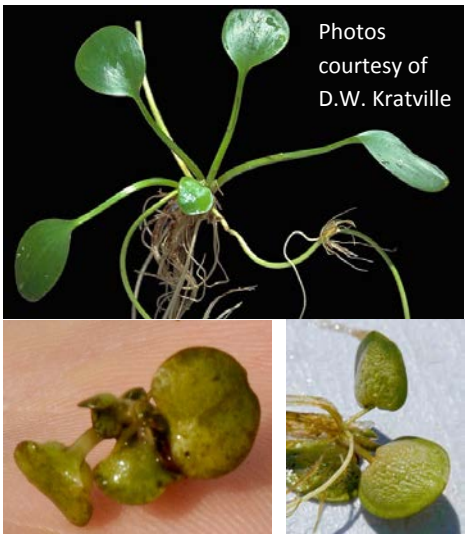
Limnobium laevigatum (Humb. & Bonpl. ex Willd.) Heine
(= *L. spongia* (Bosc) Rich. ex Steud. [Jepson Manual 2012])

Smooth frogbit or South American spongeplant



Family: Hydrocharitaceae
Range: Only found in California to date.
Habitat: Found growing wild in lakes, ponds, and slow rivers.
Origin: Introduced from tropical to sub-tropical Central and South America. In California, smooth frogbit has escaped cultivation as a pond ornamental
Impacts: Can form dense stands in aquatic systems and impede the flow of water. Also weedy in Canada and South America.
Western states listed as Noxious Weed: California
California Invasive Plant Council (Cal-IPC) Inventory: High Invasiveness (Alert)

Smooth frogbit or spongeplant is a floating to rooted stoloniferous perennial with foliage that may be confused with that of water hyacinth. The floating rosettes send runners out into the water, the ends of which form juvenile plants. The juvenile form has thick, spongy, floating ovate to spatula-shaped leaves, usually with rounded tips and on an inflated stalk. Juvenile rosettes gradually develop into mature clumps to about 2 ft tall, with leathery, emergent, broadly elliptic leaves. Unlike water hyacinth, smooth frogbit typically has juvenile leaves and sometimes mature leaves with a patch or disc of honeycomb-like spongy tissue (aerenchyma) on the lower surfaces.

Plants are monoecious and produce small solitary or paired unisexual white flowers (~0.5 inches in diameter) with inferior ovaries on stalks up to ~1/3 the height of the leaves. Capsules are fleshy, berry-like, containing seeds that are covered with short hairs. Dispersal is by seed and stem fragments and by attaching to watercraft. A large mat of runners and adult plants can develop very quickly, shading plants growing below. Smooth frogbit seeds germinate rapidly to produce extremely small, floating seedlings that can resemble duckweed (e.g. *Lemna* spp.) and are easily dispersed by wind, currents, tidal action and also on waterfowl, boats and even trapped on water hyacinth plants. Seeds appear to survive for at least 4 years.

NON-CHEMICAL CONTROL

Mechanical (pulling, cutting, harvesting)	Construction of dams can create still water conditions that are favorable to *Limnobium* establishment. Even flowing river systems are susceptible to infestations. Best results are achieved when efficient systems are used to transport harvested plant to local landfill or composting sites. Mechanical choppers and shredders leave viable pieces of frogbit that can easily reestablish populations and also may disperse with moving water or wind. An added concern with mechanical removal is that it can dislodge and spread very small (ca. 0.1 to 2 cm) frogbit seedlings that then float to adjacent areas. These can also be easily transported by the workboats and harvesting equipment. Where possible, containment nets or curtains should be deployed to minimize off-site dispersal of seedling and small plants. When populations are discovered early and before seeds are produced, physical removal can be a very effective tool.
Cultural	Since frogbit is a relatively new invasive (since 2001 and with limited distribution), prevention of further movement and import is critical. Any horticultural shipments of floating plants should be inspected for the presence of frogbit. The similarity between water hyacinth and frogbit at young stages of growth make the

	presence of frogbit easily overlooked.
Biological	There are no host-specific biological control agents available for *Limnobium*. The triploid grass carp may be useful in small infestations but it is a nonselective herbivore that prefers submersed plants, which it is likely to consume before it feeds on frogbit.

CHEMICAL CONTROL

The following specific use information is based on 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:** 1 to 2 pt product/acre (0.48 to 0.95 lb a.e./acre) with a non-ionic surfactant **Timing:** Postemergence in spring to early summer is optimal. However, mid-summer to early fall applications can also be effective in suppressing growth. **Remarks:** 2,4-D is a relatively fast-acting, selective systemic herbicide. Effects (symptoms) usually appear within a few days to a week and include collapse of petioles and twisted petioles.
AROMATIC AMINO ACID INHIBITORS	
Glyphosate *Rodeo, Aquamaster*	**Rate:** 1 to 2 % v/v solution *Rodeo* or *Aquamaster* (1% a.e.) plus an approved surfactant **Timing:** Postemergence in early spring to fall. Optimal management is achieved with early applications and continued reapplication to new plants. **Remarks:** Glyphosate is a slow-acting systemic herbicide. Efficacy can be reduced if plants have dust and fine debris on the petioles (leaves). Therefore, applications made 24 hr after rains wash off the dust can often have increased efficacy.
BRANCHED-CHAIN AMINO ACID INHIBITORS	
Imazamox *Clearcast*	**Rate:** Broadcast treatment to emergent shoots: 1 to 2 pt product/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 from early spring to early summer during the rapid growth phase. **Remarks:** Use an approved surfactant. Aerial application is approved in some states.
Imazapyr *Habitat*	**Rate:** Broadcast treatment to emergent shoots: 1 to 2 pt product/acre (4 to 8 oz a.e./acre). Spot treatment: 0.5% v/v solution applied at 100 gal/acre for adequate coverage. **Timing:** Postemergence from early spring to early summer when new growth is present. **Remarks:** May require repeated applications to maintain desired concentration for 5 to 7 weeks.
Penoxsulam *Galleon*	**Rate:** Foliar treatment: 2 to 5.6 oz product/acre (0.5 to 1.4 oz a.i./acre) plus approved surfactant. **Timing:** Postemergence to foliage from spring to mid-summer. **Remarks:** Penoxsulam is a slow-acting herbicide and may take 4 to 6 weeks to show effects.
CONTACT PHOTOSYNTHETIC INHIBITORS	
Diquat *Reward*	**Rate:** 0.5% v/v solution or 2 qt/100 gal water **Timing:** Postemergence applications in spring to early summer are optimal. Repeat treatments may be needed in mid-summer. **Remarks:** Diquat is a contact herbicide that is inactivated in turbid water. Only clean water should be used to mix and spray the herbicide.
Flumioxazin *Clipper*	**Rate:** 6 to 12 oz product/acre (3 to 6 oz a.i./acre). It is critical to buffer the spray solution to achieve pH values below 7. **Timing:** Postemergence from spring to early summer. Fall applications may also be effective if temperatures remain high. **Remarks:** If infestation is dense, treat in sections and wait 10 to 14 days before treating the next section. Do not treat the same section of water within 28 days. Flumioxazin may be tank mixed with 2,4-D.

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.