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NAS - Nonindigenous Aquatic Species

***Landoltia punctata* (G. Mey.) Les & D.J. Crawford = *Spirodela punctata* (G. Mey.) C.H. Thompson**

Common Name: dotted duckweed

Taxonomy: Family-Lemnaceae (Duckweed Family); Order-Arales; Subclass-Arecidae; Class-Liliopsida (Monocotyledons); Division-Magnoliophyta.

Recent comprehensive review of morphological, biochemical and molecular data finds *Spirodela punctata* taxonomically distinct from other duckweeds (see Les and Crawford 1999). Although more closely related to *Lemna* than to *Spirodela*, this species has been reclassified under a new genus, *Landoltia*, in honor of Dr. Elias Landolt, world scholar on the Lemnaceae. It has also been referred to as *Spirodela oligorrhiza*.

Identification: Tiny free-floating aquatic plants comprised of individual [fronds that produce fine roots](#). Mature fronds appear 1.5 to 2 times longer than wide, with widths measuring from 1-3 (or 5) mm. Fronds are narrowly egg-shaped to slightly kidney-shaped and intensely green in color. A waxy layer of cuticle makes plants sparkle in the sunlight. Fronds are not leaves; they may be a reduced form of stem and shoot. The [roots](#) number from 2-4 and can range up to 7. All of the roots penetrate the prophyllum (a scale surrounding the base of the frond that covers the point of attachment of the roots).

Propagation is mainly through vegetative budding of daughter fronds from two pouches at base of the frond. Daughter fronds often remain attached to mother frond by a short stipe so that plants often appear as a cluster of several fronds. This species occasionally reproduces sexually, by seed.

In the field, *Landoltia punctata* can readily be distinguished from native look-alike duckweed species, especially with the aid of a 10X hand lens. [Lemna](#) species will always have only 1 root per frond and are light green in color. [Spirodela polyrrhiza](#) has many roots (5-21); the frond is broad with nerves that are easily noticed and usually a red dot at the base of the nerves. *Landoltia punctata* is more elliptical and has several roots (2-4) per frond. [Take this link](#) to a comparison page for distinguishing the nonnative *Landoltia punctata* from the native *Spirodela polyrrhiza*.

Native Range: Australia and Southeast Asia. Crawford and Landolt (1993) used enzyme electrophoresis to measure genetic diversity among *Spirodela* species. In *Spirodela* (*Landoltia*) *punctata* the highest diversity was found in biotypes from Australia and southeastern Asia. This supports the presumption of origin and species development in those regions, where early collection records also were made (Landolt 1986).

