

Oregon Department of Agriculture  
Weed Risk Assessment  
For *Sagittaria platyphylla*, Delta arrowhead  
January 2018

Delta arrowhead  
Family: Alismataceae

**Findings of this review and assessment:**

**Common name, *Genus species***, was evaluated and determined to be a category “**A**” rated noxious weed, as defined by the Oregon Department of Agriculture (ODA) Noxious Weed Policy and Classification System. This determination was based on a literature review and analysis using two ODA evaluation forms. Using the Noxious Qualitative Weed Risk Assessment v. 3.8, **common name** scored **59** indicating a Risk Category of **A**; and a score of **18** with the Noxious Weed Rating System v. 3.2, indicating a “**A**” rating.

**Introduction:** Delta arrowhead is a perennial wetland plant, inhabiting wetlands, marshes, shallow lakes and slow moving waterways. A recent discovery at the Blue Heron wetlands near Portland indicates it has high reproductive potential. Native to the Southeast United States, *S. platyphylla* is present within one lake in Thurston County, WA (Parsons, per com.2014). Little information is available regarding impact and control within the United States. Research and management has been focused in Australia where *S. platyphylla* is a national weed of significance, spreading rapidly and effecting natural and man-made systems alike (Aus. Weeds, 2012).

**Description:** *Sagittaria platyphylla* is an aquatic plant in the Water-Plantain family that can grow up to 5 ft. (150 cm) tall. It has stolons and fleshy corms. *S. platyphylla* has two types of leaves. One type of leaf is held above the surface by long rigid triangular petioles. These leaves are linear-ovate to ovate are from 2-6.5 in. (4.6-16.4 cm) long with an acute apex.



The submerged leaf is sessile (directly attached to stem) and strap shaped. Leaf shape and growth form are directly influenced by submersion or emersion above

water. Submerged plants are widely available in the aquarium trade under the name Chilensis.

The flowers are held on a raceme in 3-9 whorls. Each flower has three green sepals and three white to pinkish petals.

Fruits are from 0.3-0.5 in. (0.7-1.2 cm) in diameter. *S. platyphylla* spreads both by seed and vegetatively via corms. (Swearingen, Bargeron. 2016)

**Reproduction:** Representatives of *Sagittaria* reproduce both vegetatively and sexually. *Sagittaria* spp. produce over 14,000 seeds annually that are able to float for up to 3 weeks, with claims that *S. platyphylla* can produce hundreds of thousands of seeds annually (Kaul, 1985; North South Wales Government, 2011). Corms of *S. platyphylla* easily detach from the plant and remain viable within the soil for years (North South Wales Government, 2011). Dense monocultures have been observed in Australia and Thurston Co., WA.

**Dispersal:** Water movement, waterfowl and small animals all disperse *S. platyphylla* seeds, locally and within watersheds. Human disperse seeds and tubers through the nursery trade, in contaminated soil movement and possibly recreational activities.

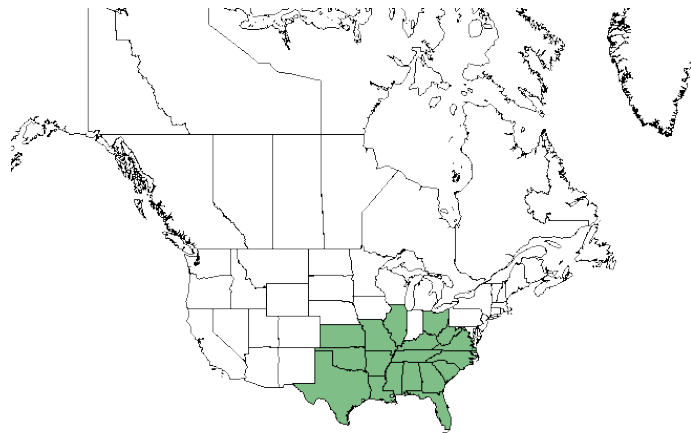
**Habitat availability:** Delta arrowhead inhabits shallow waterbodies, slow moving creeks and rivers, mudflats and wetlands. It is limited by salinity, excluding it from estuaries and by water depth in deeper ponds and lake. The mudflats and freshwater marshes of the Columbia and Willamette systems provide significant substrate for the plant to invade.

