

**WRITTEN FINDINGS OF THE
WASHINGTON STATE NOXIOUS WEED CONTROL BOARD
DRAFT: August, 2011; updated September 2014**

Scientific name: *Arum italicum* Mill.

Common name: Italian arum, Italian lords and ladies, Italian Lily, Cuckoo's Pint

Family: Araceae

Legal Status: under consideration for a Class C noxious weed listing in 2015

Description and Variation:

Boyce (1993) recognizes 4 subspecies of *Arum italicum*--subspecies *italicum*, subsp. *albispatham*, subsp. *canariense* and subsp. *neglectum*. There are a number of *A. italicum* cultivars, including 'Tiny', 'White Winter', 'Cyclops' and 'Marmoratum' (Boyce 1993, RHS 2011). All subspecies and cultivars would be included in the Class C listing of *Arum italicum*.

Overall Habit:

Arum italicum is a perennial, herbaceous plant that can grow as a dense colony (Boyce 1993, Boyce 1994(-5)). Leaves and flowers grow from tubers, with leaves emerging in the autumn that are oval or arrowhead shaped. Leaves will remain all winter and die back in the summer or in colder climates they die back in the winter, reemerge in the spring, and then die back in the summer. Flowers bloom in the spring and summer, are made up of a spathe and spadix, and form orange-red berries.

Roots:

Arum italicum has a rhizomatous tuber that forms thick, unbranched roots that anchors the tuber in the soil at the beginning of the growing season (Boyce 1993). After the plant is anchored, fine feeding roots develop (Boyce 1993). The tuber produces a number of daughter tubers that remain attached to it during the growing season (Méndez 1999).

Leaves:

Hairless leaves emerge in the fall and die back in the summer (Méndez 1999). Leaf petioles are rounded to 'D' shaped in cross-section and 15 to 35 (-40) cm long (Boyce 1993). The leaf blades are variable--narrow or broad arrowhead (hastate to sagittate-hastate) to ovate-oblong in shape and 9 to 35(-40) cm long, though noted by Kozloff (2005) as being rarely more than 20 cm long. Leaves are green and can have veins colored silver-gray, cream or yellowish green (Figure 1.). Leaf blades may also have purple-black spots and speckles or silvery-gray blotches (Boyce 1993). The silver-gray venation of the leaves is typically associated with *A. italicum* subsp. *italicum* (Boyce 1993, Boyce 1994(-5)). Plants can also produce solid green leaves (Boyce 1993).

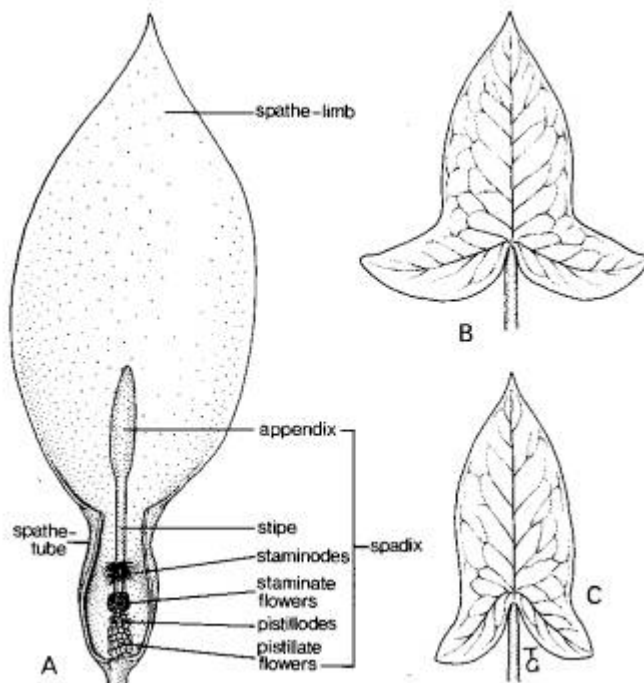


Figure 1. Two examples of *Arum italicum* leaf shape and color. Right image, © 2005, Ben Legler.

Flowers:

The inflorescence of *Arum italicum* is atop a rounded peduncle that is 4.6 to 16 cm long, and is shorter than the leaves. Small flowers, male and female, are crowded in a club-like inflorescence called a spadix (Kozloff 2005). The spadix is 4.4 to 14 cm in total length, from the tip to the base, and has an appendix, staminodes, staminate flowers, pistillodes, and pistillate flowers (Figure 2). The appendix is a sterile portion of the spadix and is clavate, long stipitate, 3 to 10 cm long, 4 to 10 mm wide, pale to dark yellow or

dull tawny brown, with the stipe sometimes pale (Boyce 1993). Staminodes are in 2 to 5 whorls forming a zone of 4 to 10 mm long, with filiform, flexuous bristles 3.5 to 5 mm long and cream with conical bases (Boyce 1993). There is a small gap between the staminodes and the staminate flowers that is 1.5 to 5 mm long and is longitudinally ridged, though sometimes obscurely, and is pale cream in color (Boyce 1993).



The staminate flowers form an oblong zone, 3 to 6 mm long and 5 to 9.5 mm wide, pale to mid-yellow (Boyce 1993). There may be another gap between the staminate flowers and the pistillodes, that is cream, 0 to 3mm long with slight longitudinal ridging and some vestigial, pistillode bases (Boyce 1993).

Pistillodes are in 3 or 4 whorls, forming a zone 2.5 to 3 mm long. The bristles are filiform and flexuous, 3 to 5.5 mm long and cream colored with paler tips (Boyce 1993). Pistillate flowers are in an oblong-cylindric cluster 9 to 14 mm long, ovaries ovoid-oblong, 2 to 3 mm long, pale green to off-white with a slightly darker

Figure 2. *Arum* inflorescence and leaves showing general morphology. A, typical inflorescence. Variation in leaf shapes: B, hastate; C, sagittate (adapted from Boyce 1993).

stigma (Boyce 1993).