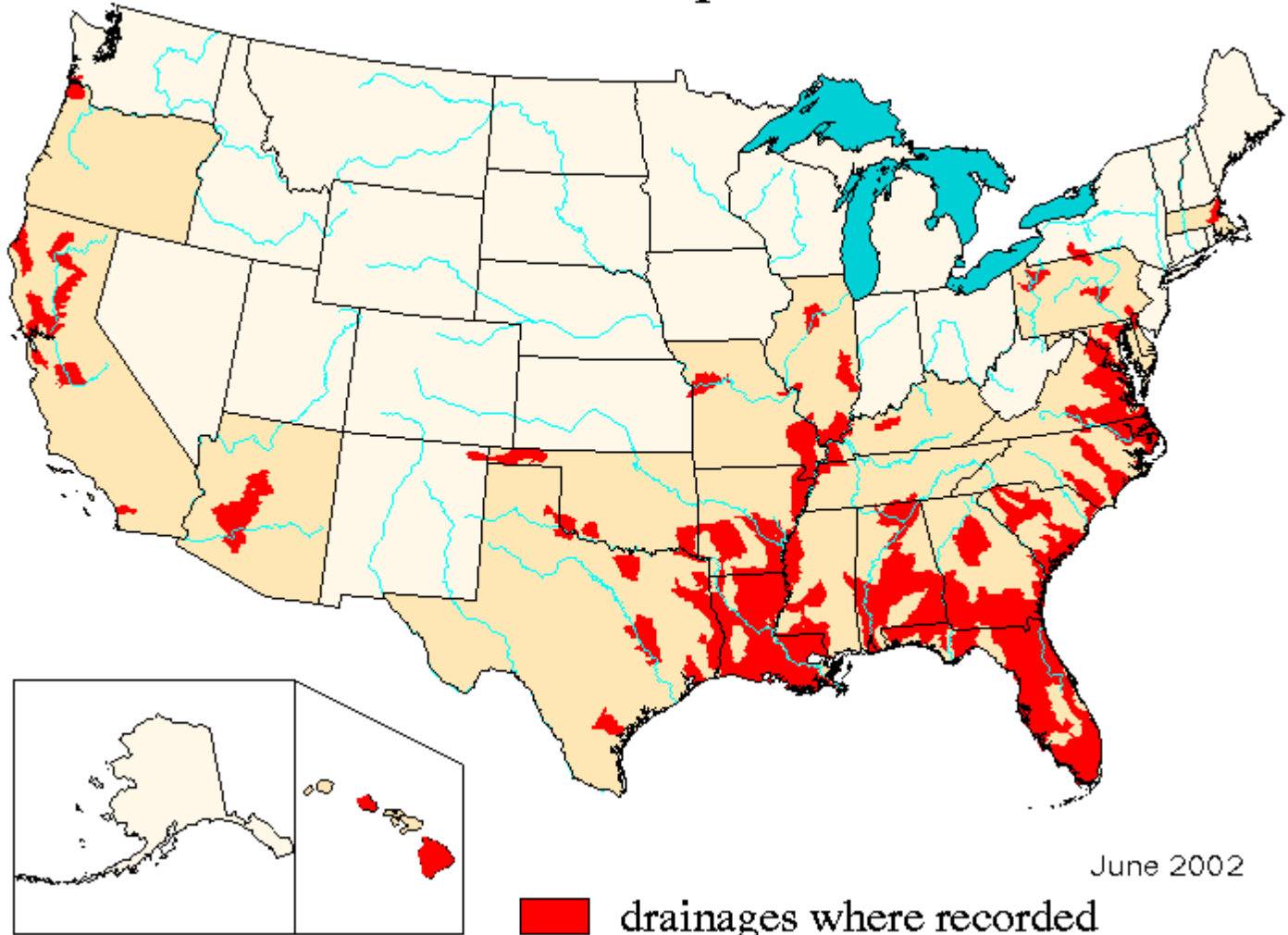
Landoltia (*Spirodela*) *punctata* is sometimes reported as native to North America (BONAP 1999; USDA, NRCS 1999). However no evidence has been presented that refutes the extensive taxonomic and distribution studies conducted on this species (Landolt 1986). In reviewing more than 10,000 Lemnaceae specimens from North America, none of *Landoltia punctata* were found to predate the 1930 collection from Kansas City, Missouri (Saeger 1934), indicating the species as

introduced to North America (Landolt 1986; E. Landolt, pers. comm. 1999).

Habitat: Small, quiet, nutrient rich waters such as ponds, ditches, swamps and backwaters; also seasonally intermittent waters.



Landoltia punctata



Nonindigenous Occurrences: First documented in North America at two locations in **Missouri** (Saeger 1934); presently known from a limited distribution in that state (Yatskievych 1999). Well naturalized in the southeastern United States, notably in **Florida** and **Georgia**. Common in ponds and still waters throughout **Alabama** (Davenport and Haynes 1981). Abundant in late summer and autumn at scattered locals in southwest **Mississippi** (Jones 1974). Abundant throughout **Louisiana**, at lakes, bayous and fresh marshes (Montz 1979). Extending northward, especially through drainages of the Lower Mississippi River in **Arkansas**, **Tennessee**, and **Kentucky**. Widely scattered in east **Texas** and into **Oklahoma** (Nelson and Couch 1985). Eliminated at one of two known locals in **Arizona** - Lindberg Springs, just south of Flagstaff, was the only known locality for wild rice (*Zizania*) in the state of Arizona, but weeds and all perished when it was siphoned dry to irrigate a golf course (T. Ayers, Deaver Herbarium pers. comm. 2000). First discovered on the west coast in **California** during the 1950s near Berkeley (Mason 1957), but not collected in southern California until 30 years later (Armstrong 1984). Northern occurrences include Clatsop County, **Oregon** (Landolt 1986), **Illinois** (Daubs 1962), western **Pennsylvania** (Wohler et al. 1965) and eastern **Massachusetts** (Landolt 1986). First reported for **North Carolina** in 1964 where it has spread rapidly to become locally abundant in widely scattered

locations of the Coastal Plain and Piedmont (Harrison and Beal 1964; Harrison 1977). Collected in south eastern North Carolina, June 2002, associated and entangled with *Salvinia molesta* [Kay s.n. (NCSU)]. Rather frequent around the **District of Columbia** (Landolt 1986), yet reported in 2000 as **new to Maryland**, along a creek head in Aberdeen Proving Grounds (Steury 2000). Documented for **Delaware** in 1991 at Lums Pond State Park, in the Brandywine-Christina drainage (DOV 19761). Naturalized on the islands of Oahu and Hawaii, **Hawaii** (Bishop Museum 1999).

