

recorded in California Natural Diversity Data Base occurrences (California Natural Diversity Data Base (2003). The Madera Irrigation District manages this property, which is owned by the U.S. Bureau of Reclamation (Stebbins *et al.* 1995).

10. *ORCUTTIA PILOSA* (HAIRY ORCUTT GRASS)

a. Description and Taxonomy

Taxonomy.—Hairy Orcutt grass is in the tribe Orcuttieae of the grass family Poaceae (Reeder 1965). Hoover (1941) published the original scientific name *Orcuttia pilosa* for hairy Orcutt grass, which has remained unchanged since. He collected the type specimen in Stanislaus County, “12 miles east of Waterford” (Hoover 1941) in 1937. Hoover (1937) initially identified that specimen as *Orcuttia tenuis*, but later recognized that it represented a new species (Hoover 1941). This species also has been known by the common names hairy Orcuttia (Smith *et al.* 1980) and pilose Orcutt grass (U.S. Fish and Wildlife Service 1985c).

Description and Identification.—Characteristics shared among all members of the tribe or among species in the genus *Orcuttia* are described above in the *Neostapfia colusana* and *O. inaequalis* species accounts. *Orcuttia pilosa* grows in tufts consisting of numerous stems. The stems are decumbent or erect and branch from only the lower nodes. Stems are 5 to 20 centimeters (2.0 to 7.9 inches) long and 1 to 2 millimeters (0.04 to 0.08 inch) in diameter (Stone *et al.* 1988). Almost the entire plant is pilose (bearing long, soft, straight hairs), giving it a grayish appearance. The terrestrial leaves are 3 to 6 millimeters (0.12 to 0.24 inch) wide. The inflorescence is 5 to 10 centimeters (2.0 to 3.9 inches) long and contains between 8 and 18 flattened spikelets. The spikelets near the tip of the inflorescence are crowded together, whereas those near the base are more widely spaced. Each spikelet consists of 10 to 40 florets and two tiny (3 millimeters [0.12 inch]) glumes. The lemmas are 4 to 5 millimeters (0.16 to 0.20 inch) long, with five teeth of equal size. Each caryopsis is 1.75 to 2 millimeters (0.07 to 0.08 inch) long (Hoover 1941; Reeder 1982, 1993) and weighs 0.46 to 0.95 milligram (1.6 to 3.4×10^{-5} ounce) (Griggs 1980). *Orcuttia pilosa* has a diploid chromosome number of 30 (Reeder 1982).

Orcuttia pilosa is most likely to be confused with *O. tenuis*. However, *O. pilosa* has broader stems and leaves, branches originating from the lower nodes, smaller spikelets that are crowded near the rachis tip, smaller grains, a later flowering period, and a different chromosome number (Reeder 1982). Other *Orcuttia* species typically have unequal lemma teeth and differ in seed size and chromosome number from *O. pilosa* and *O. tenuis* (Reeder 1982).

b. Historical and Current Distribution

Historical Distribution.—Prior to the surveys by Stone *et al.* (1988), *Orcuttia pilosa* had been reported from 25 sites, primarily in the Northeastern Sacramento Valley and Southern Sierra Foothills Vernal Pool Regions (Keeler-Wolf *et al.* 1998) (**Figure II-14**). These included eight occurrences each in Tehama and Stanislaus Counties, six in Madera County, and two in Merced County (Hoover 1941, Crampton 1959, Reeder 1982, Stone *et al.* 1988, California Natural Diversity Data Base 2003). *Orcuttia pilosa* also was collected in the Solano-Colusa Vernal Pool Region, Glenn County, in 1937 (California Natural Diversity Data Base 2003); the specimen has since been lost, but may have originally been misidentified as California Orcutt grass (Oswald and Silveira 1995, J. Silveira pers. comm. 1997, J. Silveira *in litt.* 2000). During the late 1980s, Stone *et al.* (1988) determined that 12 historical occurrences had been extirpated, but they and others discovered 3 additional populations in Madera, Stanislaus, and Tehama Counties. One other occurrence from Madera County (California Natural Diversity Data Base Element Occurrence 29) was previously considered to be *O. pilosa* and is still listed as such in the California Natural Diversity Data Base (2003); however, this population has been identified as *O. inaequalis* (R. Stone *in litt.* 1992).

Current Distribution.—Within about the last decade, 10 new natural occurrences of *Orcuttia pilosa* have been discovered: 5 in Madera County, 4 in Tehama County, and 1 in Stanislaus County (California Natural Diversity Data Base 2005). *Orcuttia pilosa* also has been discovered in another pool at the Vina Plains Preserve in Tehama County (Alexander and Schlising 1997); this pool may represent a separate occurrence or it may be an extension of California Natural Diversity Data Base Element Occurrence 25. In addition, this species has been introduced into a re-created pool in Madera County (Durgarian 1995, Stebbins *et al.* 1995, California Natural Diversity Data Base 2005).



Figure II-14. Distribution of *Orcuttia pilosa* (hairy Orcutt grass).

