Valley Elderberry Longhorn Beetle

(Desmocerus californicus dimorphus)

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Legal Status

Federal: Threatened; proposed for delisting (USFWS 2006).

State: None.

Global and State Conservation Status: G3T2S2: Global Rank, G3 = Vulnerable: At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors. T-Rank, T2 = Same rank as state rank, limited only to the status of the subspecies within its range. State Rank, S2 = Imperiled: Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state.

Recovery Plan: None.

Species Description and Life History

The valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) (hereafter referred to as VELB) is an atypical lepturine, the Lepturinae is a subfamily of the Cerambycidae (longhorn beetle family). Elderberry beetles are separated from all other lepturines by the form of the mandibles, which are broad and short, without internal pubescence (Linsley and Chemsak 1972). Originally described by Horn (1881), VELB is black in color, with red to orange margins on the elytra (wing covers), which fades to yellow after death. The pronotum (plate behind the head) is smooth, with confluent punctuations. The elytra are densely punctate or rugose. Adult beetles range from 14 to 25 mm (0.55 to 0.98 in) in length (Linsley and Chemsak 1972).

The VELB was described as a separate species by Fisher (1921) and was reduced to subspecific status by Doane *et al.* (1936). The majority of male VELB can be separated from other subspecies by the short, suberect, pale setae (bristle or hair-like structures) on the antennae (as opposed to dark setae) and the black markings on each forewing (Linsley and Chemsak 1972). The female VELB cannot be separated morphologically from other subspecies.

Female VELBs lay between 8 and 20 eggs in bark crevices on the host plant and produce only one generation per year (Burke 1921; Barr 1991). The host plant is the elderberry (*Sambucus mexicana, S. caerulea, S. racemosa, S. glauca*) (Burke 1921; Linsley and Chemsak 1972, 1997; Barr 1991). The eggs, which are white initially then darken to a reddish brown, are 3.5 to 1.25 mm (0.14 to 0.05 in) in diameter; oblong with a small knob

at each end; and have wavy, longitudinal ridges (Burke 1921; Barr 1991). The egg is attached to the shrub by a thin secretion, and the larva encloses within 30 to 40 days (Burke 1921).

The newly emerged larvae bore into the wood of the host plant (Linsley and Chemsak 1972; Barr 1991). Burke (1921) and Eya (1976) reported that the larvae take 2 years to mature; however, Halstead (1991) believes that 1 year is the norm. The larva typically bores into the central pith of stems and feeds there; however, on large trunks, the larvae feed on the wood (Burke 1921). The larvae create an elongated, longitudinal gallery through the heart of the stems, filling it with debris and shredded wood (Barr 1991). When the larva is ready to pupate, it chews a circular to slightly oval exit hole (7 to 10 mm [0.28 to 0.39 in] in diameter) to the outside, which it plugs with frass. Then the larva backs up into the gallery and constructs a pupal chamber out of shredded wood and frass (Barr 1991). Jones & Stokes (1985, 1986, 1987a, 1987b) and Halstead (1991) reported that 70 percent of exit holes are within 1.2 m (3.9 ft) of the ground in stems greater than 13 mm (0.51 in) in diameter; however, holes may be as high as 3 m (10 ft) above the ground (Barr 1991). Pupae can be found between January and April, and the pupal stage lasts about 1 month (Burke 1921).

After pupation, the adult remains in the pupal cell for several weeks prior to emergence (Burke 1921). The adult eventually emerges from the pupal chamber, through the exit hole (Barr 1991). The adults readily fly from shrub to shrub. VELB is most often seen on, in, or immediately under the host plant's flowers. However, copulation occurs on the lower parts of the stems (Barr 1991). The adults feed on the leaves (Linsley and Chemsak 1972; Barr 1991; Talley *et al.* 2006) and are active from March to early June.

