Eichhornia crassipes (Mart.) Solms

Water hyacinth

Family: Pontederiaceae
Range: Nearly worldwide in tropical to warm temperate regions; one of the most serious aquatic weeds, especially in tropical regions. In the western U.S. it is found in Washington (perhaps eradicated), California and Arizona. Also common throughout the southern U.S. and some eastern states.
Habitat: Ponds, sloughs, channels, streams, lakes, in still or slow-moving water. Grows best in warm, high nutrient water.
Origin: Native to tropical South America (Brazil), introduced to the U.S. as an aquatic ornamental.
Impacts: Populations expand rapidly, forming dense mats that can produce high quantities of dry matter. Floating mats clog waterways, alter water oxygen levels, temperature, and pH, provide mosquito habitat, and displace native aquatic vegetation and wildlife. In some places, water hyacinth is used as green manure, to produce methane gas, or processed into a component of animal feeds, paper, particle board, activated carbon, and other products. Water hyacinth removes pollutants from water, including sewage, heavy metals, and chlorinated hydrocarbons, and is useful in waste treatment systems.
Western states listed as Noxious Weed: Arizona, California
California Invasive Plant Council (Cal-IPC) Inventory: High Invasiveness (Alert)

Water hyacinth is a floating perennial with stolons and emergent leaves to ~2 ft tall. Plants are often linked to other plants by stolons from a thick erect stem. Leaf petioles are spongy, to 1 ft long or more, usually inflated in younger plants and tapered in older plants. Water hyacinth seedlings are most often observed rooted in mud along shorelines where the water level fluctuates or on floating or beached mats of decomposing water hyacinth.

Inflorescences are spikes of funnel-shaped showy flowers, pale blue, lilac, or white. The fruit are capsules with numerous seeds. Plants reproduce by seeds and vegetatively from stolons. Vegetative parts and seeds disperse primarily with water. Vegetative reproduction is rapid under favorable conditions; plant numbers can double in ~5 days. Seeds also disperse by clinging to feet or feathers of birds. Seeds sink to the substrate upon release from capsules and then germinate in spring. Seeds are reported to survive 15 to 20 years in dried mud.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, chopping, harvesting)	Construction of dams can create still water conditions favorable to water hyacinth establishment. Even flowing river systems are susceptible to infestations. Physical removal or destruction of the infestation may be achieved on a small scale by manual removal or on a large scale by harvesting equipment. Mechanical choppers and shredders leave viable fragments that can reestablish populations and may disperse in moving water or with winds. Best results are achieved when efficient systems are used to transport harvested plants to local landfill or composting sites. Floating booms or fixed barriers can prevent movement of water hyacinth into other areas. Booms may also be used to try and prevent movement of the weed downstream.
Cultural	Early removal of all plants is best. Dewatering in winter during hard freeze can kill mature plants, but seeds may remain viable if protected by bottom sediments. Even severe frost will not kill floating water

	hyacinth because the meristem is protected just below the surface of the water. Reducing levels of nitrogen and phosphorus in the water will reduce the growth of water hyacinth.
Biological	Two crown/petiole-boring weevils (*Neochetina bruchi* and *N. eichhorniae*) and a stem-boring moth (*Sameodes albiguttalis*) have been released as biocontrol agents in California. Only *Neochetina bruchi* established, but control has been poor. Control with these insects has been more successful in the southeast. The fungal pathogen *Cercospora rodmanii* is host specific to water hyacinth and has potential as a bioherbicide, although it is not yet registered. *C. rodmanii* has not been found on water hyacinth in the San Joaquin Delta. In August 2011, a fourth insect, *Megamelus scutellaris*, a plant hopper, was introduced at two locations in the San Joaquin Delta. Monitoring in December 2011 showed the insects survived the summer. Monitoring will continue to determine if these insects can survive the winter and proliferate next spring.

CHEMICAL CONTROL

The following specific use information is based on published papers and 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.