Of the 39 Element Occurrences listed by the California Natural Diversity Data Base (2003), not counting the misidentified population of *Orcuttia inaequalis* previously mentioned, 27 natural occurrences and the introduced population are presumed to be extant (California Natural Diversity Data Base 2005).

Currently, the main area of concentration for *Orcuttia pilosa* (9 extant occurrences and 1 that is possibly extirpated) is the Vina Plains in Tehama County, which is in the Northeastern Sacramento Valley Vernal Pool Region. An isolated occurrence in central Butte County is in the same region. Eleven occurrences are in the Southern Sierra Foothills Vernal Pool Region, including nine in Madera County between the City of Madera and Millerton Lake, and two in eastern Stanislaus County. All six extant occurrences in the Solano-Colusa Vernal Pool Region are on the Sacramento National Wildlife Refuge in Glenn County (Stone *et al.* 1988, Keeler-Wolf *et al.* 1998, California Natural Diversity Data Base 2005).

c. Life History and Habitat

The life history characteristics common to all members of the Orcuttieae were presented above within the *Neostapfia colusana* discussion, and others shared by all *Orcuttia* species were described under the *O. inaequalis* discussion.

Reproduction and Demography.— Griggs (1974, as cited in Stone *et al.* 1988) found that stratification followed by temperatures of 15 to 32 degrees Celsius (59 to 90 degrees Fahrenheit) was necessary for seed germination in *Orcuttia pilosa*. Flowering individuals have been observed as early as mid-April in Madera County (Durgarian 1995). Populations observed in Glenn County began flowering at the beginning of May 1993. However, heavy rains in late May and early June of that year refilled the five pools that were being monitored, causing 80 percent to 100 percent of the plants to die before they set seed (J. Silveira *in litt.* 1997). Seed production has not been studied extensively in *O. pilosa*, but Griggs and Jain (1983) did note that one individual plant produced more than 10,000 seeds. Although the predominant pollination agent for all Orcutt grasses is wind, native bees (Halictidae) have been observed visiting the inflorescences of *O. pilosa* to gather pollen (Griggs 1974, as cited in Stone *et al.* 1988).

Like other vernal pool annuals, the size of *Orcuttia pilosa* populations fluctuates dramatically from year-to-year. Population sizes have varied by as much as four orders of magnitude over time (Griggs 1980, Griggs and Jain 1983, Alexander and Schlising 1997). In fact, two populations that had no visible plants for 3 years in succession exceeded 10,000 plants in the fourth year (Griggs 1980, Griggs and Jain 1983). However, populations that number fewer than 100 plants

in even the most favorable years are not likely to persist. They probably begin with chance dispersal events which never build up enough of a soil seed bank to become established. This phenomenon was noted at the Sacramento National Wildlife Refuge, the Vina Plains, and an unspecified location where the population consisted of six plants in 1973, dropped to zero the following year, and was considered to be extirpated when no plants reappeared by 1978 (Griggs 1980, Griggs and Jain 1983).

Densities of *Orcuttia pilosa* were determined at the Vina Plains Preserve in 1995. Among four pools where this species grew, densities ranged from 45 to 474 plants per square meter (4.2 to 44.0 plants per square foot) (Alexander and Schlising 1997). The high densities illustrate that although the total population size seems large, the individuals grow in close proximity and may actually occupy a relatively small area.

Habitat and Community Associations.— This species is found on high or low stream terraces and alluvial fans (Stone *et al.* 1988). *Orcuttia pilosa* occurs in Northern Basalt Flow, Northern Claypan, and Northern Hardpan vernal pools (Sawyer and Keeler-Wolf 1995) within annual grasslands (California Natural Diversity Data Base 2003). The median size of occupied pools measured in the late 1980s was 1.7 hectares (4.2 acres), with a range of 0.34 to 250 hectares (0.8 to 617.5 acres) (Stone *et al.* 1988). At the Vina Plains, *O. pilosa* was found growing only in pools that held water until May, June, or July in 1995, and not in those that had dried by April (Alexander and Schlising 1997). This species is known from elevations of 26 meters (85 feet) in Glenn County to 123 meters (405 feet) in Madera County (California Natural Diversity Data Base 2003). *Orcuttia pilosa* is found on both acidic and saline-alkaline soils, in pools with an iron-silica cemented hardpan or claypan. In the Northeastern Sacramento Valley Vernal Pool Region, pools supporting *O. pilosa* occur on the Anita and Tuscan soil series (Stone *et al.* 1988, California Natural Diversity Data Base 2003). At one pool in the Vina Plains that spans both Anita clay and Tuscan loam soils, *O. pilosa* was found growing primarily on the Anita clay type (Alexander and Schlising 1997). In the Solano-Colusa Vernal Pool Region, *O. pilosa* occurs on the Willows and Riz soil series (J. Silveira *in litt.* 2000), whereas in the Southern Sierra Foothills Vernal Pool Region, it occurs on the Cometa, Greenfield, Hanford, Meikle, and Whitney soil series (Stone *et al.* 1988).

