This WEED REPORT does not constitute a formal recommendation. When using herbicides always read the label, and when in doubt consult your farm advisor or county agent.

This WEED REPORT is an excerpt from the book *Weed Control in Natural Areas in the Western United States* **and is available wholesale through the UC Weed Research & Information Center (wric.ucdavis.edu) or retail through the Western Society of Weed Science (wsweedscience.org) or the California Invasive Species Council (cal-ipc.org).**

Cabomba caroliniana A. Gray

Fanwort

Family: Cabombaceae
Range: Western coastal states including Washington, Oregon and California.
Habitat: Grows rooted in the mud, or free-floating, in stagnant to slow flowing water, including streams, smaller rivers, lakes, ponds, sloughs, and ditches. Fanwort inhabits tropical to temperate regions and grows best in slightly acidic water.
Origin: Introduced from the eastern United States. Fanwort is commonly used as an aquarium ornamental and can be introduced into new areas when people discard their aquarium contents into a body of water. It is also considered a noxious weed in parts of Australia.
Impacts: Fanwort can form dense stands that crowd out well-established desirable plants. It can also clog ecologically, recreationally or economically important water bodies and drainage canals.
Western states listed as Noxious Weed: California, Washington

Fanwort or cabomba is a submersed rooted to free-floating perennial with short, fragile rhizomes. The erect shoots are upturned extensions of the horizontal rhizomes. Unlike coontail, fanwort has opposite leaves. without toothed margins, on short stalks. Submersed leaves are palmately dissected and fan-shaped. Sometimes a few small floating leaves develop when plants flower. Floating leaves are 0.5 to 1.5 inches long, narrowly elliptic, with the stem attached at the center (peltate) and one end shallowly forked.

Fanwort flowers are white to pink to purplish and are about 0.5 inch across. The flowers are on stalks which arise from the tips of the stems. Although fanwort produces seeds, there is no information about seed viability or soil longevity. Like many problem aquatic plants, fanwort can reproduce from small fragments. Fanwort stems become brittle in late summer, which causes the plant to break apart, facilitating its distribution and invasion of new water bodies. Although it reproduces by seed, vegetative reproduction seems to be its main method of spreading to new waters.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, disking)	Fanwort easily fragments from disturbance, so physical control activities can actually contribute to its spread if great care is not taken to completely harvest all plant parts. Using a venturi dredge, which is like a giant vacuum cleaner, can overcome this problem. It minimizes fragmentation and also extracts the root ball.
Cultural	Fanwort is sensitive to drying out and requires permanent shallow water. Where possible, draining a water body can provide temporary control. If the base of the water storage dries out completely there is little chance of fanwort surviving, but if it remains damp there is a more than 50% chance it will recover. Extreme drying is also required to prevent regrowth from seed. With drinking water supplies, lowering water levels is particularly effective. In the southern USA, water drawdown has been used effectively to reduce fanwort growth. In addition, dewatering infested areas during periods of high temperature in the summer can suppress regrowth. Similarly dewatering during winter during periods of hard freezes can suppress growth the following spring and summer. Dewatering can also be integrated with herbicide applications.
Biological	Potential host-specific biological control agents for fanwort have been identified in Argentina and their efficacy has been investigated under laboratory conditions. However no successful field releases have yet been made. The most promising agents are the stem-boring weevil *Hydrotimetes natans* and an aquatic

	moth (*Paracles* spp.). The stem-boring weevils were predicted to have a larger impact on deep-water fanwort populations, while the moth larva is expected to control shallow-water populations. The triploid (sterile) grass carp (white amur) is a relatively nonselective herbivorous fish that will consume *Cabomba* spp. and most other submersed aquatic plants. However, triploid grass carp can only be used with specific permits in most U.S. states.

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	
Triclopyr *Renovate*	**Rate:** 0.5 to 2 ppm **Timing:** Apply directly to water from spring to early summer. Fall applications may also be effective when temperatures remain high. **Remarks:** Triclopyr is a selective, systemic herbicide that controls broadleaf plants. Therefore, many native monocots (pondweeds and sedges) may be unaffected. Other reports indicate that 2,4-D may also be effective for control, but little information is available.
BRANCHED-CHAIN AMINO ACID INHIBITORS	
Penoxsulam *Galleon*	**Rate:** 100 to 200 ppb for 4 to 6 weeks **Timing:** Apply directly to water in spring to early summer. Fall applications may also be effective if temperatures remain high. **Remarks:** Penoxsulam is a slow-acting systemic herbicide that can also be used following "drawdown" (dewatering) in canals and lake shorelines. Reemerging plants will be controlled as they sprout from the sediment in the late winter to spring when water is reintroduced.
PIGMENT SYNTHESIS INHIBITORS	
Fluridone *Sonar*	**Rate:** 6 to 15 ppb for 5 to 7 weeks **Timing:** Direct treatment to water is best in early spring during the rapid growth phase. **Remarks:** Fluridone is a slow-acting systemic herbicide. Early symptoms typically appear within a week and include a pink to white appearance in new shoots and leaves.
CONTACT PHOTOSYNTHETIC INHIBITORS	
Diquat *Reward*	**Rate:** 0.1 to 0.25 ppm **Timing:** Apply directly to water in late spring to early summer. Diquat is a fast-acting contact herbicide that can be effective in mid- to late summer, but if biomass is large, only a portion of the infested sites should be treated to minimize effects of reduced dissolved oxygen. **Remarks:** Diquat is quickly bound to, and becomes inactivated on, suspended clay particles and it should not be used in moderately or highly turbid water.
Flumioxazin *Clipper*	**Rate:** 100 to 400 ppb **Timing:** Apply directly to water from spring to early summer. Fall applications may also be effective if temperatures remain high. **Remarks:** Do not use flumioxazin if pH is > 8.0, or use a buffer to reduce the pH to below 7.5. To minimize effects of high pH, apply from dawn to mid-morning. Due to photosynthesis of aquatic plants and algae, pH in the water column rises from mid-day to dusk under most circumstances.
GENERAL CELL TOXICANT	
Endothall *Cascade*, *Teton*, *Aquathol K*	**Rate:** 1 to 2 ppm for 48 hours **Timing:** Apply directly to water from spring to early summer. **Remarks:** Endothall is a fast-acting, contact herbicide that will generally produce symptoms (flaccid tissue and collapsing plants) within 3 to 7 days.
NON-HERBICIDAL CHEMICAL	
Dyes or	Although technically not herbicides, dyes and colorants control submerged aquatic plants by absorbing light

colorants *Aquashade*	in the water column and reducing photosynthesis. Applications should be made in early spring and repeated to maintain concentration recommended on the label. Colorants are not as effective on well-established plants in mid- to late summer.

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.