Potamogeton natans L.; floatingleaf pondweed
Potamogeton nodosus Poir.; American pondweed

Floatingleaf and American pondweed (floating leaves)

Family: Potamogetonaceae
Range: Throughout much of North America, including all western states.
Habitat: Ponds, lakes, streams, rivers, reservoirs, irrigation ditches, marshy areas. They commonly grow in shallow water, but can grow to depths of ~20 ft or more in clear water. Floatingleaf pondweed also grows in brackish water.
Origin: Both species are widespread natives of North America and elsewhere.
Impacts: Both of these pondweeds provide habitat, and are an important food source, for wildlife. In natural areas, they are a desirable component of the aquatic community. However, colonies can be troublesome in drainage canals, irrigation ditches, and other controlled aquatic systems.

Floatingleaf and American pondweeds are creeping rhizomatous perennials with both submerged and floating leaves. The floating leaves are glabrous, waxy-shiny, elliptic to ovate, stalked, and leathery. Floatingleaf pondweed has a broader leaf compared to American pondweed.

Inflorescences consist of cylindrical spikes that are above the surface of the water. The flowers are greenish and inconspicuous. Plants are wind- and water-pollinated. Fruits are achene- or nutlet-like structures. Despite the prolific production of seeds, seedlings are seldom encountered. When seeds are produced, they float and disperse with water, are ingested by wildlife, or cling to the feet, fur, or feathers of animals. Seeds surviving ingestion by birds germinate readily. Most plants reproduce vegetatively from rhizomes or stem fragments. In late summer to fall, many pondweed species (e.g., *P. nodosus*, *P. gramineus*) form dozens of distinct vegetative propagules called "winter buds" from a few inches to more than a foot deep in the sediments at the tips of their rhizomes. These are usually dormant until the following spring. Seed longevity of other species is poorly documented, but may be similar to those of sago pondweed, which survive up to 1.5 years under dry conditions.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, excavating)	Repeated mechanical harvesting can help reduce stem densities, but escaped stem fragments can drift elsewhere and develop into new plants. Removing and destroying stem fragments from recreational equipment, such as boat propellers, docking lines, and fishing gear can help prevent the spread of pondweeds. Several types of "bottom barriers' are available and are used to cover and smother specific infested areas. Materials used include polyvinyl chloride (pvc) sheets, small-mesh screens, and natural fibers such as jute. Bottom barriers are best installed in spring before plants produced large biomass and exceed 10 inches tall. In canals, backhoes and telescoop devices can be used to remove infestations, but these operations usually remove sediment as well. Because plants form winter buds, excavation depths should reach at least 12 inches.
Cultural	Dewatering (draining) canals or lakeshores in mid-summer may suppress subsequent growth, but plants can easily resprout from rhizomes if bottom sediments remain moist and cool. Winter drawdown alone will not impact growth since vegetative propagules are protected within the sediments.
Biological	The (sterile) triploid grass carp (white amur) is a relatively nonselective herbivorous fish that will consume most pondweed species readily. The fish do not selectively feed on "non-native" plants so careful monitoring of feeding impacts is necessary. In many canal systems non-selectivity is not a problem, as few

	or no plants are desired since they can interfere with efficient water delivery.

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.

BRANCHED-CHAIN AMINO ACID INHIBITORS	
Penoxsulam *Galleon*	**Rate:** For in-water applications: 25 to 75 ppb; may be repeated but not to exceed 150 ppb in an annual season. For dewatered (drawdown) applications: 5.6 to11.2 oz product/acre (1.4 to 2.8 oz a.i./acre) to canal or shorelines where plants grow **Timing:** Apply to water in early spring to early summer (rapid growth). For dewatered treatment, apply during mid- to late-winter before refilling. **Remarks:** Penoxsulam is a slow-acting herbicide and may take 4 to 6 weeks to achieve control. For drawdown applications use 20 to 100 gal/acre of spray solution to wet the sediment.
Imazamox *Clearcast*	**Rate:** For in-water applications: 50 to 100 ppb. For dewatered (drawdown) applications: 64 oz product/acre (8 oz a.e./acre); first flush of water in canals must not be used for irrigation **Timing:** Apply to water in early spring to early summer (rapid growth). For dewatered treatment, apply in late winter at least 14 days before water will be reintroduced. **Remarks:** Use an approved surfactant.
PIGMENT SYNTHESIS INHIBITORS	
Fluridone *Sonar*	**Rate:** For in-water applications: 5 to 10 ppb; exposures must be maintained for 5 to 7 weeks for optimal control. For dewatered (drawdown) applications to dry canals or shorelines: 4 pt product (*Sonar*)/acre (2 lb a.e./acre) applied with 30 to 100 gal water/acre **Timing:** Apply to water in early spring to early summer. For dewatered treatment, apply from fall to late winter, optimally when there is no standing water. **Remarks:** Fluridone is a slow-acting systemic herbicide that affects young, rapidly growing plants. Lower rates can be used if applied during early spring growth and when water movement is not likely to dilute or move the herbicide.
CONTACT PHOTOSYNTHETIC INHIBITORS	
Flumioxazin *Clipper*	**Rate:** For in-water applications: 100 to 400 ppb **Timing:** Apply to water in early spring to early summer, during rapid growth. **Remarks:** Flumioxazin is rapidly degraded and is inactive if pH exceeds 8.5. Use only if pH will not exceed 8.5. It is best to apply in the early morning when pH is low.
GENERAL CELL TOXICANTS	
Acrolein *Magnacide H*	**Rate:** For in-water applications: 1 to 15 ppm; rate is variable and depends on target weeds, temperature and flow rates **Timing:** Apply to water in late spring to fall. No more than 8 applications are allowed per year. **Remarks:** Acrolein is a very fast-acting, nonselective contact herbicide and algaecide. It is a "Restricted Use" pesticide but can be used in some irrigation canals under specific conditions, with proper permits, and may only be applied by qualified, trained applicators. Symptoms of efficacy may appear in less than an hour and include discoloration of leaves and loss of turgidity.
Endothall *Cascade*; *Aquathol K*	**Rate:** For in-water applications: 1 to 3 ppm; exposures must be maintained for 24 to 48 hours or more for optimal control (see labels for specific duration of contact and concentration needed). **Timing:** Apply to water in early spring to early summer. Endothall can be used in mid-summer, but partial treatments are recommended if biomass is large in order to prevent large reduction in dissolved oxygen. **Remarks:** Endothall is a selective, contact herbicide. It affects young, rapidly growing and mature plants. Lower rates can be used if applied during early spring growth and when water movement is not likely to dilute or move the herbicide.

ECOMMENDED 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.