Glyceria declinata Brébiss.

Waxy mannagrass

Family: Poaceae
Range: Currently only found in California.
Habitat: Moist canyons, meadows, swales, ditches, and stock ponds and, more recently, from vernal pool areas of California. Adapted to long periods of inundation.
Origin: Native to Europe, where it can also be found in vernal pools. First identified in California in 1953.
Impacts: Can compromise the integrity of vernal pools and threaten endemic and endangered plants. Dense waxy mannagrass invasions appear to eliminate or significantly reduce populations of all native annual plant species, such as endangered *Orcuttia viscida* (Sacramento orcutt grass) from the vernal pools. In addition, the grass produces a considerable fine root mass on or just under the surface of the soil that can change nutrient cycling in the vernal pools and negatively impact vernal pool hydrology through increased transpiration. Is also weedy in Africa, Australia, and New Zealand.
California Invasive Plant Council (Cal-IPC) Inventory: Moderate Invasiveness

While *Glyceria declinata* is described as a perennial species, in the Central Valley of California it appears to grow as a facultative annual. The stems are 4 to nearly 20 inches long and often lay close to the ground or are decumbent. The leaf-blade surface is glabrous with scabrous margins. The ligule is long (4-9 mm) and membranous with a ciliate tip. Plants are often mistaken for Italian ryegrass (*Lolium multiflorum*). The taxonomic confusion with other grass species, including native *Glyceria*, has resulted in the widespread invasion of a rare ecosystem. *Glyceria declinata* is the only species of mannagrass that is found in vernal pools.

The inflorescence is an open panicle, 2 to 12 inches long, and is linear or lanceolate. The spikelets can be ascending, appressed or nodding on the stem. In the Central Valley of California the spikelets mature from late April through May. Seeds are dispersed by floating on the surface of water or by becoming attached to waterfowl and grazing animals. Waterfowl, in particular, are strongly attracted to maturing plants and strip the seed from the culms with their bills. This is likely the main method of long-distance seed dispersal.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, disking)	Because of the sensitive nature of vernal pools, great caution should be taken when implementing any control method or eradication program. To be successful in an eradication program it is critical to deplete the seedbank of waxy mannagrass. Repeated hand pulling before plants produce viable seed can be effective in vernal pools, but extreme caution should be taken to minimize disturbance or soil compaction. In addition, surrounding vernal pools and swales should also be weeded to prevent the rapid reintroduction of seed. It will probably require several years of repeated hand pulling to deplete the soil seedbank. To accomplish this, it is critical to prevent any escaped plants from reproducing. String trimmers can reduce cover of plants, as well as seed production. If only a few vernal pools on a site are severely affected and a source of water is available it may be beneficial to wet the soil very early in fall to stimulate germination, then use string trimmers to kill the young plants in their upright terrestrial stage.
Cultural	It is important to prevent the spread of seed from one area to another through animal or human activity. It is also critical that all equipment used in both natural and created vernal pools be free of plant fragments or soil that may be contaminated with seed. Artificial or stock ponds that attract waterfowl should be eliminated or replaced to reduce site desirability. Minimizing additional nutrient additions can also discourage waxy mannagrass from proliferating in sensitive areas. Because of the sensitivity of most sensitive habitats, particularly vernal pools, grazing or burning are not recommended control options.

	In some cases grazing has been shown to increase the populations due to reduced competition with other native species. However, heavy continuous grazing can reduce the cover of waxy mannagrass, but may increase nutrients and favor other species not normally found in vernal pool areas, including algae blooms. Cattle grazing should be managed in vernal pool landscapes to reduce phosphorous loading.
Biological	There are no biological control options available for *Glyceria declinata*, as there are many important native species of *Glyceria* in the western United States.

CHEMICAL CONTROL

The following specific use information is based on reports by researchers and land managers. Other trade names may be available, and other compounds also are labeled for this weed. Directions for use may vary between brands; see label before use. Herbicides are listed by mode of action and then alphabetically. The order of herbicide listing is not reflective of the order of efficacy or preference.

LIPID SYNTHESIS INHIBITORS	
Clethodim *Select*, *Envoy*	**Rate:** 1 to 2 pt product (*Envoy*)/acre (2 to 4 oz a.i./acre) **Timing:** Postemergence before plants produce viable seeds. **Remarks:** In vernal pools, grass herbicides are only recommended when waxy mannagrass is the only grass species present. If endangered grasses such as *Orcuttia viscida* (Sacramento orcutt grass) are also present, a grass-specific herbicide should never be used. Note that *Envoy* formulation is 1 lb a.i./gallon, *Select* is 2 lb a.i./gallon.
Fluazifop *Fusilade*	**Rate:** 1 pt product/acre (4 oz a.e./acre) **Timing:** Postemergence before plants produce viable seeds. **Remarks:** In vernal pools, grass herbicides are only recommended when waxy mannagrass is the only grass species present. If endangered grasses such as *Orcuttia viscida* (Sacramento orcutt grass) are also present, a grass-specific herbicide should never be used.
Sethoxydim *Poast*	**Rate:** 1.67 pt product/acre (5 oz a.i./acre) **Timing:** Postemergence before plants produce viable seeds. **Remarks:** In vernal pools, grass herbicides are only recommended when waxy mannagrass is the only grass species present. If endangered grasses such as *Orcuttia viscida* (Sacramento orcutt grass) are also present, a grass-specific herbicide should never be used.
AROMATIC AMINO ACID INHIBITORS	
Glyphosate *Aquamaster*, *Rodeo*	**Rate:** Broadcast foliar treatment: 1 to 2 pt product (*Roundup ProMax*)/acre (0.56 to 1.1 lb a.e./acre) or 1 to 2 pt product (*Rodeo* or *Aquamaster*)/acre (0.5 to 1 lb a.e./acre) near aquatic sites. Spot treatment: 1% v/v solution. Wiper treatment: 33 to 50% of concentrated product. **Timing:** Postemergence before plants produce viable seeds. **Remarks:** In vernal pools, broadcast application of glyphosate would cause too much damage to sensitive native species. However, a wiper application to waxy mannagrass may give selectivity.

RECOMMENDED CITATION: DiTomaso, J.M., G.B. Kyser et al. 2013. *Weed Control in Natural Areas in the Western United States*. Weed Research and Information Center, University of California. 544 pp.