GROWTH REGULATORS	
2,4-D *Weedar 64*	**Rate:** Broadcast foliar treatment: 2 to 4 qt product/acre (1.9 to 3.8 lb a.e./acre) with a non-ionic surfactant **Timing:** Optimal from spring to early summer. Mid-summer to early fall applications can also suppress growth. **Remarks:** Relatively fast-acting, broadleaf-selective systemic herbicide. Symptoms usually appear within a few days to a week and include collapse of petioles and twisted petioles. Best results are achieved under conditions of rapid growth, high temperature and high humidity, when most plants will be killed and sink within 2 to 4 weeks. Under less favorable conditions, some plants may regrow and require repeat treatment. In any case retreatment is almost inevitably required after a few months as a result of reinfestation from incompletely sprayed plants, reinvasion from outside the sprayed area, or regrowth by seedlings.
Triclopyr *Renovate*	**Rate:** Broadcast foliar treatment: 2.67 to 5.33 pt product (*Renovate*)/acre (1 to 2 lb a.e./acre) with a non-ionic surfactant **Timing:** Postemergence to foliage from spring to early summer for optimal timing. However, mid-summer to early fall applications can also effectively suppressing growth. **Remarks:** Triclopyr is a broadleaf-selective, relatively fast-acting systemic herbicide.
AROMATIC AMINO ACID INHIBITORS	
Glyphosate *Rodeo*, *Aquamaster*	**Rate:** Broadcast treatment: 5 to 6 pt product (*Rodeo* or *Aquamaster*)/acre. Spot treatment: 1 to 2 % solution of *Rodeo* or *Aquamaster* (0.5 to 1% a.e.) plus an approved surfactant **Timing:** Postemergence when plants are growing rapidly and at or beyond the bloom stage. Optimal management is achieved with early applications and continued reapplication to new plants. **Remarks:** Slow-acting systemic herbicide. Efficacy can be reduced if plants have dust and debris on the leaves. Application after spring rains wash off the dust can increase efficacy. Glyphosate may have advantages over 2,4-D in causing a slower kill of the weed, which reduces the risks of deoxygenation during decomposition.
BRANCHED-CHAIN AMINO ACID INHIBITORS	
Bispyribac-sodium *Tradewind*	**Rate:** Broadcast foliar treatment: 1 to 2 oz/acre (0.8 to 1.6 oz a.i./acre) **Timing:** Postemergence to foliage from early spring to early summer during rapid growth. May need repeat applications. Allow 30 days between applications. Do not exceed 4 applications/year or 8 oz product/acre/year. **Remarks:** Slow-acting herbicide that may take 4 to 6 weeks to achieve effective control. It may be tank-mixed with other herbicides.
Imazamox *Clearcast*	**Rate:** Broadcast foliar treatment to emergent shoots: 16 to 32 oz/acre (2 to 4 oz a.e./acre). Spot spray-to-wet treatment: 0.25 to 5% v/v solution. For in-water treatment: 50 to 100 ppb **Timing:** Postemergence or directly to water from early spring to early summer during the period of rapid growth. **Remarks:** Use an approved surfactant. Aerial application is approved in some states.

Imazapyr *Habitat*	**Rate:** Broadcast foliar treatment to emergent shoots: 1 to 2 pt/acre (4 to 8 oz a.e./acre). Spot treatment: 0.5% v/v solution with 100 gal/acre for adequate coverage. **Timing:** Postemergence to foliage from early spring to early summer when new growth is present. **Remarks:** Use various formulations or repeated applications to achieve desired concentration for 5 to 7 weeks.
CONTACT PHOTOSYNTHETIC INHIBITORS	
Diquat *Reward*	**Rate:** Spot treatment to emergent shoot: 0.5% v/v solution (2 qt per 100 gal water) **Timing:** Postemergence to foliage from spring to early summer. Repeat treatments may be needed in mid-summer. **Remarks:** Diquat is a contact herbicide that is inactivated in turbid water. The use of clean water in spray solution is critical to its effectiveness.

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.