**Biological factors limiting establishment:** Plants such as reed canarygrass, Phragmites and native sedges and rushes are likely to provide significant competition to exclude delta arrowleaf. No insects or diseases are noted.

**Probability of detection:** Only people aware of the native flora of northwest wetlands would notice the introduction of this species. Once established though, exploding populations would begin to dominate water bodies making them easier to detect.

**Spread by humans:** Humans are directly responsible for dispersing this species around the country through aquarium plant sales. The degree to which this is occurring has not been determined.

**Current distribution:** Worldwide, Australia reports the largest invasive



USDA Plants Database

populations. Native populations exist in the South from Texas through to Georgia. They also extend northward into Ohio and Illinois. Populations in the West are extremely rare.

**Economic impact:** Delta arrowleaf has the capacity to invade dirt-lined irrigation and drainage canals causing slowdowns in water movement. Southeast Australia has significant problems in this regard. No indication of this impact in North America was found in the literature.

**Environmental impact:** Delta arrowleaf invasions will pose similar impacts demonstrated by many other wetland invaders. They primarily compete with native vegetation, can populate mudflats valuable to feeding birds, and may restrict fish movement in shallow waterbodies. It is an important wetland species in the lower Mississippi River wetlands where it is utilized by waterfowl and mammals.

**Control:** Control options may be limited to a few herbicide products. Manual control can be utilized somewhat in very small populations on mudflats and sandbars that can physically support humans. Submerged plants may present increased difficulty. Herbicide products such as Glyphosate (3% Rodeo + 1% Competitor) (Staunch per. comm. 2017) and endothal (Clements et. al. 2015) have proven effective. Long exposure times are needed on canals and mudflats when using endothal after drawdown. Generally, applications of all products and methods require multiple seasons for complete success.

## Noxious Weed Qualitative Risk Assessment 3.8

### Oregon Department of Agriculture

Common Name: Delta arrowleaf  
Scientific Name: *Sagittaria platyphyla*  
Family: Alismataceae

For use with plant species that occur or may occur in Oregon to determine their potential to become serious noxious weeds. For each of the following categories, select the number that best applies. Numerical values are weighted to increase priority categories over less important ones. Choose the best number that applies, intermediate scores can be used.

Total Score: **59** Risk Category: **A**

#### GEOGRAPHICAL INFORMATION

- 1) **4** **Invasive in Other Areas**
- 0 Low- not known to be invasive elsewhere.
  - 2 Known to be invasive in climates dissimilar to Oregon's current climates.
  - 6 Known to be invasive in geographically similar areas.

Comments: Plant has a modest ecological range.

- 2) **5** **Habitat Availability:** Are there susceptible habitats for this species and how common or widespread are they in Oregon?
- 1 *Low* – Habitat is very limited, usually restricted to a small watershed or part of a watershed (e.g., tree fern in southern Curry County).
  - 3 *Medium* – Habitat encompasses 1/4 or less of Oregon (e.g., oak woodlands, coastal dunes, eastern Oregon wetlands, Columbia Gorge).
  - 6 *High* – Habitat covers large regions or multiple counties, or is limited to a few locations of high economic or ecological value (e.g., threatened and endangered species habitat).

Comments: Inhabits limited habitats of high ecological value.

- 3) 0 **Proximity to Oregon:** What is the current distribution of the species?
- 0 *Present* – Occurs within Oregon.
  - 1 *Distant* – Occurs only in distant US regions or foreign countries.
  - 3 *Regional* – Occurs in Western regions of US but not adjacent to Oregon border.
  - 6 *Adjacent* – Weedy populations occur adjacent (<50 miles) to Oregon border.

Comments: Occurs in one location in Oregon.

