Ludwigia spp.

Waterprimroses

Family: Onagraceae
Range: Primarily in the coastal states, Washington, Oregon and California; creeping waterprimrose is also found in Arizona and New Mexico.
Habitat: Slow-flowing rivers, lake and reservoir margins, and in the shallow waters of canals and floodplains.
Origin: Most species are native to South America. *L. peploides* ssp. *peploides* is native to California, Arizona, New Mexico, Texas, and Louisiana; ssp. *glabrescens* (Kuntze) Raven is native to the central and eastern U.S.; and ssp. *montevidensis* (Spreng.) Raven is introduced from southern South America. *L. peploides* is sometimes sold as an aquarium or pond ornamental.
Impacts: Dense stands degrade natural communities, reduce water quality and floodwater retention, and prevent effective mosquito control. Plants can develop a tangled mat of stems that can reduce water flow in irrigation channels and drainage ditches.
Western states listed as Noxious Weed: *L. grandiflora,* Washington
California Invasive Plant Council (Cal-IPC) Inventory: *L. hexapetala,* High Invasiveness (Alert); *L. peploides,* High Invasiveness

Waterprimroses are floating to emergent perennials with stems to 10 ft long. Stems and leaf veins are often reddish. Leaves are alternate with smooth margins. Species, or even subspecies or varieties, differ in hairiness. Plants expand by creeping rhizomes.

The taxonomy of *Ludwigia* is still very confusing. Two or three species are problematic, including creeping waterprimrose (*L. peploides* (Kunth) Raven) and Uruguay waterprimrose (*L. grandiflora* (Michx.) Greuter & Burdet; = *L. hexapetala* (Hook. & Arn.) Zardini, Gu & Raven and *L. uruguayensis* (Camb.) Hara var. *major* (Hassler) Munz). Recent evidence suggests that *L. grandiflora* and *L. hexapetala* are two distinct species.

Flowering stems are usually creeping and floating to ascending. Flowers are solitary in upper leaf axils, trumpet-shaped with a long slender tube (inferior ovary). Flowers have five petals, generally bright yellow and showy. Plants reproduce by seed and vegetatively from creeping stems and stem fragments, and to some degree from rhizomes. The fruits are hard, narrowly cylindrical capsules, 4 to 5-chambered, 1 to 2 inches long, typically bent downward. The fruits contain numerous small seeds, float in water and are easily dispersed by currents. Seeds do not individually disperse from capsules. Despite the production of numerous seeds, seedlings are rarely encountered. The plants also produce creeping submerged stems that root at nodes and produce aerial shoots. Floating vegetative mats or shoot fragments readily break off and are carried away by flowing water.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, roguing)	Ideally, mechanical control measures should include removal of plant material that contains viable propagules (fruit, rhizomes, seed). Equipment that can dig up, plow or "rogue" the stands of *Ludwigia* spp. usually is capable of lifting and depositing it on trucks.

	Mowing devices typically leave fragmented pieces that can reinfest or disperse downstream. However, mowing may be used as part of an integrated program if done before seed set and in conjunction with properly applied herbicides.
Cultural	Preventing accumulation of nutrients and sediment can reduce the spread of *Ludwigia* spp., but this usually requires significant reduction in existing nutrient sources. Managed flood/dry conditions can be used in conjunction with both mechanical removal and approved herbicides.
Biological	The native flea beetles *Lysathia flavipes* and *L. ludoviciana* can defoliate some *Ludwigia* species. The chrysomelid *Altica cyanea* has been investigated for use in China. The USDA-ARS Exotic and Invasive Research Lab at UC Davis has begun a search for potential agents in South America. The grass carp (white amur, *Ctenopharyngodon idella*) is a relatively nonselective herbivorous fish that will consume some *Ludwigia* species, particularly those producing prostrate, floating mats. However, since the grass carp prefers submersed plants, its use must be weighed against potential impacts to native submersed plants.

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: 1 to 2 pt product/acre (0.48 to 0.95 lb a.e./acre) with a non-ionic surfactant **Timing:** Optimal timing is to apply 2,4-D postemergence from spring to early summer. However, applications from mid-summer to early fall can also be effective in suppressing growth. **Remarks:** 2,4-D is a relatively fast-acting, selective systemic herbicide.
Dicamba + diflufenzopyr *Overdrive*	**Rate:** 4 to 8 oz product/acre **Timing:** Postemergence to rapidly growing plants. **Remarks:** Reported effective on some waterprimrose species. Diflufenzopyr is an auxin transport inhibitor which causes dicamba to accumulate in shoot and root meristems, increasing its activity. Higher rates should be used when treating perennial weeds. Add a non-ionic surfactant to the treatment solution at 0.25% v/v or a methylated seed oil at 1% v/v solution. This product does not have an aquatic registration and cannot be used near water.
Triclopyr *Renovate*	**Rate:** Broadleaf foliar treatment: 2.67 to 5.33 pt product/acre (1 to 2 lb a.e./acre) with a non-ionic surfactant **Timing:** Postemergence, spring to early summer, is optimal. However, mid-summer applications can also be effective in suppressing growth. Late summer to fall applications can reduce subsequent spring regrowth. **Remarks:** Triclopyr is a selective, relatively fast-acting systemic herbicide.
AROMATIC AMINO ACID INHIBITORS	
Glyphosate *Rodeo, Aquamaster*	**Rate:** Spot foliar treatment: 1 to 2% v/v solution (*Rodeo* or *Aquamaster*) with approved surfactants. **Timing:** Postemergence from spring through fall. **Remarks:** Nonselective, slow-acting systemic herbicide. Efficacy can be reduced if plants have dust and debris on the petioles (leaves). Applications made after rains remove the dust can often increase efficacy.
BRANCHED-CHAIN AMINO ACID INHIBITORS	
Imazamox *Clearcast*	**Rate:** Broadcast treatment to emergent shoots: 2 pt product/acre (4 oz a.e./acre). Spot spray-to-wet treatment: 0.25 to 5% v/v solution. Direct in-water treatment: 50 to 100 ppb. Efficacy may be improved by adding 1 qt/acre glyphosate (*Rodeo* or *Aquamaster*). **Timing:** All applications (in-water or foliar) should be made 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 treatment to emergent shoots: 4 to 6 pt product/acre (1 to 1.5 lb a.e./acre). Spot treatment: 1.5% v/v solution in 100 gal/acre for adequate coverage. **Timing:** Early spring to early summer (when new growth is present)

	Remarks: Use repeated applications to achieve desired concentration for 5 to 7 weeks. Do not tank mix with glyphosate for *Ludwigia* control.
CONTACT PHOTOSYNTHETIC INHIBITORS	
Diquat *Reward*	**Rate:** Spot (emergent shoot) treatment: 0.5% v/v solution (2 qt/100 gal water) **Timing:** Postemergence foliar treatment from spring to early summer is optimal. Repeat treatments may be needed in mid-summer. **Remarks:** Contact herbicide that is inactivated in turbid water; use only clean water to mix and spray.

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.