

# Northwest Science Notes

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## Butterflies Hanging on to Existence in the Willamette Valley: A Relict Population of the Great Copper (*Lycaena xanthoides* Boisduval)

The great copper, *Lycaena xanthoides* (Boisduval), is a 3.5–3.8 cm in wingspan grey butterfly (Figure 1) that inhabits dry meadows, riparian areas, roadside ditches, chaparral, and seasonally inundated grasslands throughout California (Shapiro 1974, Emmel and Pratt 1998). In southern Oregon, extant populations of great coppers are known from the Siskiyou Mountains and the Cascade-Siskiyou National Monument, but Willamette Valley populations of western Oregon are presumed extinct (Dornfeld 1980, Pyle 2002). A morphologically similar species, the Edith's copper (*Lycaena editha*), inhabits higher elevations in the Cascades and does not occur on the Willamette Valley floor (Dornfeld 1980, Hinchliff 1994, Pyle 2002). Historical collections of great coppers in the Willamette Valley are few and the localities are not precise, so basic life history and habitat association is virtually unknown. Pyle (2002) refers to the habitat for great coppers in the Willamette Valley as, "fields of uncertain characteristics," which is too vague for focused searching. Some of the ambiguity surrounding this species in the Willamette Valley is undoubtedly due to its rarity. Five great coppers housed in the Oregon State University Arthropod Collection were collected in the general vicinity of "Corvallis" with capture dates that ranged from early June through early August from 1916 to 1970. Six historical records from Eugene span from the early 1930s to the early

1960s in "grasslands" that were developed for roadways and commercial buildings. Combining all historical records, there are less than twelve individuals known from the Willamette Valley, and all precisely known locations of historical populations were lost to development before the habitat was characterized.

In the Willamette Valley, there are two distinct grassland ecosystems with characteristic floras that may be home to great coppers, upland prairie and wetland prairie. Both grassland types have been reduced to a small portion, < 1%, of their pre-Euro-American settlement area due to urbanization, agricultural development and habitat degradation (Noss et al. 1995). Moreover, upland and wetland prairies house a number of Federally listed Endangered, Threatened and Species of Concern (Oregon Natural Heritage Program 2001), most notably the Fender's blue butterfly, Kincaid's lupine (Wilson et al. 2003), and Bradshaws's desert parsley (Pendergrass et al. 1999). Biologists have frequented both of these habitats but no great coppers were recorded from either upland or wetland prairie study sites. In the summer of 2004 a population of great coppers was found in the wetlands of west Eugene, Oregon while conducting surveys for a butterfly diversity study. In this manuscript, we describe the habitat, flight period, and life history of the solitary known extant population of great coppers in the Willamette Valley. In so doing, we hope to provide land managers and biologists who work in the prairies of southern Washington and western