- 4) 10 **Current Distribution:** What is the current distribution of escaped populations in Oregon?
- 0 *Not present* – Not known to occur in Oregon.
  - 1 *Widespread* – Throughout much of Oregon (e.g., cheatgrass).
  - 5 *Regional* – Abundant (i.e., occurs in eastern, western, central, coastal, areas of Oregon) (e.g., gorse, tansy ragwort).
  - 10 *Limited* – Limited to one or a few infestations in state (e.g., kudzu).

Comments: Limited to one infestation in state.

#### BIOLOGICAL INFORMATION

- 5) 3 **Environmental Factors:** Do abiotic (non-living) factors in the environment effect establishment and spread of the species? (e.g., precipitation, drought, temperature, nutrient availability, soil type, slope, aspect, soil moisture, standing or moving water).
- 1 *Low* – Severely confined by abiotic factors.
  - 2 *Medium* – Moderately confined by environmental factors
  - 4 *High* – Highly adapted to a variety of environmental conditions (e.g., tansy ragwort, Scotch broom).

Comments:

- 6) 6 **Reproductive Traits:** How does this species reproduce? Traits that may allow rapid population increase both on and off site.
- 0 *Negligible* – Not self-fertile, or is dioecious and opposite sex not present.
  - 1 *Low* – Reproduction is only by seed, produces few seeds, or seed viability and longevity are low.
  - 3 *Medium* – Reproduction is vegetative (e.g., by root fragments, rhizomes, bulbs, stolons).
  - 3 *Medium* – Produces many seeds, and/or seeds of short longevity (< 5 years).

- 5 *High* – Produces many seeds and/or seeds of moderate longevity (5-10 years) (e.g., tansy ragwort).
- 6 *Very high* – Has two or more reproductive traits (e.g., seeds are long-lived >10 years and spreads by rhizomes).

Comments: Long-lived seeds and abundant rhizomes.

- 7) 4 **Biological Factors:** Do biotic (living) factors restrict or aid establishment and spread of the species? (What is the interaction of plant competition, natural enemies, native herbivores, pollinators, and pathogens with species?)
- 0 *Negligible* – Host plant not present for parasitic species.
  - 1 *Low* – Biotic factors highly suppress reproduction or heavily damage plant for an extended period (e.g., biocontrol agent on tansy ragwort).
  - 2 *Medium* – Biotic factors partially restrict or moderately impact growth and reproduction, impacts sporadic or short-lived.
  - 4 *High* – Few biotic interactions restrict growth and reproduction. Species expresses full growth and reproductive potential.

Comments: Not restrained by biological factors.

- 8) 4 **Reproductive Potential and Spread After Establishment - Non-human Factors:** How well can the species spread by natural means?
- 0 *Negligible* – No potential for natural spread in Oregon (e.g., ornamental plants outside of climate zone).
  - 1 *Low* – Low potential for local spread within a year, has moderate reproductive potential or some mobility of propagules (e.g., propagules transported locally by animals, water movement in lakes or ponds, not wind blown).
  - 3 *Medium* - Moderate potential for natural spread with either high reproductive potential or highly mobile propagules (e.g., propagules spread by moving water, or dispersed over longer distances by animals) (e.g., perennial pepperweed).
  - 5 *High* – Potential for rapid natural spread throughout the susceptible range, high reproductive capacity and highly mobile propagules. Seeds are wind dispersed over large areas (e.g., rush skeletonweed).

Comments: Can reproduce by seed and rhizomes . Can be dispersed by moving water and waterfowl.

- 9) 4 **Potential of Species to be Spread by Humans.** What human activities contribute to spread of species? Examples include: interstate or international commerce; contaminated commodities; packing

materials or products; vehicles, boats, or equipment movement; logging or farming; road maintenance; intentional introductions of ornamental and horticultural species, or biofuel production.

- 1 *Low* – Potential for introduction or movement minimal (e.g., species not traded or sold, or species not found in agricultural commodities, gravel or other commercial products).
- 3 *Medium* – Potential for introduction or off-site movement moderate (e.g., not widely propagated, not highly popular, with limited market potential; may be a localized contaminant of gravel, landscape products, or other commercial products) (e.g., lesser celandine, Canada thistle).
- 5 *High* – Potential to be introduced or moved within state high (e.g., species widely propagated and sold; propagules common contaminant of agricultural commodities or commercial products; high potential for movement by contaminated vehicles and equipment, or by recreational activities) (e.g., butterfly bush, spotted knapweed, Eurasian watermilfoil).