Habitat Requirements and Ecology

The VELB is completely dependent on its host plant, the elderberry (Linsley and Chemsak 1972, 1997; Eng 1984; Barr 1991; Collinge *et al.* 2001). This shrub is a component of riparian forests throughout the Central Valley. Although this shrub occasionally occurs outside riparian areas, shrubs supporting the greatest beetle densities are located in areas where the shrubs are abundant and interspersed among dense riparian forest, including Fremont cottonwood (*Populus fremontii*), box elder (*Acer negundo*), California sycamore (*Platanus racemosa*), California walnut (*Juglans californica*), white alder (*Alnus rhombifolia*), willow (*Salix* spp.), button willow (*Cephalanthus occidentalis*), Oregon ash (*Fraxinus latifolia*), wild grape (*Vitis californica*), California hibiscus (*Hibiscus californica*), and poison oak (*Toxicodendron diversilobum*) (Barr 1991, USFWS 1999, Collinge *et al.* 2001). Isolated elderberry shrubs separated from contiguous habitat by extensive development are not typically considered to provide viable habitat for VELB (USFWS 1998, Collinge *et al.* 2001).

Elderberry savannah was a habitat type that was previously more extensive in the California Central Valley but now is limited to the confluence area of the American River, which is outside the Plan Area (Jones & Stokes 1985, 1986, 1987a, 1987b; Barr 1991; USFWS 1984, 1999), and the VELB was probably a component of this habitat.

Therefore, potential VELB habitat is defined as stands of elderberry shrubs that are adjacent to, or contiguous with, riparian forest, floodplains, or relict elderberry savannah.

There are no known diseases that are considered a source of mortality for VELB. Numerous species of Cleridae (checkered beetles), Cucujidae (flat bark beetles), Ostomatidae (bark-gnawing beetles), Elateridae (click beetles), Asilidae (robber flies), Phymatidae (ambush bugs), Reduviidae (assassin bugs), and some Thysanoptera (thrips) are known predators of Cerambycid beetles (Linsley 1961). All are common in the Central Valley, but none have been reported feeding on VELB.

Birds that hunt insect larvae in wood, such as woodpeckers, creepers, and nuthatches, may also predate upon VELB but no observations of this have been reported. Due to the VELB's warning colors, birds may not take adult beetles. Whether these warning colors are genuine or represent Batesian mimicry is unknown.

Species Distribution and Population Trends

Distribution

Desmocerus californicus is one of three species of *Desmocerus* in North America. VELB is one of two subspecies of *D. californicus*. One subspecies is widespread in coastal California, ranging from Mendocino County southward to western Riverside and northern San Diego Counties, and into the southern Sierra Nevada range (Kern and Tulare Counties).

The VELB subspecies is a narrowly defined, endemic taxon, limited to portions of the Central Valley (USFWS 1999, USFWS 2006). Studies to assess the distribution and extent of the valley subspecies began in the late 1970s (Eya 1976), and the USFWS proposed the species for listing in 1978. Since VELB was listed in 1980 (USFWS 1980), numerous distributional studies have been conducted (summarized in Talley *et al.* 2006). This subspecies is endemic to California, occurring below 900 m (2,953 ft) elevation (USFWS 1999).

In the Central Valley of California, VELB was first collected from "Sacramento, CA," the precise location unknown (Fisher 1921). Additional material was identified from Putah Creek in Solano and Yolo Counties and from along the Lower American River in Sacramento County (Linsley and Chemsak 1972). Linsley and Chemsak (1972) also reported a single female from the Merced River; however, since the females cannot be separated to subspecific level, the identification is unverified.

Subsequent to various surveys throughout the California Central Valley, the USFWS (1999) prepared a map of the presumed range of VELB. This map encompasses the entire California Central Valley and the Sacramento River Delta below 900 m (2,953 ft) elevation.

In Yolo County, numerous records of occupied and potential VELB habitat occur throughout the Sacramento River corridor (Eya 1976; Jones & Stokes 1985, 1986, 1987a, 1987b; USFWS 1984; Barr 1991; Collinge *et al.* 2001; CNDDB 2000), as well as along Putah Creek from Monticello Dam east to Davis (Eya 1976, USFWS 1984, Barr 1991, Collinge *et al.* 2001, CNDDB 2005) and along Cache Creek (Barr 1991, CNDDB 2005). However, because comprehensive surveys for VELB in Yolo County have not been conducted and because known occurrences throughout the species' range are based mostly on incidental observations (e.g., CNDDB), the population size and locations of this species in the Yolo NCCP study area are not fully known. Few surveys focused on VELB have been conducted within and adjacent to Yolo County, and the total extent of potential habitat is unknown. Within and adjacent to Yolo County exist several preserves, parks, and mitigation banks that support VELB occurrences, including the Lake Solano Park and the American River Parkway.