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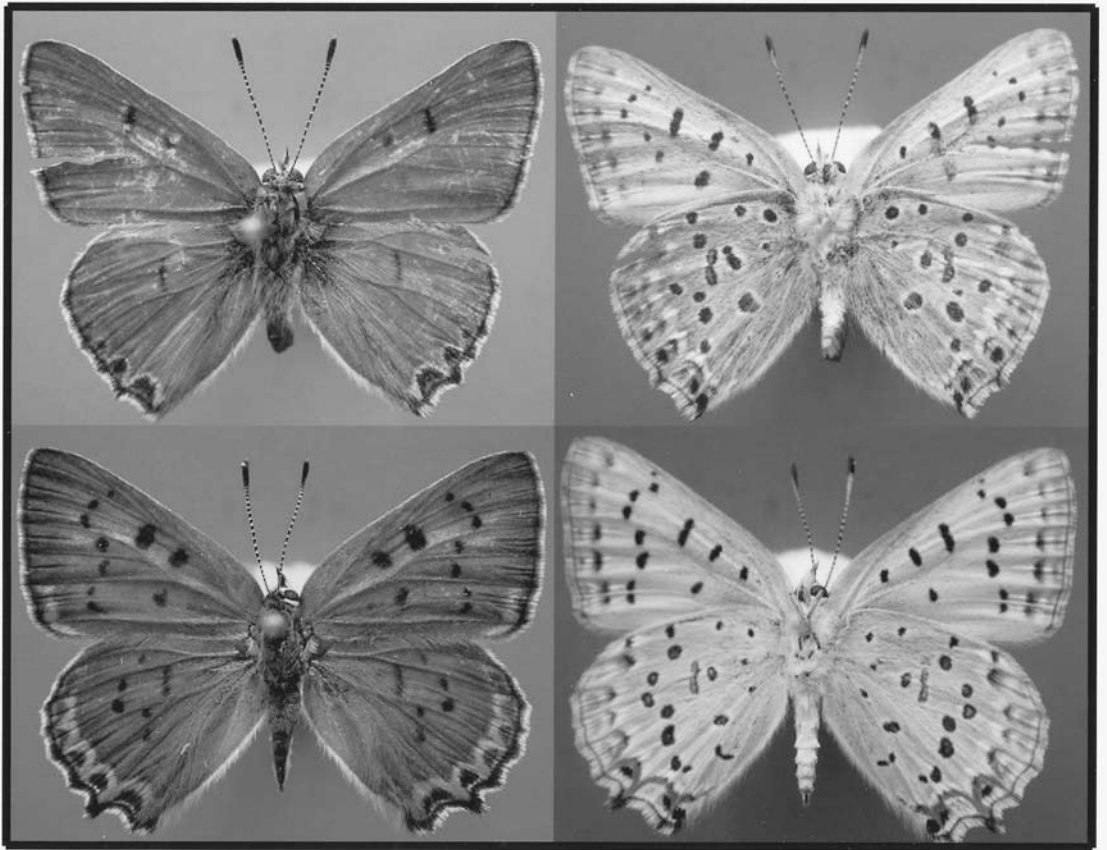


Figure 1. Photographs of the dorsal and ventral surfaces of male and female Willamette Valley great coppers. Upper left, male dorsum. Lower left, female dorsum. Upper right, male ventral. Lower right, female ventral.

Oregon with enough information that they may discover new populations of this rare Willamette Valley butterfly.

The recently discovered great copper population occupies a parcel of wetland prairie that includes the northern portion of the Willow Creek Nature Conservancy Preserve north to Tsal Luk-wah Boardwalk in the western part of Eugene, Oregon. The first observation of a great copper was likely made by Sharon Blick while leading a 4<sup>th</sup> of July Xerces Society/NABA (North American Butterfly Association) butterfly group on an annual count. The butterfly in question, however, was recorded as an “unidentified female species of blue” and could not be verified as a great copper due to the lack of a photograph or voucher specimen. Ignorant of the “unidentified species of blue,” on 6 July 2004, the primary author found two

great coppers in the Willow Creek Preserve and eight more individuals approximately 1 km to the north on Tsal Luk-wah Boardwalk (managed by the Bureau of Land Management). The last adult great copper was observed at the Tsal Luk-wah boardwalk site on 8 August 2004. Tsal Luk-wah Boardwalk appeared to be the center of the butterfly population and the following observations come from that site. Two voucher specimens from the Tsal Luk-wah site, a male and female, were captured and deposited in the Oregon State Arthropod Collection at Oregon State University in Corvallis. Although no formal adult population census was performed, the butterfly population is likely to be at least 25 individuals but less than 100 butterflies. This estimation is based on the number of butterflies encountered, the species’ presumed life span, and the duration of the flight period.

Great coppers occupied a remnant parcel of wetland prairie that is dominated by native *Deschampsia cespitosa* L. bunchgrass. As its name implies, the wetland prairie is a seasonally inundated grassland with standing water from November through early May. In the Sacramento Valley of California, great coppers inhabit similarly flooded remnant bunchgrass dominated areas in the floodplain of the Sacramento River (Shapiro 1974), so the butterflies' presence in Willamette Valley wetland prairies is not a novel habitat for the species. At Tsal Luk-wah, great coppers began to fly around 0900 hrs, but became more active and abundant after 1100 hrs and continued flying through the heat of the day to at least 1700 hrs. Adults, especially females, sought nectar from the yellow-flowered, native endemic wetland prairie composite, Willamette Valley gumweed (*Grindelia integrifolia x nana*). This naturally occurring hybrid swarm of Willamette Valley gumweed occupies the southern Willamette Valley while the pure *Grindelia integrifolia* DC inhabits wetland prairies from Corvallis north (Ken Chambers, Oregon State University, personal communication). Although butterflies (mostly males) also nectared on the non-native, invasive mint pennyroyal (*Mentha pulegium* L.), great coppers appeared to prefer the native nectar plants to the exotic nectar species (n=54 nectaring observations; 89% were on Willamette Valley gumweed). A pronounced preference for gumweed flowers by great coppers was also documented in central California (Scott and Opler 1975).