Comments: Continues to be sold in aquarium trade.

#### IMPACT INFORMATION

- 10) 5 **Economic Impact:** What impact does/can the species have on Oregon's agriculture and economy?
- 0 *Negligible* – Causes few, if any, economic impacts.
  - 1 *Low* - Potential to, or causes low economic impact to agriculture; may impact urban areas (e.g., puncture vine, pokeweed).
  - 5 *Medium* – Potential to, or causes moderate impacts to urban areas, right-of-way maintenance, property values, recreational activities, reduces rangeland productivity (e.g., English ivy, Himalayan blackberry, cheatgrass).
  - 10 *High* – Potential to, or causes high impacts in agricultural, livestock, fisheries, or timber production by reducing yield, commodity value, or increasing production costs (e.g., gorse, rush skeleton weed, leafy spurge).

Comments: Can infest drainage and irrigation canals slowing water movement.

- 11) 5 **Environmental Impact:** What risks or harm to the environment does this species pose? Plant may cause negative impacts on ecosystem function, structure, and biodiversity of plant or fish and wildlife habitat; may put desired species at risk.
- 0 *Negligible* – None of the above impacts probable.
  - 1 *Low* – Can or does cause few or minor environmental impacts, or impacts occur in degraded or highly disturbed habitats.

- 4 *Medium* – Species can or does cause moderate impacts in less critical habitats (e.g., urban areas, sagebrush/ juniper stands).
- 6 *High* – Species can or does cause significant impacts in several of the above categories. Plant causes severe impacts to limited or priority habitats (e.g., aquatic, riparian zones, salt marsh; or T&E species sites).

Comments: Species is very invasive in certain habitats crowding out native vegetation.

- 12) 0 **Impact on Health:** What is the impact of this species on human, animal, and livestock health? (e.g., poisonous if ingested, contact dermatitis, acute and chronic toxicity to livestock, toxic sap, injurious spines or prickles, causes allergy symptoms.
- 0 *Negligible* – Has no impact on human or animal health.
  - 2 *Low* – May cause minor health problems of short duration, minor allergy symptoms (e.g., leafy spurge).
  - 4 *Medium* – May cause severe allergy problems, death or severe health problems through chronic toxicity, spines or toxic sap may cause significant injury. (e.g., giant hogweed, tansy ragwort).
  - 6 *High* – Causes death from ingestion of small amounts, acute toxicity (e.g. poison hemlock).

Comments: No impacts to health

#### CONTROL INFORMATION

- 13) 6 **Probability of Detection at Point of Introduction:** How likely is detection of species after introduction and naturalization in Oregon?
- 1 *Low* – Grows where probability of early detection is high, showy and easily recognized by public; access to habitat not restricted (e.g., giant hogweed).
  - 5 *Medium* – Easily identified by weed professionals, ranchers, botanists; some survey and detection infrastructure in place. General public may not recognize or report species (e.g., leafy spurge).
  - 10 *High* – Probability of initial detection by weed professionals low. Plant shape and form obscure, not showy for much of growing season, introduction probable at remote locations with limited access (e.g., weedy grasses, hawkweeds, skeletonweed).

Comments: Can be identified by botanists, weed professionals, not generally recognized by public.



14) **3**

**Control Efficacy:** What level of control of this species can be expected with proper timing, herbicides, equipment, and biological control agents?

- 1 *Negligible* – Easily controlled by common non-chemical control measures (e.g., mowing, tillage, pulling, and cutting; biocontrol is very effective at reducing seed production and plant density) (e.g., tansy ragwort).
- 2 *Low* – Somewhat difficult to control, generally requires herbicide treatment (e.g., mechanical control measures effective at preventing flowering and but not reducing plant density; herbicide applications provide a high rate of control in a single application; biocontrol provides partial control).
- 4 *Medium* – Treatment options marginally effective or costly. Tillage and mowing increase plant density (e.g., causes tillering, rapid regrowth, spread from root fragments). Chemical control is marginally effective. Crop damage occurs or significant non-target impacts result from maximum control rates. Biocontrol agents ineffective.
- 6 *High* – No effective treatments known or control costs very expensive. Species may occur in large water bodies or river systems where containment and complete control are not achievable. Political or legal issues may prevent effective control.

