WRITTEN FINDINGS OF THE
WASHINGTON STATE NOXIOUS WEED CONTROL BOARD

(September 2005)

Scientific Name: *Ludwigia peploides* (Kunth) Raven
SY = *Jussiaea californica* (L.) Jeps.
SY = *Jussiaea patibilcensis* Kunth
SY = *Jussiaea peploides* Kunth
SY = *Jussiaea polygonoides* Kunth
SY = *Jussiaea repens* L. vars. p*eploides* (Kunth) Griseb. and *californica* Wats.

Common Name: floating primrose-willow, creeping water-primrose

Family: Onagraceae

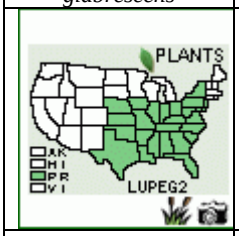
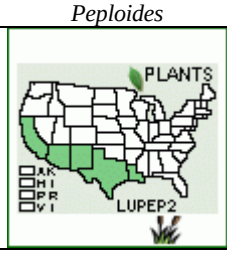
Legal Status: Proposed as Class A for 2006 Weed List

Description and Variation: *Ludwigia peploides* is a herbaceous, perennial, wetland obligate plant, which can be categorized as a creeping macrophyte (Rejmánková, 1992), meaning that is it an emergent macrophyte with stems that grow prostrate to the mud or float on the water's surface. Stems are fleshy and reach a length between 2-6 dm long and are typically glabrous (smooth and hairless) or villosulous (slightly pubescent) with long, soft hairs. Leaves are alternately arranged are variable in shape and size. They can be lanceolate (longer than wide and usually tapering at both ends), oblanceolate (broader above the middle of the leaf, then tapering at base), or obovate (egg-shaped, wider at leaf tip), although leaves are typically round during the early growth period. Petiole length ranges between 2.5-3.7 cm, and the leaf blade ranges in length between 1-9 cm. The leaf veins are light green and pinnately arranged. *L. peploides* forms two kinds of roots: those for substrate anchorage and nutrient absorption; and adventitious roots, which occur at the stem internodes and can absorb atmospheric oxygen. They are also important for the survival of plant fragments. Flowers are long-stalked, occur in the axils, and are 5-merous with five bright yellow petals (1.0-1.5 cm in length) and typically ten stamens surrounding a cylindrical, short-styled ovary containing numerous ovules. Calyx is bright green, and sepals are between 3-12mm. The fruit capsule is hard, cylindrical, 4-5 chambered, and often droop on a long (ca. 9 cm) stalk. Seeds (including endocarp) are 1 mm and uniseriate (arranged in single row) in each locule (chamber).

Ludwigia peploides is morphologically similar to another noxious water-primrose in Washington State, *L. hexapetala*. They can only be differentiated when flowering: *L. peploides* flowering stems typically grow prostrate and the petals are usually 1-1.5 cm and the anthers are 1-1.7 mm whereas *L. hexapetala* flowering stems grow erect and its petals are larger, 1.5-2.5 cm, and the anthers are 2.5-3.5 mm. Additionally, the two bractlets

(small, specialized leaves at the base of the flower) of *L. peploides* are deltate (triangular) or ovate (egg-shaped), whereas the bractlets of *L. hetapetala* are ovate to obovate.

There are three subspecies of *L. peploides*: *glabrescens*; *montevidensis*; and *peploides*. While both subspecies *montevidensis* and *peploides* occur in California, only *peploides* is native. The subspecies *montevidensis* was introduced from southern South America (Ditomaso and Healy, 2003). These two subspecies can be differentiated by foliage surface, leaf apex (leaf tip when it attached to stem) and fruit capsule size. According to Ditmaso and Healy (2003), in *peploides*, the leaves are glabrous (smooth and hairless), the leaf apex is not glandular, and the fruit capsules are 10-25 mm. In *montevidensis*, the leaves are pubescent with glandular hairs, the leaf apex is glandular, and the fruit capsules are 25-40 mm. Their distributions in the U.S. are as follows:

