Salvinia molesta Mitch.

Giant salvinia

Family: Salviniaceae
Range: Many of the southern states, particularly Texas. In the western United States, it is found in California and Arizona.
Habitat: Streams, lakes, ponds, ditches, and even rice fields. Thrives in slightly acidic, high nutrient, warm, slow-moving freshwater. Resistant to periods of low temperature, dewatering, and elevated pH levels. Low tolerance to salinity.
Origin: Native to South America and brought to North America through the aquarium trade.
Impacts: Giant salvinia grows rapidly to cover the surface of lakes and streams, spreading aggressively by vegetative fragments. It forms floating mats that shade and crowd out native plants. Thick mats reduce oxygen content and degrade water quality for fish and other aquatic organisms. Mats impede boating, fishing, and swimming, and clog water intakes for irrigation and electrical generation.
Western states listed as Noxious Weed: Arizona, California, Colorado, Nevada, Oregon
California Invasive Plant Council (Cal-IPC) Inventory: High Invasiveness (Alert)

Giant salvinia is a free floating aquatic fern. Depending on the climate, it can either be a perennial or an annual (in non-tropical regions). Its fronds occur in whorls of three, two floating and one submerged. The submerged frond is finely dissected and functions as roots. The floating fronds are positioned opposite each other and are round to oblong in shape. The upper surface has rows of cylindrical papillae. Each papilla has four hairs at its distal end that are joined together at their tips to form what looks like an inverted egg-beater. This cage-like structure is an effective air trap giving the plant buoyancy in the water. The fronds are light to medium green, often with brownish edges in mature plants, and with a distinctive fold in the center. The plant exhibits great morphological variation depending on the conditions of habitat (such as space and nutrient availability), and ranges from a slender floating specimen with fronds less than 0.5 inch wide to fronds up to 2.5 inches wide.

Reproduction is by vegetative growth and fragmentation. As many as five lateral buds can be found at one node. Populations can double every 2 days in the wild and small ponds have been completely covered with giant salvinia in as little as 6 weeks from the point of invasion. Although giant salvinia produces an egg-shaped spore sac along the submersed frond, all spores are infertile. Plants can also be carried overland on anything entering infested waters.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, disking)	Manual removal of the weed is only carried out to alleviate water blockages in the short term, and not as a permanent solution. This is because reinfestation is certain and the cost of manual control is high. Manual removal is only practical in the early stages of invasion. Typically, floating booms and wire nets have some value in containing salvinia infestations. However, such equipment is subject to breakage under the weight of large windblown mats. Habitat modification is a useful strategy in modified areas or areas in which the use of herbicides is unacceptable. Dams, human-made lakes, canals and other water bodies can be drained (or the water level reduced) to strand and dry out giant salvinia.
Cultural	Boaters and anglers can help prevent spread by removing all aquatic plants from propellers, intakes, trailers and gear before leaving a launch area. Always blow out jet ski intakes and wash boats and equipment land-side before traveling to a new waterway.
Biological	A weevil, *Cyrtobagous salviniae*, has been used successfully in in at least 10 countries and has been

	released in Florida, Texas and Louisiana. It is native to south-eastern Brazil. Feeding and damage by the salvinia weevil is dependent on levels of nitrogen in the plant. In South Africa, Botswana, and India, where the weevils have been introduced, salvinia has been reduced to 1% of its former area. However, in the Northern Territory, Australia, high water temperatures have been associated with the failure of the weevil to control the plant. This may account for its inability to establish in California or Arizona.

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.

AROMATIC AMINO ACID INHIBITORS	
Glyphosate *Aquamaster*, *Rodeo*	**Rate:** Broadcast treatment: 3 to 3.75 qt product (*Rodeo* or *Aquamaster*)/acre (3 to 4 lb a.e./acre) in water plus an aquatic approved surfactant containing 0.1% v/v non-ionic organosilicone and 0.25% v/v non-ionic spreader sticker. Spot treatment: 2% solution v/v *Aquamaster* and water plus 0.5 to 2% v/v of a non-ionic surfactant to thoroughly wet all leaves **Timing:** Postemergence when plants are growing rapidly. **Remarks:** Apply spray solution to completely wet the target weed. Do not spray to runoff. Glyphosate is a nonselective systemic herbicide. Repeated applications may be necessary for complete control.
BRANCHED-CHAIN AMINO ACID INHIBITORS	
Penoxsulam *Galleon*	**Rate:** 2 to 5.6 oz product/acre (0.5 to 1.4 oz a.i./acre) in water plus an aquatic approved surfactant **Timing:** Postemergence when plants are growing rapidly. **Remarks:** Apply spray solution to completely wet the target weed. Do not spray to runoff. Penoxsulam is a selective systemic herbicide and should not be applied in areas where it will be diluted rapidly. *Galleon* will take 60 to 120 days or longer to completely kill the target plants.
PIGMENT SYNTHESIS INHIBITORS	
Fluridone *Sonar*	**Rate:** 1.3 qt product/acre (1.3 lb a.i./acre) plus an approved aquatic surfactant **Timing:** Postemergence when plants are growing rapidly. **Remarks:** Apply spray solution to completely wet the target weed. Do not spray to runoff. *Sonar* is a selective systemic herbicide that is slow-acting and requires an extended contact period. Rapid water movement or any condition that results in rapid dilution of fluridone will reduce its effectiveness.
Contact photosynthetic inhibitors	
Diquat *Reward*	**Rate:** Spot treatment: 0.5% solution v/v *Reward* and water plus 0.25 to 1% v/v of an approved aquatic wetting agent. Broadcast treatment: 0.5 to 2 gallons product/acre (1 to 4 lb a.i./acre) in water plus 1 to 2 pt/acre of an approved wetting agent. **Timing:** Postemergence when plants are growing rapidly. **Remarks:** Apply spray solution to completely wet the target weed. Do not spray to runoff. Make additional applications if treating densely-packed weeds or mats. Weed escapes are best controlled if repeat applications are made within 2 weeks of the first treatment.
Flumioxazin *Clipper*	**Rate:** 6 to 12 oz product/acre (3 to 6 oz a.i./acre) in water plus an approved aquatic surfactant **Timing:** Early postemergence when plants are young and rapidly growing. **Remarks:** Apply spray solution to completely wet the target weed. Do not spray to runoff. Flumioxazin is a broad-spectrum contact herbicide. Water pH needs to be below 8.5 or flumioxazin will rapidly degrade and lose 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.