

D. Animal Species of Concern

1. Midvalley Fairy Shrimp (*Branchinecta mesovallensis*)

a. Description and Taxonomy

Taxonomy.—The midvalley fairy shrimp (*Branchinecta mesovallensis*) was only recently described by Belk and Fugate (2000). The species was named for its limited range in the Central Valley of California. The type locality is on the Virginia Smith Trust land in Merced County, California (Belk and Fugate 2000). Midvalley fairy shrimp specimens had been collected as early as 1989.

Description and Identification.— The midvalley fairy shrimp is characterized by relatively simple male antennae, lacking spines or protuberances. Male midvalley fairy shrimp range in length from 12 to 20 millimeters (0.5 to 0.8 inch), and females range from 7 to 20 millimeters (0.3 to 0.8 inch), measured from the front of the head to the tip of the cercopods (Belk and Fugate 2000).

Male midvalley fairy shrimp are most similar in appearance to the Conservancy fairy shrimp (Belk and Fugate 2000). These species are distinguished by the shape of the tip of their antennae. The midvalley fairy shrimp's antennae are bent such that the larger of the two humps possessed by both species is anterior, whereas the larger hump is posterior in the Conservancy fairy shrimp. Females of these two species differ in the shape of their brood pouches. The brood pouch of the midvalley fairy shrimp is pyriform, opens terminally, and extends to below segments 3 and 4. The brood pouch of the Conservancy fairy shrimp is fusiform and extends to below segments 5 and 7. Midvalley fairy shrimp females also closely resemble the vernal pool fairy shrimp, except that vernal pool fairy shrimp females have a pair of dorsolateral processes on each side of thoracic segment 3, whereas the midvalley fairy shrimp does not have any dorsolateral processes on this thoracic segment.

b. Historical and Current Distribution

Historical Distribution.—Although the historical distribution of the midvalley fairy shrimp is unknown, vernal pool habitats in the regions where it is currently known to occur have been dramatically reduced since pre-agricultural times (Holland 1998). The habitat of the midvalley fairy shrimp may have been even more severely reduced than other vernal pool habitats since it can occur in swales and short lived pools that may escape detection in dry years or during the dry season (Helm 1999, Belk and Fugate 2000).

Current Distribution.—The midvalley fairy shrimp is endemic to a small portion of California’s Central Valley (**Figure II-39**). Helm (1998) found midvalley fairy shrimp in less than 0.5 percent of the vernal pools he examined. Based on the few known occurrences, the species’ distribution is apparently limited to the Southeastern Sacramento, Southern Sierra Foothill, San Joaquin, and Solano-Colusa Vernal Pool Regions. In the Southeastern Sacramento region, most occurrences are clustered around the City of Sacramento and Mather Air Force Base in Sacramento County. In the Southern Sierra Foothills and San Joaquin Vernal Pool Regions, the midvalley fairy shrimp has been documented in the vicinity of the Virginia Smith Trust property in Merced County and from isolated occurrences in San Joaquin, Madera, and Fresno Counties. However, because this species was described only recently, it is likely additional occurrences will be found in the future.

c. Life History and Habitat

Life History.—The life cycle of the midvalley fairy shrimp is well suited to the unpredictable conditions of vernal pool habitats. The midvalley fairy shrimp can mature and reproduce very rapidly; it has been observed to reach maturity in as little as 8 days and reproduction was observed in as few as 16 days after hatching (Helm 1998). Under the culturing conditions described in Helm (1998), the midvalley fairy shrimp lived for 147 days, about as long as other Central Valley species observed. Multiple hatchings of the midvalley fairy shrimp have been observed in a single rainy season as its vernal pool habitat repeatedly fills and dries. Helm (1998) found the midvalley fairy shrimp to be very tolerant of warm water, occurring in pools with water temperatures ranging from 5 to 32 degrees Celsius (41 to 89 degrees Fahrenheit). This temperature is higher than that measured for any other Central Valley fairy shrimp except for the California fairy shrimp. Little is known about the midvalley fairy shrimp’s tolerance to variations in water chemistry, but it has been found in some relatively alkaline pools (Helm 1998).

