

CONSERVANCY FAIRY SHRIMP

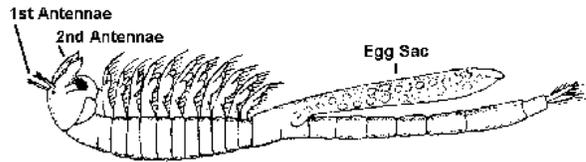
Branchinecta conservatio

USFWS: Endangered

CDFG: none

Species Account

Status and Description. The Conservancy fairy shrimp was listed as a federally Endangered Species on September 19, 1994 (59 FR 48153). The Conservancy fairy shrimp is a small crustacean in the Branchinectidae family. The species has distinctly segmented elongate bodies, large-stalked compound eyes, no carapaces (hard protective outer covers), and 11 pairs of swimming legs (Eng *et al.* 1990, Johnson and Williams 1996). Adult shrimp range between 0.6 to 1.1 inches in length (Eng *et al.* 1990). Conservancy fairy shrimp are similar in appearance to versatile fairy shrimp (*Branchinecta lindahli*). However, the female brood pouch is cylindrical and usually ends under the fourth segment in versatile fairy shrimp, while the pouch is tapered at both ends and usually ends under the eighth abdominal segment in the conservancy fairy shrimp (USFWS 2001, Johnson and Williams 1996). Both species have a similar large, oval pulvillus at the proximal end of the basal segment of the male antenna, but the ends of the antennae segments furthest from the body of the conservancy fairy shrimp are distinctive (Eng *et al.* 1990). The second pair of antennae in adult females are cylindrical and elongate. The males' second antennae are enlarged and specialized for clasping females during copulation.



Range, Populations and Activity. The historic range of the Conservancy fairy shrimp likely occurred throughout the Central Valley of California. Conservancy fairy shrimp populations are presently known from eight localities: Vina Plains, Tehama County; south of Chico, Butte County; Jepson Prairie and near the Potrero Hills, Solano County; Sacramento National Wildlife Refuge, Glenn County; Tule Ranch unit of the CDFG Yolo Basin Wildlife Area, Yolo County; the Mapes Ranch in Stanislaus County; Flying M Ranch, Ichord Ranch, and Virginia Smith Trust lands, Merced County; and Los Padres National Forest, Ventura County (USFWS 1999; USFWS 2005; Eriksen and Belk 1999).

Female Conservancy fairy shrimp carry their eggs in an oval or elongate brood sac on their abdomen. Eggs are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks (Federal Register 1994). Resting (summer) eggs are known as cysts and are capable of withstanding heat, cold, and prolonged dry periods. The cyst bank in the soil may be comprised of cysts from several years of breeding (Donald 1983). As the vernal pools refill with rainwater, in the same or subsequent seasons, some of the cysts may hatch. Early stages of fairy shrimp develop rapidly into adults. The shrimp take an average of 49 days to reach maturity (Helm 1998). These non-dormant populations often disappear early in the season, long before the vernal pools dry up (Federal Register 1994). The species is mostly observed from November to early April (Federal Register 1994). The Conservancy fairy shrimp is usually collected at cool temperatures and are relatively long-lived (Simovich *et al.* 1992, Federal Register 1994). In a study by Helm (1998), the species had an average life span of 123 days.

The diet of Conservancy fairy shrimp consists of algae, bacteria, protozoa, rotifers, and bits of organic detritus (Pennak 1989). The Conservancy fairy shrimp is a prey species for the vernal pool tadpole

shrimp (Alexander and Schlising 1997), as well as a variety of insect and vertebrate predator species (USFWS 2005).

Conservancy fairy shrimp swim or glide upside down by means of beating movements that pass along their 11 pairs of swimming legs in a wave-like motion from head to tail.

Habitat Use and Species Associations. Conservancy fairy shrimp inhabit ephemeral or temporary pools of somewhat turbid fresh water (vernal pools) that form in the cool, wet months of the year (Johnson and Williams 1996). Fairy shrimp are not known to occur in permanent bodies of water, and are dependent upon seasonal fluctuations in their habitat, such as the absence or presence of water during specific times of the year (Johnson and Williams 1996). They have been observed in pools ranging from 30 to 356,253 square meters, with a mean size of 27,865 square meters. The pools inhabited by the Conservancy fairy shrimp are typically large, such as the 36 hectare (89 acre) Olcott Lake at Jepson Prairie (Federal Register 1994). At the Jepson Prairie, the Conservancy fairy shrimp is found in large playa-like depressions on deep alluvial soils of Pescadero Clay Loam on Basin Rim landforms (USFWS 2005). The pools at Jepson Prairie and Vina Plains inhabited by the Conservancy fairy shrimp have neutral pH, very low conductivity, total dissolved solids (TDS), and alkalinity (Barclay and Knight 1984, Eng *et al.* 1990). Conservancy fairy shrimp have been found at elevations ranging from 5 to 1,700 meters (Eriksen and Belk 1999), and at water temperatures as high as 23 degrees celsius (Syrdahl 1993).