Female great coppers were tightly associated with the native willow dock (*Rumex salicifolius* Weinm), despite the presence and greater abundance of the non-native curly dock (*Rumex crispus* L.). Willow dock was patchily distributed throughout the Tsal Luk-wah site in approximately 10 clusters of 4-20 plants each. Three different females were observed alighting on willow dock and displayed the typical behavior of ovipositing lycaenid butterflies. Female coppers landed upright on the apical end of willow dock inflorescences and after approximately 0.5 to 1.5 minutes of basking, crawled headfirst down the peduncle to the base of the plant. While walking down the stem, females curled their abdomen as if laying eggs, touching various parts of the stem with the tip of their abdomen, but no eggs were deposited on the cauline leaves or the peduncle. When females reached the base of the plant, they crawled

under a thin layer of thatch where they spent 1 to 2 minutes laying flattened, white eggs, 1.5-2 mm in diameter, nestled between the reflexed sheath and the primary flowering stem. Females also laid eggs on loose thatch at the base of the plant.

Eggs of the great copper in southern California diapause over the winter and hatch in the spring to consume fresh host plant material (Emmel and Emmel 1973). While a geographically isolated subspecies of great copper in Death Valley National Park uses willow dock as its host plant (Emmel and Pratt 1998), some populations of great coppers, and closely related congeners from North America, are known to use the non-native curly dock as alternate larval host plants (Shapiro 1974, Orsak 1977, Layberry et al. 1998, Pyle 2002). However, female Willamette Valley great coppers appeared to ignore the more abundant curly dock and spent their time investigating willow dock. Searches for eggs laid on curly dock at Tsal Luk-wah were negative (n=30 plants).

The potential for other Willamette Valley populations of great coppers to be discovered is greater now that their habitat has been characterized, the larval host plant documented, and the preferred nectar plants identified. Biologists and land managers should look for this butterfly in the last weeks of July in remnant Willamette Valley wetland prairie parcels that contain willow dock and Willamette Valley gumweed. We noticed that gumweed was abundant in the areas that we found great coppers and that generally coppers flew rapidly over areas with no native nectar sources or were not observed there at all. The presence of native nectar plants may be an essential component for great copper populations in the Willamette Valley, as populations of Fender's blue butterfly are also dependant on native nectar sources (Schultz and Dlugosch 1999).

A second habitat in which Willamette Valley great coppers may be encountered in is remnant oak savanna with a riparian corridor. One great copper in the Oregon State Arthropod Collection was captured on 1 June 1916 in "Corvallis" and the primary author recently observed one individual flying in a population of Fender's blue butterfly in the first week of June in 2003. These June sightings are unlikely to be great coppers from the wetland prairie habitat because the water from the wet prairie has not been off the base of the willow dock plants long enough for the great

coppers to mature from an egg to an adult. Typically, the wet prairie dries by middle or late May, which gives only two weeks for larvae to hatch from their egg, progress through all their larval instars, pupate, and metamorphose into an adult. Like the remnant wetland prairie habitat, high quality oak savanna with a riparian habitat is also a dwindling ecosystem in the Willamette Valley, but it should be investigated for the presence of great coppers.

