



Hairy Orcutt grass (*Orcuttia pilosa*) within mud-cracked bottom of a vernal pool. Photo courtesy of George W. Hartwell



This small native grass thrives in harsh conditions but produces a massive amount of seed (2019). Photo courtesy of Chad Aakre

SPECIES SPOTLIGHT: by Chad Aakre¹

Hairy Orcutt Grass (*Orcuttia pilosa*)

Hairy Orcutt grass (*Orcuttia pilosa*) is a rare grass endemic to vernal pools of the Central Valley and San Joaquin Valley of California, occurring presently within four counties and a handful of known locations. I first became familiar with this species in association with a project specifically targeting hairy Orcutt grass for restoration, enhancement, and management in Madera County. As I researched further into this species and its tribe, I have become increasingly fascinated by its tenacity to adapt and persist in harsh environments.

Hairy Orcutt grass is one of five species within the genus *Orcuttia* to occur in California; all are endemic to the State. All *Orcuttia* species are rare and endemic to California; California Rare Plant Ranking (CRPR) status 1.B.1: Rare, threatened, or endangered in California and elsewhere. Hairy Orcutt grass was likely more prevalent within the vernal pools that covered the Central Valley and San Joaquin Valley of California in the past.

Vernal pools are a type of temporary wetland and are some of the most ecologically important and distinctive areas in California. Vernal pools are depressions in areas where a hard underground layer prevents rainwater from draining downward into the subsoil. When rain fills the pools in the winter and spring, the water collects and remains in the depressions. In the springtime, the water gradually evaporates away, until the pools become completely dry in the summer and fall (CDFW 2013). The spring phase of the vernal pools in California is characterized by a very diverse set of

flora, often with a high number of native species as opposed to the surrounding areas.

Hairy Orcutt grass is currently found in two clusters: one located in Tehama and Glenn Counties, and the other in Madera County. The cluster in Northern California includes populations located at the Vina Plains Preserve, within lands managed by the Sacramento National Wildlife Refuge, and two on private lands under conservation easement. Merced and Stanislaus Counties had previously reported populations, but most are presumed extirpated. One population remains extant outside of Madera County at the Hickman vernal pools; however, its existence is fragile due to habitat conversion to year-round ponded conditions from orchard runoff. Hairy Orcutt grass germinates in saturated habitat and then persists in dry habitat for the remainder of the year. Permanent inundation has resulted in much of the Hickman populations being lost. The populations in Madera County, representing the bulk of the southern cluster, are the location of my project and recent experience.

The genus is named after the botanist who first collected it, C.R. Orcutt; a fervent botanical collector from the early 1900s whose other passion was collecting and cataloging abalone and other crustaceans. His collection of plant specimens proved important to understand the California floristic province, and his devotion to collecting was renowned (Bullard 1994).

All Orcutt grasses are endemic to vernal pool habitat and thought to be derived from an ancient lineage that evolved on the margin of a shallow inland sea that covered the length of the Central Valley

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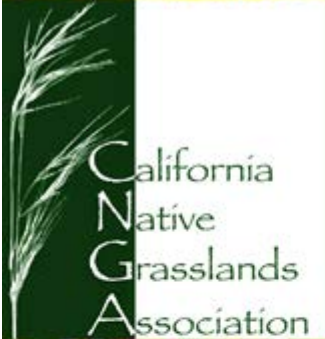
Hairy Orcutt Grass *continued*

and San Joaquin Valley during the early Tertiary Period. All Orcutt grasses are wind-pollinated, though some insect pollination may occur, including by native bees (*Halictidae* sp.), which have been observed visiting plants (Griggs 1976).

Hairy Orcutt grass germinates in standing water after vernal pools have become inundated by late fall and early winter rains. The primary leaves are a submerged basal rosette of five to eight cylindrical leaves. The secondary leaves consist of a submerged lower blade, and a flat, floating upper blade adapted to increase photosynthesis by emerging above water. This blade is crucial for developing grasses because it aids with early root development while the vernal pool is saturated. A third set of leaves develop after the pool dries up, and flowering culms form, often referred to as

terrestrial leaves. If the vernal pool becomes re-inundated with water after the terrestrial leaves have formed, high mortality typically occurs; thus, late-season rainfall events tend to have a detrimental effect on hairy Orcutt grass populations from year to year. The flowering stems become latent with seed in favorable conditions, such as slow pool desiccation and gradual drying of mud. Plants may produce no seed or very little seed in less favorable conditions where drying of the pools occurs rapidly. Favorable conditions for hairy Orcutt grass during the growing season include average, above average, or well-timed rainfall and moderate temperatures during vernal pool dry-down. These conditions present a fragility tested by erratic weather patterns and exacerbated by climate change.

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Hairy Orcutt Grass *continued*

Among other fascinating attributes, Orcutt grass species have a significant relationship with black mold, which aids germination. Research has shown that a black fungus contained within the chaff is necessary for seed germination and so “naked” seeds (i.e. seeds with no chaff) will not germinate (Birker 2018).

Hairy Orcutt grass flowers are protogynous, meaning that female flowering parts become mature and receptive well before male pollen is shed. Vernal pools, at early summer dry-down, present various ranges of age classes between the pool margin and its center. Mature dead plants containing ripe seed may be present at the margin, while the center may contain premature flowering individuals. This variability in age classes within a small area supports the theory that successful pollination occurs with a strong protogynous reproduction strategy.

Hairy Orcutt grass is tough and gritty and several interesting adaptations ensure their survival. Seed production and dispersal is an adaptation that singles out this grass from other species. They do not immediately shed their seed like most grasses. Seeds remain firmly attached to the parent plant, and senesced plants persist late into the dry season and are largely shattered and disbursed by the first heavy rains of the late fall/early winter. It is presumed that seed retention helps prevent seeds from being blown into the surrounding unfavorable upland grasslands adjacent to vernal pools. They also produce an enormous amount of seed — up to 10,000 seeds on a single plant (Griggs 1980). Thus, favorable years likely result in a massive amount of seed production and add to the seed bank in the soil, buffering some of the fragilities of the species, including years of low seed production and high mortality.

Hairy Orcutt grass does not tolerate heavy competition from other plants. It commonly occurs in the deepest portions of vernal pools with a relatively long inundation period and low soil depth (shallow hardpan). This niche suggests that shallow soils and harsh environments play an important role in reducing plants that are competitive with this species. Another interesting adaptation of hairy Orcutt grass and other members of the genus is that they produce a secretion that is extremely acidic and is initially aqueous, becoming viscous and brown as the plant matures. The secretion helps deter predation from grasshoppers, grazing animals, and other herbivores (Griggs 1976).

Like many other rare plants, hairy Orcutt grass thrives on the edge of the world in an extreme habitat with specific conditions. Although habitat conversion and fragmentation has resulted in a significant reduction in this species over time, its unique ecological



Quadrats were used to quantify a huge hairy Orcutt grass stand within a vernal pool (Madera County, 2019). *Photo courtesy of Rebekah Bergkoetter*

niche and biological characteristics have served to buffer those effects and provide hope for the continued existence of this rare and unique California grass species.



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