L. peploides spp. *glabrescens*	*L. peploides* spp. *Montevidensis*	*L. peploides* spp. *Peploides*
		
	http://plants.usda.gov/index.html	

Economic Importance:

Detrimental: The dense, sprawling mats, which can weigh 2 kg/m^2 (dry weight) (Cemagref, 2004) clog waterways, can impede navigability, hunting, fishing, irrigation, and water drainage (EPPO, 2004). The reduction of water flow increases sedimentation, which further reduces water flow (Cemagref, 2004). The mats also displace native wetland plants (Grillas, 1992 as cited in Azner et al., 2003), including native *Myriophyllum* in France, which provides habitat for many macroinvertebrates upon which some fish feed (Cemagref, 2004). The mats also reduce pH and dissolved oxygen in the water (Cemagref, 2004), making the habitat less hospitable for many aquatic organisms. By outcompeting wetland grasses, *L. peploides* can reduce grazing space for livestock when it displaces wetland grasses (Cemagref, 2004), since the plant is unpalatable due to concentrations of saponins and calcium oxalate (EPPO, 2004). As with *L. hexapetala*, it could easily be dispersed by shipping, waterfowl, and human activity; moreover, this plant can be spread geographically through the aquarium and horticultural trade (EPPO, 2004). Once established, canal systems facilitate its spread into connected marshes (Aznar et al., 2003). The fast growth rate of *L. peploides* allows it to dominate areas quickly. For example, it only took five years for a small population of *Ludwigia* (few dozen square meters) to cover 321 acres (1.30 Km^2) in France (EPPO, 2004). Floating mats of this plant can indirectly increase mosquito populations – including those carrying West Nile Virus – by making the larvae inaccessible to mosquito-eating fish (Pillsbury, 2005).

Beneficial: *Ludwigia peploides* has potential for wastewater treatment, especially in areas where it is considered native, such as California, because its nitrogen-absorbing capabilities exceed those of water hyacinth, *Eichhornia crassipes* (Rejamánková, 1992).

Habitat: Like *L hexapetala, L. peploides* is a perennial aquatic herb that can grow horizontally on water or mud and can emerge over the water surface. The plant can tolerate water depths up to three meters and grows up to 80 cm above the water surface (EPPO, 2004). It grows in dense mats along shorelines and out into the water. While it typically inhabits the margins of lakes, ponds, ditches and streams, *L. peploides* can also tolerate dry spells (Rejmankova, 1992). Its negative geomorphic (growing upward instead of towards the ground) roots are capable of absorbing atmospheric oxygen, allowing the plant to tolerate environmentally stressful condition. Moreover, *L. peploides* can grow under a range of nitrogen levels. However, when *L. peploides* is introduced to favorable, nutrient-rich conditions, it quickly becomes a dominant competitor (Rejmánková, 1992). It thrives where sites are disturbed (e.g., dredging and water level fluctuations), because these disturbances stress emergent vegetation that would otherwise dominate over *L. peploides* (Rejmánková, 1992).

Geographic Distribution: *Ludwigia peploides* is a pantropical plant native to South America, including Argentina, and Chile, Central America, West Indies, Cuba, and in North America, Mexico, and portions of the United States, particularly in (but neither limited to nor inclusive of all) the southern regions.

History: *Ludwigia peploides* is currently documented in Belgium, Italy, France, the Netherlands, Australia (EPPO, 2004), and is spreading into regions of the United States where it was previously undocumented, including Delaware and Washington State. It is considered "adventive" in Delaware (McAvoy, 2001), meaning that it is native to North America but has now expanded into Delaware. In 2004, *L. peploides* was detected growing extensively in high quality wetlands of a Taylor Creek tributary in King County. It is uncertain when this population was introduced, but it currently covers an estimated 3,100 square feet.