Population Trends

Habitat occupied by VELB tends to form and exist in riparian corridors and on the level open ground of periodically flooded river and stream terraces and floodplains. This geomorphic setting historically has been desirable for agricultural, urban, or industrial development. As a result, much of this habitat type has been converted through dams and levees for use as developable land. Although it has been estimated that 90 percent of California riparian habitat has been lost over the last century and a half (Smith 1980, Barr 1991, Naiman *et al.* 1993, Naiman and Décamps 1997), these losses are difficult to accurately quantify in terms of direct VELB habitat losses (Talley *et al.* 2006). Therefore, an unknown amount of riparian forest and elderberry savannah habitat has been lost and an unknown number of VELB populations as well (Collinge *et al.* 2001). Due to current pressures from increasing human populations in California, more VELB habitat is being encroached on and affected throughout the species' range.

Threats to the Species and Other Conservation Issues

The greatest historic threat to VELB has been the elimination, loss, or modification of its habitat by urban, agricultural, or industrial development and other activities that reduce or eliminate its host plants (Talley *et al.* 2006). While mitigation and restoration actions do not come close to restoring the enormous amount of lost habit lost in the more remote past they appear to be adequate for current levels of impact (Talley *et al.* 2006). However Talley *et al.* (2006) observed that the quality and persistence of mitigation and restoration efforts are uncertain and that there have been declines in the total number of VELB-occupied sites and in the number of riparian sites. Talley *et al.* (2006) also noted that the information included in reports is often unusable making assessments of mitigation and restoration success difficult.

The greatest current threat to VELB is from the invasive non-native Argentine ant (*Linepithema humile*) and European earwig (*Forficula auricularia*) (Talley *et al.* 2006). The non-native invasive Argentine ant has been observed attacking and killing VELB larvae. The ants enter the exit hole that the beetle makes prior to pupation and remove

the larva (Huxel 2000; Huxel *et al.* 2003). Given that the invasion of riparian systems by Argentine ant in the Central Valley is continuing to spread, it is unclear how the invasion will impact VELB, but it appears that the Argentine ant may have caused the disappearance of some populations (Talley *et al.* 2006). Field bait and trapping experiments have determined that Argentine ant has been introduced widely through mitigation plantings and irrigation (Klasson *et al.* 2005). Irrigation plays a major role in Argentine ant's rate and distance of dispersal in other ecosystems (Menke and Holway 2006). Those data also suggest that there may be a threshold of Argentine ant density above which VELB is extirpated from a site (Klasson *et al.* 2005). If confirmed, this would be a serious threat to VELB's recovery because once VELB is extirpated from a site recolonization is unlikely (Talley *et al.* 2006). The non-native invasive European earwig is also considered to be a threat to VELB through direct predation or by supporting higher populations of predators of insects (Talley *et al.* 2006), and earwig populations are also significantly larger in mitigation plantings and irrigated areas (Klasson *et al.* 2005).

Non-native invasive plant species such as black locust (*Robinia pseudoacacia*), giant reed (*Arundo donax*), red sesbania (*Sesbania punicea*), Himalaya blackberry (*Rubus armeniacus*), tree of heaven (*Ailanthus altissima*), Spanish broom (*Spartium junceum*), Russian olive (*Eleagnus angustifolia*), edible fig (*Ficus carica*), and Chinese tallowtree (*Sapium sebiferum*), may have significant indirect impacts on VELB by impacting elderberry shrub vigor and recruitment (Talley *et al.* 2006). It is also predicted that ripgut brome (*Bromus diandrus*), foxtail barley (*Hordeum murinum*), *Lolium multiflorum*, and yellow starthistle (*Centaurea* solstitialis) may increase seedling mortality through competition for light and water or through increased fire return intervals (Talley *et al.* 2006).

The taxonomic status of VELB was questioned by Halstead (1991) and Halstead and Oldham (2000). However, in a reanalysis of that data in support of the 5-year status review, Talley *et al.* (2006) found that it supported a distinct biomodal distribution separation between CELB and VELB. That analysis also found that there appeared to be some interbreeding where there is contact between the two subspecies and molecular genetic study would be required to completely describe their distributions Talley *et al.* 2006).

Long term data regarding site persistence, population size and dynamics, extirpation, and recolonization are also lacking as are estimates regarding the minimum self-sustaining population size, riparian forest corridor size, or habitat complex size for VELB or other riparian forest organisms.

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Photo Credit: Theresa Sinicrope Talley, UC Davis

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