Common associates of *Orcuttia pilosa* throughout its range include *Eryngium* spp. and *Plagiobothrys stipitatus*. *Orcuttia pilosa* also co-occurs at numerous sites with other rare plants addressed in this recovery plan, including *Neostapfia colusana* in the San Joaquin Valley and *Chamaesyce hooveri* and *Tuctoria greenii* in the Sacramento Valley (Stone *et al.* 1988, Alexander and Schlising 1997, California Natural Diversity Data Base 2003). Additional associates in the

San Joaquin Valley include *Trichostema lanceolatum* (vinegar weed) and *Anthemis cotula* (mayweed) (Stone *et al.* 1988). *Orcuttia pilosa* formerly occurred in one pool with *O. inaequalis* (Crampton 1959), a habitat that has since been converted to almond orchards (California Natural Diversity Data Base 2003). In the Vina Plains, other common associates of *O. pilosa* are *Marsilea vestita*, *Convolvulus arvensis*, and *Amaranthus albus* (Alexander and Schlising 1997). Both *O. pilosa* and *O. tenuis* grow on the Vina Plains, but do not occur in the same pools (Stone *et al.* 1988, Alexander and Schlising 1997). At least in 1995, the Vina Plains pools where *O. pilosa* grew had few spring-flowering annuals (Alexander and Schlising 1997).

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 *Orcuttia pilosa* are described below.

Some indications of decline (*i.e.*, California Natural Diversity Data Base description as “possibly extirpated”) for this species may have, in fact, been only artifacts of random dispersal events in which the “extirpated” populations were never well-established to begin with. In particular, two such occurrences on the Vina Plains Preserve apparently died out because the populations were too small to be viable. These occurrences involved only 2 plants at one site and fewer than 100 at the other site, and thus may have not represented truly established populations.

Nevertheless, the primary threats are continuing. In particular, agricultural and residential developments, and planning for such, are proceeding in the vicinity of the remaining Stanislaus and Madera County occurrences and may lead to the destruction of additional populations in the foreseeable future (Stone *et al.* 1988). Construction of a landfill threatens one occurrence (U.S. Fish and Wildlife Service 1997a). Cattle grazing was an ongoing land use at 20 occurrences when they were last visited, including 6 where this species may already be extirpated (California Natural Diversity Data Base 2003). Also, competition from invasive plants is believed to be an increasing problem throughout the range of *Orcuttia pilosa* (Stone *et al.* 1988). Several researchers (Stone *et al.* 1988, Alexander and Schlising 1997) have suggested that cattle may have carried in seeds of nonnative plants, and disturbance from trampling may have then facilitated their establishment. *Convolvulus arvensis* has increased in frequency in the Vina Plains since 1984, and *Xanthium strumarium* is still present. In addition, small population size continues to be a threat to *O. pilosa*. Six of the presumably extant

populations have had fewer than 100 plants at their peak (California Natural Diversity Data Base 2003).

e. Conservation Efforts

We listed *Orcuttia pilosa* as an endangered species on March 26, 1997 (U.S. Fish and Wildlife Service 1997a). *Orcuttia pilosa* had previously been State-listed as endangered in 1979 (California Department of Fish and Game 1991) and was identified as rare and endangered by the California Native Plant Society 5 years before that (Powell 1974). The California Native Plant Society still considers this species to be “endangered throughout its range” and includes it on its List 1B (California Native Plant Society 2001). In 2005, critical habitat was designated for *O. pilosa* and several other vernal pool species in *Final Designation of Critical Habitat for Four Vernal Pool Crustaceans and Eleven Vernal Pool Plants in California and Southern Oregon; Evaluation of Economic Exclusions From August 2003 Final Designation; Final Rule* (U.S. Fish and Wildlife Service 2005).

Relatively large populations of *Orcuttia pilosa* are protected at The Nature Conservancy’s Vina Plains Preserve in Tehama County (Broyles 1987, Alexander and Schlising 1997, California Natural Diversity Data Base 2003) and at our Sacramento National Wildlife Refuge in Glenn County (J. Silveira *in litt.* 1997, J. Silveira *in litt.* 2000). A small population is now protected at a California Department of Transportation mitigation site in Madera County, although that site has, at times, been degraded due to discing by the former landowner (Stebbins *et al.* 1995). The Vina Plains populations have been monitored sporadically since 1983 (Alexander and Schlising 1997) and the Sacramento National Wildlife Refuge populations since 1993 (J. Silveira *in litt.* 2000). *Xanthium strumarium*, an aggressive native plant, has been removed by hand from some of the Vina Plains pools (Alexander and Schlising 1997), an effort that began in 1991 using funds from the California Endangered Species Tax Check-Off Fund (California Department of Fish and Game 1991).

Orcuttia pilosa was one component of an interagency vernal pool re-creation program in Madera County. The experiment was funded by the California Department of Transportation, carried out on U.S. Bureau of Reclamation property, and conducted by personnel from California State University, Fresno, and the University of California, Davis (Stebbins *et al.* 1996). *Orcuttia pilosa* was seeded into nine of the re-created pools in fall 1993. Flowering individuals were found in eight of the pools the following year, six in 1995, and eight in 1996 (Durgarian 1995, Stebbins *et al.* 1996), and the species was also observed in the re-created pools in 2000 (R. Faubion *in litt.* 2000).