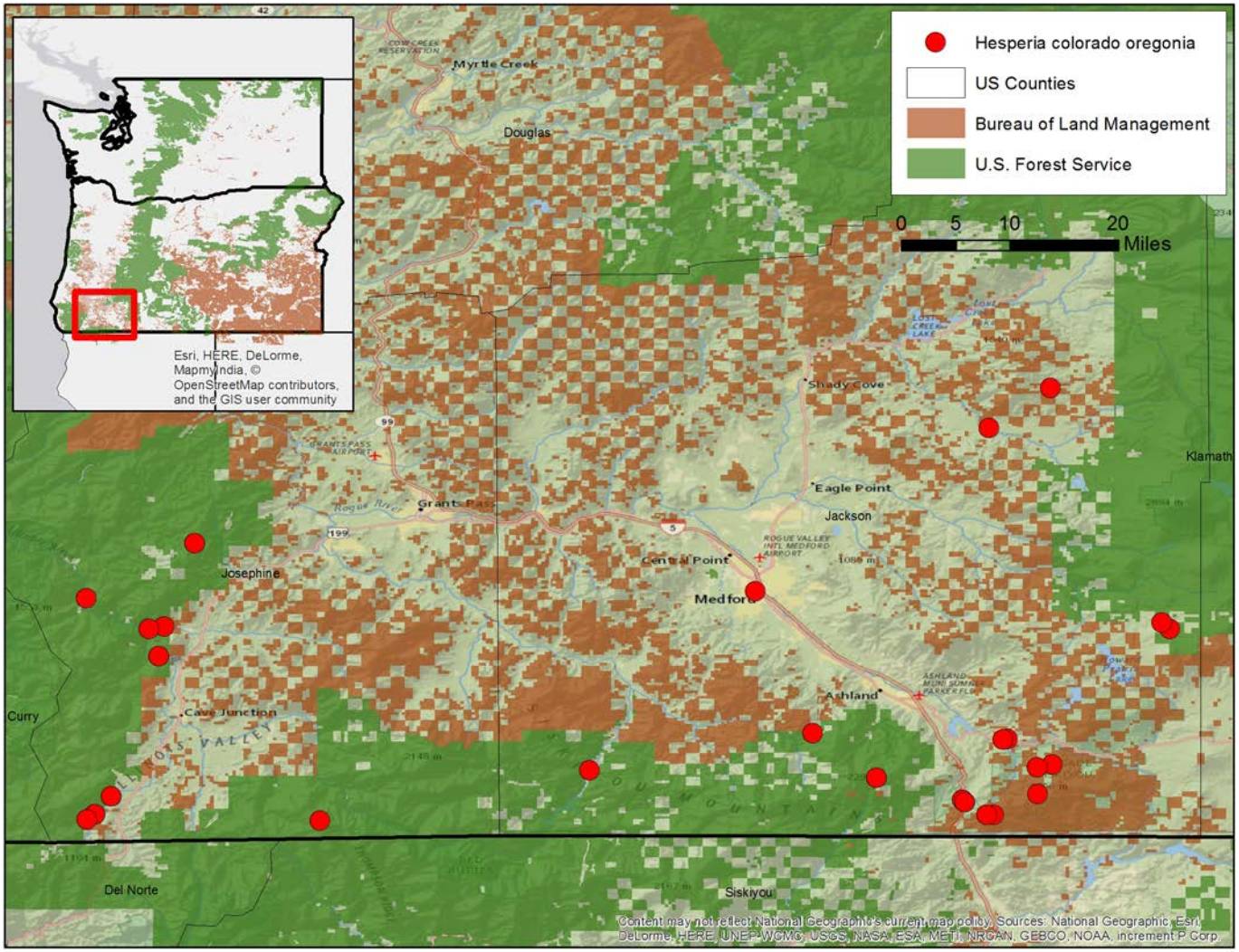
ATTACHMENT 2: List of pertinent, knowledgeable contacts

Crispin Guppy, Whitehorse, Yukon.
Jon Pelham, Burke Museum, Seattle, Washington.
Andy Warren, Florida Museum of Natural History, Gainesville, Florida.
Robert M. Pyle, Grays River, Washington.