Comments: Requires herbicide treatment. Multiple treatments required.

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Category Scores:

**19** Geographic score (Add scores 1-4)

**21** Biological Score (Add lines 5-9)

**10** Impact Score (Add lines 10-12)

**9** Control Score (Add Lines 13-14)

**59** Total Score (Add scores 1-14 and list on front of form)

Risk Category:      55-90 = A      24-54 = B      < 24 = unlisted.

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This Risk Assessment was modified by ODA from the USDA-APHIS Risk Assessment for the introduction of new plant species.

V3.8 2/19/2016

**Oregon Department of Agriculture  
Noxious Weed Rating System**

Common Name: Delta arrowleaf

Scientific Name: Saggitaria platyphyla

Point Total: 18                      Rating: A

1) Detrimental Effects: *Circle all that apply, enter number of circles*

- 1. **Health: causes poisoning or injury to humans or animals**
- X 2. **Competition: strongly competitive with crops, forage, or native flora**
- 3. **Host: host of pathogens and/or pests of crops or forage**
- 4. **Contamination: causes economic loss as a contaminate in seeds and/or feeds**
- 5. **Interference: interferes with recreation, transportation, harvest, value wildlife and livestock movement**

2) **Reproduction & Capacity for Spread:** Circle the number that best describes, enter that number

- 1. **Few seeds, not wind blown, spreads slowly**
- 2. **Many seeds, slow spread**
- 3. **Many seeds, spreads quickly by vehicles or animals**
- X 4. **Windblown seed, or spreading rhizomes, or water borne**
- 5. **Many wind-blown seeds, high seed longevity, spreading rhizomes, perennials**

3) **Difficulty to Control:** Circle the number that best describes, enter that number

- 1. **Easily controlled with tillage or by competitive plants**
- 2. **Requires moderate control, tillage, competition or herbicides**
- X 3. **Herbicides generally required, or intensive management practices**
- 4. **Intensive management generally gives marginal control**
- 5. **No management works well, spreading out of control**

4) **Distribution:** Circle the number that best describes, *enter that number*

- 1. **Widely distributed throughout the state in susceptible habitat**
- 2. **Regionally abundant, 5 or more counties, more than 1/2 of a county**
- 3. **Abundant throughout 1- 4 counties, or 1/4 of a county, or several watersheds**
- 4. **Contained in only 1 watershed, or less than 5 square miles gross infestation**
- 5. **Isolated infestation less than 640 acres, more than 10 acres**
- X 6. **Occurs in less than 10 acres, or not present, but imminent from adjacent state**

5) **Ecological Impact:** Circle the number that best describes, *enter that number*

- 1. **Occurs in most disturbed habitats with little competition**

2. **Occurs in disturbed habitats with competition**
3. **Invades undisturbed habitats and crowds out native species**
- X 4. **Invades restricted habitats (i.e. riparian) and crowds out native species**

TOTAL POINTS: 18

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**Note: Noxious weeds are non-native plants with scores of 11 points or higher. Any plants in 4.1, 4.2, and 4.3 should not be classified as "A" rated weeds.**

**Ratings: 16 + = A, 15 - 11 = B**

ODA Weed Rating System 8/30/2012 v3.2

#### References:

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Martin S.B., Shaffer G.P. 2005. *Sagittaria* biomass partitioning relative to salinity, hydrologic regime, and substrate type: Implications for plant distribution patterns in coastal Louisiana, United States. *Journal of Coastal Research* Volume 21, Issue 1, January 2005, Pages 167-174

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Kaul R.B. (1985). Reproductive phenology and biology in annual and perennial Alismataceae. *Aquatic Botany*. 22, 153-164.

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