Habitat.—The midvalley fairy shrimp has been found in small, short-lived vernal pools and grass-bottomed swales ranging from 4 to 663 square feet (0.37 to 61.6 square meters) in area and averaging less than 4 inches (10 centimeters) in depth (Helm 1998). The species has been collected from pools on a volcanic mudflow landform of the Merhten Formation in Pentz Gravelly Loam and Raynor Clay soils. The midvalley fairy shrimp has also been found on San Joaquin Silt Loam soils on the Riverbank formation on Low Terrace landforms. At the time the type specimens were collected, the dominant macrophytes in the pool were the wetland grasses *Lolium multiflorum*, *Hordeum maximum gussoneanum* and *Deschampsia danthanooides*, species that are characteristic of extremely short-lived pools and swales.

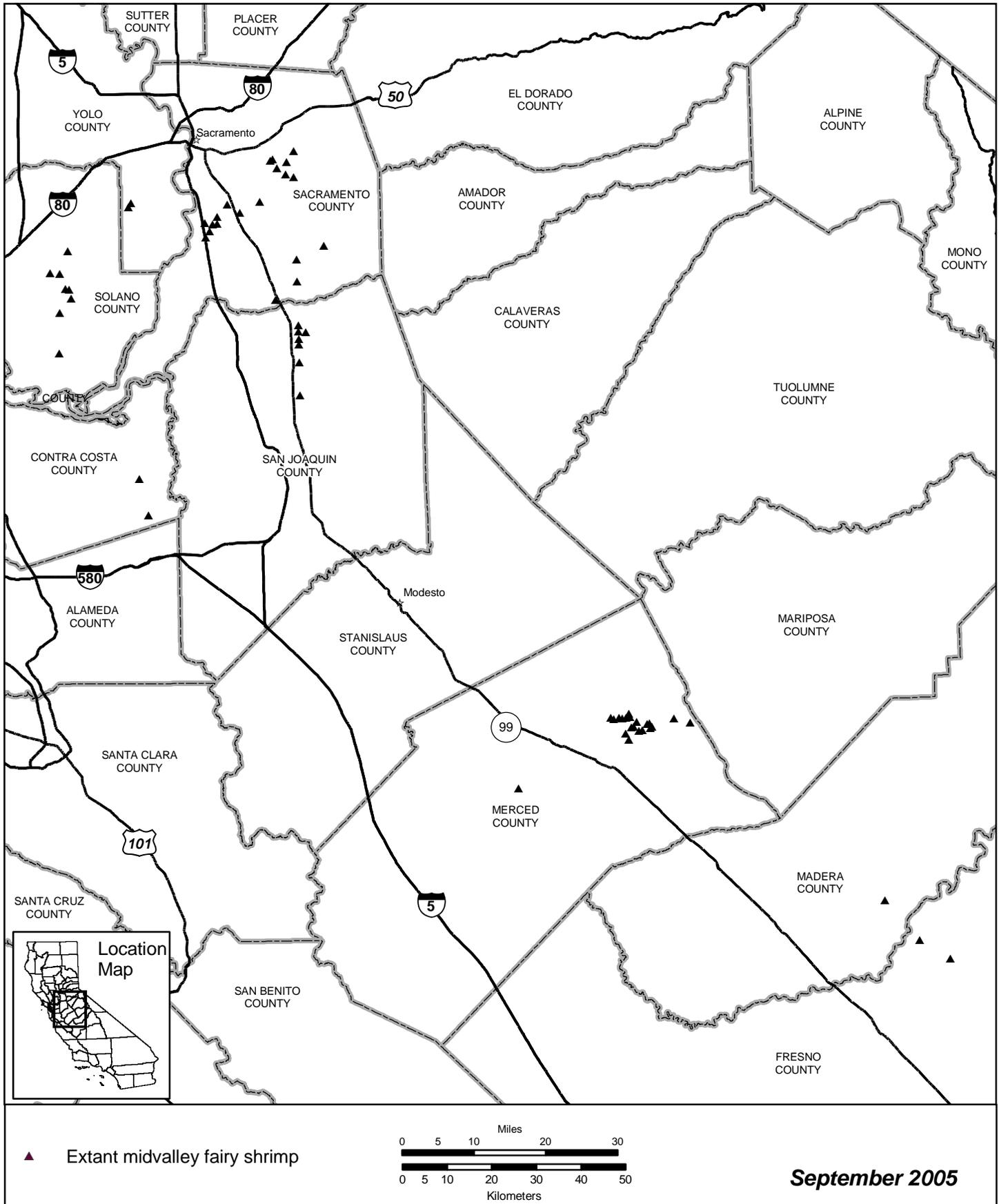


Figure II-39. Distribution of midvalley fairy shrimp (*Branchinecta mesovallensis*).