ATTACHMENT 3: Map of subspecies' occurrence in southwestern Oregon



Records of *Hesperia colorado oregonia* in Oregon relative to Forest Service and BLM lands. This record set is limited to *H. c. oregonia* records from southeastern Josephine and southern Jackson Counties, the currently recognized range of this subspecies in Oregon (Warren 2005, Pelham 2012, *pers. comm.*).

ATTACHMENT 4: Photographs of subspecies and habitat

Additional photographs of this subspecies within the southwestern Oregon range are available at: http://digital.hanlib.sou.edu/.

Dorsal view of *Hesperia colorado oregonia* specimen collected near Pilot Rock, Jackson County, Oregon. This photograph is part of a selection of images made from the Southern Oregon University Department of Biology Insect Museum and made available courtesy of Southern Oregon University Hannon Library and the Department of Biology at Southern Oregon University. See also: http://soda.sou.edu/copyright.html

Ventral view of *Hesperia colorado oregonia* specimen collected near Pilot Rock, Jackson County, Oregon. This photograph is part of a selection of images made from the Southern Oregon University Department of Biology Insect Museum and made available courtesy of Southern Oregon University Hannon Library and the Department of Biology at Southern Oregon University. See also: http://soda.sou.edu/copyright.html

Hesperia colorado oregonia habitat, Baldy Creek Road, Jackson County, Oregon, 25 August 2010. Photograph by Kim and Mike Stangeland, used with permission. Available at: http://butterfliesofamerica.com/hesperia_colorado_oregonia_habitats.htm

Hesperia colorado oregonia habitat, Baldy Creek Road, Jackson County, Oregon, 25 August 2010. Photograph by Kim and Mike Stangeland, used with permission. Available at: http://butterfliesofamerica.com/hesperia_colorado_oregonia_habitats.htm

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.

How:

Adults:
If possible, all sites should be surveyed for this butterfly during the following environmental conditions:

Minimum temperature: Above 60 degrees F.

Cloud cover: Partly sunny or better. On cooler days the sun can play a very important role in getting butterflies to take to the air. On warmer days (above 60 degrees F), direct sunlight is less important, but a significant amount of the sun's energy should be coming through the clouds to help elevate the temperature of basking butterflies.

Wind: Less than 10 MPH. On windy days, butterflies will drop out of the air if they cannot maintain their direction and/or speed of flight.

Time of day: Between 10AM and 4PM. Success is most likely during the warmest parts of the day.

Time of year: Varies by region (see notes on flight period, below). If known, currently occupied sites should be checked before the start of the planned survey period, as flight times may vary due to weather conditions in the spring and early summer.

Upon arriving at each potential site, the following survey protocol should be used:
Approach the site and scan for any butterfly activity, as well as suitable habitat. 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). Walk through the site slowly (about 100 meters per 5 minutes), looking back and forth on either side, approximately 20 to 30 feet out. Try to walk in a path such that you cover the entire site with this visual field, or at least all of the areas of suitable habitat. If you must leave the transect path (*e.g.*, to look at a particular butterfly), do your best to return to the specific place where you left your path when you resume walking/searching through the site.

When a suspected target species is encountered, net the butterfly to confirm its identification. 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.

Binoculars and cameras may also be used to view wing patterns of perched butterflies. 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).When possible, take several photographs of potential target species showing a clear view of the underside and upperside of the wings at each survey area where they are observed.