Conservation of the great copper in the Willamette Valley is warranted for three reasons: 1) because it is the northernmost known extant population of this species in North America, 2) it is a native species that is likely restricted to rare Willamette Valley habitats, and 3) the Willamette Valley population appears geographically isolated from the rest of the populations throughout the species' range (currently under molecular investigation by Jeff Oliver at the University of Arizona). Prescribed fires in wetland prairies, which are used primarily to encourage population growth of rare native plants (Pendergrass et al. 1999, Taylor 1999) and control the encroachment of woody plants (Pendergrass et al. 1998), may expose great

copper populations to local extinction when the flames consume host plant patches. Autumn prescribed fires are lethal to the immature stages of Lepidoptera in the wet prairie (Severns 2003) and would likely kill copper eggs laid at the base of dock plants once the thatch caught fire. The easiest way for land managers and biologists to preserve Willamette Valley populations of the great copper is to first document its presence or absence before restoration or management of an area begins. Then act accordingly if the butterfly is present, by setting aside refuges from prescribed fires or rotate vegetation treatments so that the entire immature butterfly population is not affected. Small butterfly populations could furthermore be encouraged for growth and long-term persistence by propagating the larval host and adult nectar plants.

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## Literature Cited

- Dornfeld, E. J. 1980. The Butterflies of Oregon. Timber Press, Corvallis, Oregon.
- Emmel, T. C., and J. F. Emmel. 1973. The Butterflies of Southern California. Natural History Museum of Los Angeles County, California.
- Emmel, J. F., and G. F. Pratt. 1998. New subspecies of *Lycaeninae* from California and a type locality restriction for *Chrysophanus cupreus* W. H. Edwards (Lepidoptera: Lycaenidae). Pages 661-680 *In* T. C. Emmel (editor), Systematics of western North American butterflies. Mariposa Press, Gainesville, Florida.
- Hinchliff, J. 1994. An atlas of Oregon butterflies. Oregon State University Bookstore Press, Corvallis.
- Layberry, R. A., P. W. Hall, and J. D. Lafontaine. 1998. Butterflies of Canada. University of Toronto Press.
- Noss, R. F., E. T. LaRoe III, and J. M. Scott. 1995. Endangered ecosystems of the United States: a preliminary assessment of loss and degradation. Biological Report 28, National Biological Service, Washington D.C.
- Oregon Natural Heritage Program. 2001. Rare, threatened, and endangered plants and animals of Oregon. Oregon Natural Heritage Program, Portland, Oregon.
- Orsak, L. J. 1977. The Butterflies of Orange County, California. University of California Press, New York.
- Pendergrass, K. L., P. M. Miller, and J. B. Kauffman. 1998. Prescribed fire and the response of woody species in Willamette Valley wetland prairies. *Restoration Ecology* 6:303-311.
- Pendergrass, K. L., P. M. Miller, J. B. Kauffman, and T. N. Kaye. 1999. The role of prescribed burning in maintenance of an endangered plant species, *Lomatium bradshawii*. *Ecological Applications* 9:1420-1429.
- Pyle, R. M. 2002. The Butterflies of Cascadia. Seattle Audubon Society, Seattle, Washington.
- Schultz, C. B., and K. M. Dlugosch. 1999. Nectar and hostplant scarcity limit populations of an endangered Oregon butterfly. *Oecologia* 119:231-238.
- Scott, J. A., and P. A. Opler. 1975. Population biology and adult behavior of *Lycaena xanthoides* (Lycaenidae). *Journal of the Lepidopterists' Society* 29:63-66.
- Severns, P. M. 2003. The effects of a fall prescribed burn on *Hemileuca eglanterina* Boisduval (Saturniidae). *Journal of the Lepidopterists' Society* 57:137-143.
- Shapiro, A. M. 1974. The butterfly fauna of the Sacramento Valley, California. *Journal of Research on the Lepidoptera* 13:73-82, 115-122, 137-148.
- Taylor, T. H. 1999. Long-term vegetation response to fire of Willamette Valley wet prairie species. M.S. Thesis, University of Oregon, Eugene.
- Wilson, M. V., T. Erhart, P. C. Hammond, T. N. Kaye, K. Kuykendall, A. Liston, A. F. Robinson, Jr., C. B. Schultz, and P. M. Severns. 2003. Biology of Kincaid's lupine (*Lupinus sulphureus* ssp. *kincaidii* [Smith] Phillips), a threatened species of western Oregon native prairies. *Natural Areas Journal* 23:72-83.

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