Means of Introduction: In the 1800's, many of the known localities of *Landoltia punctata* outside of Australia and southeastern Asia were localized near harbors, suggesting very early dispersal among continents by humans (Landolt 1986).

Landoltia punctata is commonly used in aquaria and may be distributed when transporting fish or plants (Landolt 1986) so that even in the aquarium, the introduction one of the world's smallest flowering plants is often by accident (Stodola 1967). The Missouri pond first found with *L. punctata* also contained goldfish, suggesting the the plant might have been introduced from commercial supply sources for domestic aquaria (Daubs 1962). Its irregularity in distribution in the United States suggests multiple introduction sites. Water garden suppliers are an additional likely source.

Once escaped in a new region, *Landoltia punctata* can be transported short distances (several kilometers) by water birds, and less importantly by mammals like beavers, raccoons and wild hogs (Landolt 1986). However, duckweed fronds quickly desiccate once removed from the water, much more so than other small, floating plants, such as *Salvinia*. Wet feathers or rain may extend the distance of dispersal by birds, but generally fronds will dry out within 0.5 to 2.5 hr (Landolt 1986).

Status: Noted by many as expanding in range in North America; populations are overlooked because of its superficial resemblance to native duckweeds.

Impact of Introduction: Not known, although regarded as a pioneer species in that it is distributed easily, colonizes quickly and has a high rate of vegetative propagation (Landolt 1986).

Landoltia punctata, often occurs in extensive, almost pure stands while *Spirodela polyrrhiza* usually occurs in mixed populations, with other duckweed species (Godfrey and Wooten 1979; Davenport and Haynes 1981; Wohler *et al* 1965).

In pure laboratory culture, *Landoltia punctata* grew at approximately twice the rate of *Lemna minor* (expressed as mg of dry weight per day in a 12 cm square area). Yet, in mixed cultures, no distinct competition effect was detected between the two (Ikusima 1955). In a competition study conducted in a north Florida swamp among the small floating plants, *Salvinia minima* (Baker), *Landoltia punctata* and *Azolla caroliniana* Willdenow, *Landoltia punctata* was found to be the most abundant species through the one-year study. *Landoltia punctata* was less affected than the other species by low winter temperatures and flooding while *Salvinia minima* dominated during the warm summer months (Dickinson and Miller 1998).

Climatic Limitations and Overwintering Potential: Many duckweeds, including our native *Spirodela polyrrhiza*, survive climate in cold regions by forming an abundant supply of turions (rootless fronds rich in starch) that sink to the warm bottom to overwinter. The inability of *Landoltia punctata* to form turions accounts for its absence in the northern and Midwestern United States. Its fronds are sensitive to severe frosts and plants are reportedly limited by absolute minimum temperatures <- 20 C (- 4 F) (Landolt 1981). This concurs with the distribution mapped above, where *Landoltia punctata* ranges easily through the USDA cold hardiness Zone 7 ([USDA zone map east US](#); [west US](#); [AK, HI](#)). Outlying occurrences in Pennsylvania, Illinois, Kentucky, Missouri and Oklahoma extend into Zone 6 and 5. Indeed, the species should be looked for in the

Northeast (Crow and Hellquist 2000).

Under long-day photoperiods *Landoltia punctata* may sometimes form resting fronds. These are small, delicate single fronds with only one fragmentary root. High in starch, they function comparably to turions in that they are more capable than normal fronds in surviving unfavorable conditions such as storms and light frost. However, they do not sink to the bottom and thereby do not provide overwintering protection in zones with severe winters (Landolt 1986).

While *Landoltia punctata* has a greater ability to set seed than does *Spirodela polyrrhiza* (0.1 percent of *S. polyrrhiza* found in fruit compared to 3 percent of *L. punctata*), the seeds of *L. punctata* are not known to tolerate cold temperatures (~ 0 degrees C for several weeks) (Landolt 1986). Therefore *L. punctata* cannot be expected to overwinter by seed in regions of the United States that are too cold for vegetative survival. However, the seeds tolerate drought. In Australia, *L. punctata* survives by seed in ponds that seasonally dry out (Landolt 1986). This mechanism could contribute to establishment in the arid southwestern United States.

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