Growth and Development: Biomass doubling time under outdoor experimental conditions in California is 23 days (Rejmánková, 1992) and has been estimated at 15-20 days under stagnant, natural conditions and 70 days under flowing water conditions in France (Cemagref, 2004). The mean biomass (dry weight) under controlled conditions averaged 652 g m^{-2} and has been recorded at 2 Kg m^{-2} dry weight in the field in France (Cemagref, 2004). However, field samples collected from California in Rejmánková's study (1992) only ranged between 500-700 g m^{-2} dry weight. Growth appears to be limited by physical space, as opposed to intraspecific competition resulting from overcrowding (Rejmánková, 1992). The crop growth rate of *L. peploides* has been measured at 4-50 g m^{-2} d^{-1}, exceeding that of the noxious weed waterhyacinth, *Eichhornia crassipes* (Rejmánková, 1992).

Reproduction: *L. peploides* spreads primarily through plant fragmentation. Under controlled conditions, a single *L. peploides* plant was able to regenerate to 67% of its initial biomass in just 45 days after 95% of the stem was removed (Rejmánková, 1992). This

study also determined that severance of a stem's apical tip results in the development of two or three lateral branches. It is not known to what extent seeds play in spread of this plant, though seeds have geminated in laboratory conditions (Cemagref, 2004).

Response to Herbicide: *Ludwigia peploides* may tolerate low concentrations of residual herbicides (Rejmankova, 1992). Please refer to the PNW Weed Management Handbook, available online at http://weeds.ippc.orst.edu/pnw/weeds for specific herbicide instructions.

Response to Cultural Methods: Tarping may have potential for small infestations of *Ludwigia* species; however, large-scale tarping may negatively impact other plants, fish, and wildlife (Sears and Verdone, 2005).

Response to Mechanical Methods:

Control methods would be similar to *L hexapetala*. The U.S. Army Corps of Engineers (2002) recommends mechanical harvesting, hand-cutting, and rotovation. However, caution must be made to remove all plant fragments and roots, otherwise reinfestation can occur. Furthermore, decomposition of crushed or damaged plant material may result in increased nutrient availability and a reduction in dissolved oxygen (Sears and Verdone, 2005)

Biocontrol Potentials: Cordo and DeLoach (1982) found that the flea beetle, *Lysathia flavipes*, caused heavy damage and sometimes mortality to *L. peploides* plants in its native Argentina. The adult and larvae feed on, and eggs are laid on, the leaves of both *L. peploides* and parrotfeather, *Myriophyllum aquaticum*. Based upon field observations and preference studies using *L. peploides*, *M. aquaticum*, and 30 other aquatic plants, Cordo and DeLoach suggested that *L. flavipes* had good potential as a biocontrol agent in the United States and elsewhere and recommended other studies, *e.g.*, host range, be conducted. However, no subsequent literature has been found.

Rationale for Listing: Listing this plant as a Class A noxious weed would require the control of this plant and would avoid the possible scenario where landowners would refuse to control *L. hexapetala* by stating the plant in question is *L. peploides* and not on the Noxious Weed List. *L. peploides*, like *L. hexapetala*, is an aggressive invasive species that poses a serious risk to aquatic habitats. The floating mats reduce water flow, increase sedimentation, lower pH and dissolved oxygen, and can harbor disease-carrying mosquitoes. It can easily spread between waterways, and once established, *L. peploides* is very difficult to control. The European and Mediterranean Plant Protection Organization added to their EPPO Alert List in 2004. The New Zealand Plant Conservation Network lists it as an Unwanted Plant Organism.

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http://www.timetotrack.com/jay/ludwig3.htm

Britton, N.L., and A. Brown. 1913. *Illustrated flora of the northern states and Canada*. Vol. 2: 589. Courtesy of Kentucky Native Plant Society. Scanned by Omnitek Inc.

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http://www.neartica.com/flowers/otos/onag/Lpepl.htm

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