Community Associations.—The midvalley fairy shrimp has only been collected with one other fairy shrimp, the vernal pool fairy shrimp (Eriksen and Belk 1999). It may occupy habitats that are not inundated long enough for other species to inhabit.

d. Reasons for Decline and Threats to Survival

Most species addressed in this recovery plan are threatened by similar factors because they occupy the same vernal pool ecosystems. These general threats, faced by all the covered species, are discussed in greater detail in the Introduction section of this recovery plan. Additional, specific threats to midvalley fairy shrimp are described below.

Continued conversion of the grassland-vernal pool ecosystem matrix to urban or agricultural uses, and associated hydrological changes, is the largest threat to survival of the midvalley fairy shrimp. The small depressions in which midvalley fairy shrimp typically reside require less preparation prior to conversion to urban or agricultural uses because they are already relatively level, and thus may be more attractive to developers. During the wet season, they may not contain water continuously, even when nearby larger pools are full. Under these conditions, midvalley fairy shrimp pools may not be surveyed at all, and conversion may proceed without the required regulatory review.

Although the Act affords incidental protection to midvalley fairy shrimp where they co-exist with listed species, none of those listed species, except vernal pool fairy shrimp, have been found to co-occur with midvalley fairy shrimp in the same vernal pools (Eriksen and Belk 1999). Additionally, the co-occurrence with vernal pool fairy shrimp is believed to be a result of overland flow in a heavy precipitation event and not as a result of overlapping habitat requirements. Biological surveys are often inadequate and project proponents may miss detection of midvalley fairy shrimp due to its ability to occur in shallow pools which are inundated for short periods. In instances where co-existence of listed species and midvalley fairy shrimp are documented in the same complex, although there may be incidental protection, there is no consultation requirement to avoid take or minimize effects of the action on the midvalley fairy shrimp. The largest number of known locations are in Merced County and Sacramento County. The City of Sacramento is growing rapidly, thus threatening the continued existence of occurrences in the sphere of growth. Urban expansion in eastern Merced County also poses a threat to many midvalley fairy shrimp populations.

e. Conservation Efforts

Of the 53 midvalley fairy shrimp occurrences in the California Natural Diversity Data Base (2003), roughly 19 (36 percent) are directly threatened by proposed development projects, while 22 (41.5 percent) are on protected lands. The protected lands include two National Wildlife Refuges, several vernal pool mitigation banks, a California Department of Fish and Game ecological reserve, and several Nature Conservancy conservation easements. Sacramento and Merced Counties have the most threatened occurrences, with seven and five, respectively. Threats in Sacramento County mostly involve urban development projects, while the primary threat in Merced County is construction of the proposed University of California, Merced, campus. Merced County also has the highest number of protected occurrences, with a total of 14 occurrences located on lands that have been set aside for the conservation of vernal pool species. These lands are intended to function as conservation areas to offset the direct, indirect, and cumulative effects of the new university campus. Three ranches containing conservation easements held by The Nature Conservancy (totaling about 9,900 hectares [24,500 acres]) contain known midvalley fairy shrimp sightings. The easements are permanent, will generally be managed by The Nature Conservancy, and cannot be extinguished by selling the land to a new owner (J. Single *in litt.* 2003; U.S. Fish and Wildlife Service, *in litt.* 2003).

2. CALIFORNIA FAIRY SHRIMP (*LINDERIELLA OCCIDENTALIS*)

a. Description and Taxonomy

Taxonomy.—The California fairy shrimp (*Linderiella occidentalis*) was first described as *Branchinecta occidentalis* by Dodds (1923) from specimens collected at Stanford University, Santa Clara County, California. Linder (1941) moved this species into the genus *Pristicephalus*, but discussed the possibility that the genus *Pristicephalus* should be absorbed into the genus *Eubbranchipus*. However, he did not have the specimens necessary to make that determination. Pennak (1953) assigned California fairy shrimp specimens to the genus *Eubbranchipus*. Brtek (1964) erected the family Linderiellidae, and placed the California fairy shrimp in the genus *Linderiella*. This taxonomic placement is still recognized (Belk and Brtek 1995). The California fairy shrimp was the only recorded species in the Family Linderiellidae in North America until 1994, when the Santa Rosa fairy shrimp (*Linderiella santarosae*) was collected and described from southern California by Thiery and Fugate (1994).

Description and Identification.—Unlike the other fairy shrimp addressed in this recovery plan, the California fairy shrimp is a member of the family Linderiellidae. It is smaller than fairy shrimp in the family Branchinectidae, and