Conservancy fairy shrimp co-occur with several other vernal pool crustacean species, including other special status species such as vernal pool fairy shrimp and vernal pool tadpole shrimp (King *et al.* 1996, Helm 1998, Eriksen and Belk 1999). Although these species may all be found at one location, they have rarely been collected from the same pool at the same time (Eriksen and Belk 1999). Conservancy fairy shrimp generally have very large populations within a given pool, and is usually the most abundant fairy shrimp when more than one species is present (Helm 1998, Eriksen and Belk 1999). The Conservancy fairy shrimp also co-occurs with special status vernal pool plants, including Colusa grass (*Neostapfia colusna*) and various species of orcutt grass (*Orcuttia* spp.) (USFWS 2005).

Population Levels and Occurrence in Plan Area. Conservancy fairy shrimp occur exclusively within large playa type vernal pools in the Valley Grasslands and Vernal Pools Natural Community. Conservancy fairy shrimp are known primarily from the Jepson Prairie area within Solano County, including the Jepson Prairie Preserve and the potential Muzzy and Gridley mitigation banks. The common name for the species was selected to honor The Nature Conservancy for their important conservation efforts in protecting the vernal pool habitats on the Jepson Prairie and Vina Plains where this species was first discovered. Additional records of the Conservancy fairy shrimp are from the large vernal pools lying along the base of the Potrero Hills and one location near Collinsville. Suitable large pool habitat is also present in northeast Fairfield/north of Travis AFB although the Conservancy fairy shrimp has yet to be documented there. Well over 20 records of this species are occurrences within the Plan Area. (See Species Occurrence map.)

Population levels are unknown and difficult to quantify, but in suitable, large pool habitats, most fairy shrimp at times can occur in “great numbers” (Eriksen and Belk 1999).

Dispersal. Historically, Conservancy fairy shrimp might have dispersed via large cysts scale flood events that allowed the species to colonize different individual pool or pool complexes (USFWS 1999). Urban development and the construction of dams, levees, and other flood control measures

have limited this dispersal method. Waterfowl and shorebirds, which ingest and/or transport the cysts while attached to their legs or feathers to new habitats (Krapu 1974, Swanson *et al.* 1974, Driver 1981, Ahl 1991), are likely the shrimp's primary dispersal agent (Brusca, in. litt., 1992, King, in. litt., 1992, Simovich, in. litt., 1992).

The ability of the species to disperse is important for the long-term survival and recovery of the species as the dispersing individuals can re-colonize areas subjected to localized extinctions.

Threats to the Species. Historically, this species is believed to have been found in vernal pool complexes throughout the Central Valley. According to Holland (1978), between 67 and 88% of vernal pool habitat in the Central Valley was lost by 1973. The Service's analysis of Holland's report determined a more accurate historic loss estimate of 60 to 85% (USFWS 1999). Since 1973, several more acres of Conservancy fairy shrimp habitat, which are seasonal vernal pools, have been lost or altered by human activities. Between 1987 and 1992, 467 acres of wetlands in the Central Valley, the majority of which were vernal pools, were filled (USFWS 1992). Holland (1999) estimated the average rate of loss of vernal pool habitat in California was 1.4% per year in the late 1980s to mid 1990s.

Rapid urbanization of the Central Valley of California currently poses the most severe threat to the species (USFWS 2001). For example, remaining Conservancy fairy shrimp populations are threatened by Caltrans highway expansion in Butte County, urban expansion in Fairfield and Vacaville in Solano County, and indirect and cumulative effects associated with the development of the University of California, Merced campus in Merced County (USFWS 2005). Habitat loss and alteration due to water supply and flood control projects, agriculture, and agricultural conversions (e.g., rangeland to leveled, irrigated crops, vineyards, or orchards) are also major threats to the species' existence. Other threats to the shrimp include off-road vehicle use, certain mosquito abatement measures, pesticides/herbicide use, alterations in vernal pool hydrology, fertilizer contamination, invasive non-native plants, gravel mining, and contaminated stormwater runoff (USFWS 1999). The primary threats to the conservancy fairy shrimp in the County are urban development, agricultural conversions, agricultural use, and water supply and flood control projects. State and local laws and regulations have not been passed to protect the shrimp and other regulatory mechanisms have proven ineffective (USFWS 1999).

These factors have resulted in the isolation and fragmentation of habitats, often precluding dispersal between populations or sub-populations. This fragmentation results in small isolated populations. Ecological theory suggests that these populations could be highly susceptible to extinction due to chance events, inbreeding depression, or additional environmental disturbance (Gilpin and Soule 1986, Goodman 1987a,b). Should extinction occur in a population that has been fragmented, the opportunities for recolonization could be greatly reduced due to geographical isolation from other populations (USFWS 2001).

Conservation Issues. The Conservancy fairy shrimp is protected at many locations where it occurs, including: the Vina Plains preserve, Tehama County; the Jepson Prairie Preserve, Solano County; the Sacramento National Wildlife Refuge, Glenn County; the Tule Ranch unit of the CDFG Yolo Basin Wildlife Area, Yolo County; and the Grasslands Ecological Reserve, the Arena Plains National Wildlife Refuge and the San Luis National Wildlife Refuge, Merced County. Although Conservancy fairy shrimp populations are protected at these sites, specific management and monitoring does not occur at many of them, including the Jepson Prairie (USFWS 2005).

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