If needed, the collection of voucher specimens should be limited to males from large populations. The captured butterfly should be placed into a glassine envelope. To remove the specimen from the net by hand, grasp it carefully through the net by the thorax with fingers or a pair of flat-nosed forceps, making sure the butterfly has its wings folded back. Place the specimen in an envelope and then into a small plastic container. Place the container in a cooler with ice, buffering the specimen from the ice with a towel. Transfer the container to a freezer to kill the animal.

If using a cyanide killing jar (Triplehorn & Johnson 2005), place the animal in the jar as soon as possible, pinching the thorax slightly to stun it, to avoid damage to the wings by fluttering. 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).

Fill out all of the site information on datasheet, including site name, survey date and time, elevation, aspect, legal location, latitude and longitude coordinates of site, weather conditions, and a thorough description of habitat, including vegetation types, vegetation canopy cover, suspected or documented host plant species, landscape contours (including direction and angle of slopes), degree of human impact, and insect behavior (e.g. "puddling"). Record the number of target species observed, as well as butterfly behavior, plant species used for nectaring or egg-laying, and survey notes. Photographs of habitat are also a good supplement for collected specimens and, if taken, should be cataloged and referred to on the insect labels. Collection labels should include the following information: date, time of day, collector, and detailed locality (including geographical coordinates, mileage from named location, elevation). 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. Record data for sites whether butterflies are seen or not. In this way, overall search effort is documented, in addition to new sites.

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*").

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.

James and Nunnallee's *Life Histories of Cascadia Butterflies* (2011) includes descriptions of many Lepidoptera species, providing important diagnostic information for identification of larval stages. For species or subspecies not covered in this book, 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). 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:
Hesperia colorado oregonia

Where:
This butterfly is known in Oregon from southeastern Josephine and southern Jackson Counties according to the currently understood range. It is found on hilltops or along roads in open, sunny areas with flowers for nectaring (Warren 2005; Opler *et al.* 2012; Gudehus 2012, *pers. comm.*). Pyle (2002) lists *H. colorado* nectaring plants range-wide, including chokecherry, gayfeather, goldenweed, and yellow yarrow. *Prunus virginiana* (chokecherry) occurs in southwestern Oregon, as do species of goldenweed and yarrow (Oregon Flora Project 2016).

H. c. oregonia is documented on the Klamath National Forest and on or near the Rogue River-Siskiyou National Forest. It is also documented on BLM land in the Medford District. It is generally reported from elevations of 1382 to 4921 ft. (420 to 1500 m), although it has also been reported at 7500 ft. (2286 m) (Hinchliff 1994; Evergreen Aurelians 1996). Although the subspecies' preferred larval foodplants are unknown, this monocot skipper may feed on similar parallel-veined plants as other members of the species (*Festuca*, *Bromus*, *Poa*, *Stipa*, *Andropogon*, *Bouteloua*, and *Carex*) (Opler *et al.* 2012; *reviewed in* Warren 2005). *Festuca* has been reported as the larval foodplant of *H. colorado mattoonorum* in Del Norte County, California, and *Achnatherum thurberianum* is a known foodplant of what is now called *H. colorado idaho* in Mono County, California (*reviewed in* Warren 2005). COSEWIC (2013 citing Miskelly 2013) reports red fescue and Roemer's fescue, both of which occur in the Rogue vicinity (Oregon Flora Project 2016), as likely larval foodplants in B.C. *Festuca roemeri* may be found in full sun and in moist sites along grassy balds (Darris et al. 2007).

The most recent known sites where this subspecies has been observed include Cascade-Siskiyou National Monument (2012) and Pilot Rock (1999). Other records of the subspecies from its currently understood range are from 1996 or earlier. Repeat surveys at these previously occupied sites and nearby areas are recommended where possible. If larval surveys are conducted, sites with *Festuca roemeri* should be targeted to confirm its use as a larval foodplant.

When:
Surveys should be conducted during the adult flight period in July and August, as most observations have been reported during these months. The species has

also been reported flying on May 31 and in early June as well as in late September, however.

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