The spadix is surrounded by a bract called the spathe that is made up of two areas—a basal tube and an apical limb (Boyce 1993) (Figure 2). The overall spathe is 11 to 27 (-38) cm long, with the basal tube being 3 to 5 (-7) cm long. The basal tube exterior is pale to mid-green, sometimes stained brownish purple at the base and along the margins and its interior is greenish white, sometimes stained with purple apically, though rarely entirely purple (Boyce 1993). The spathe's apical limb is elliptic-lanceolate to elliptic ovate or broadly elliptic, erect, acute to acuminate, with the tip drooping soon after opening. Externally, it is greenish white and occasionally flushed with brownish purple towards the margins and along the mid-vein. Internally, it is very pale green to almost white and sometimes stained with brownish purple along the margins (Boyce 1993). The entire apical limb has a translucent quality (Boyce 1993).

The inflorescence is said to smell like stale urine or sometimes reminiscent of pineapple and citrus (Boyce 1993). Spontaneous self-pollination has not been found to be a common pollination mechanism (Albre et al. 2003). The female flowers are protogynous (the female flower receptivity ending before the release of pollen) (Albre et al. 2003).

Fruits and Seeds:

The fruit of *Arum italicum* are few-seeded berries, that are held in an oblong-cylindric spikes, 5 to 9 (-12) cm long by 2.5 to 3 cm wide (Boyce 1993). Individual berries are oblong-pyriform, 4 to 11 mm long by 3.5 to 5 mm wide (Boyce 1993). Fruits are orange-red in color when mature (Kozloff 2005).



Figure 3. Left image mature red fruit without leaves; center image close up of fruit; right image, seeds from one berry. First two images © 2005, Ben Legler, right image WSNWCB.

Habitat:

Arum italicum grows in a variety of habitats in its native and introduced ranges. Where it is native, *A. italicum* grows in open woodlands, forest edges, hedgerows, open scrub, dry pasture and grassy banks (Boyce 1993). Where it is introduced, it is found in forest understories, riparian areas, wetlands, old gardens and woodland gardens and disturbed locations near urban development, (WTU Image Collection, Cyndi Soliz pers. comm.)

Plants can grow from 0-1,200 m elevation (Boyce 1993) and in part to full shade in introduced habitats.

They grow best in consistently moist, humusy, organically rich soils (Missouri Botanical Garden 2011) though it has been noted to tolerate most soil types and be drought resistant once it is established (Weedbusters n.d.).

Geographic Distribution:

Arum italicum is noted to be a weed in parts of Australia and New Zealand (Hawke's Bay Regional Council 1997, Weedbusters n.d.). Boyce (1993) notes *A. italicum* subsp. *italicum* is also naturalized in Argentina. USDA ARS (2014) reports it being naturalized in the Azores, Portugal.

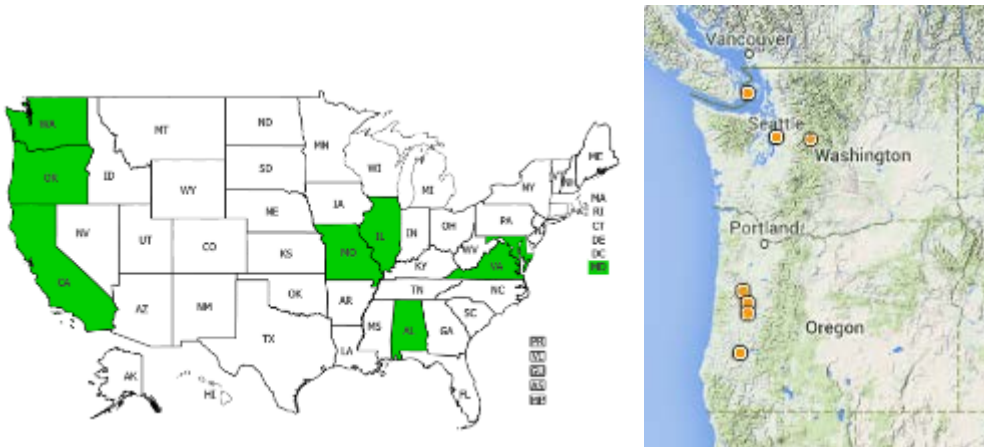
Native Distribution:

According to the GRIN database (USDA ARS 2014), *Arum italicum* is native to

- Parts of Africa: Algeria, Morocco, Tunisia, Madeira Islands, Canary Islands
- Asia: Turkey, Armenia, Georgia, Russian Federation
- Europe: United Kingdom, Switzerland, Ukraine, Albania, Bulgaria, Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Greece (including Crete), Italy (including Sardinia and Sicily), France (including Corsica), Portugal, and Spain (including Balears)

Distribution in North America:

USDA Plants database (USDA, NRCS 2011) documents the presence of *Arum italicum* in Washington, Oregon, California, Missouri, Illinois and North Carolina. Other sources list *A. italicum* naturalized in California (Calflora 2011), Alabama (EDDMapS 2011), Virginia (Steury 2010) and in Rock Creek National Park, Washington, D.C. (Invasive Plant Atlas of the United States 2011).



Left, EDDMapS (2011) state distribution map of *Arum italicum*; right, herbarium records of *A. italicum* in Washington and Oregon (Consortium of Pacific Northwest Herbaria 2014).

History and Distribution in Washington:

In Washington, WTU herbarium records document naturalized populations of *Arum italicum* in San Juan County on San Juan Island (Zika 17768) in 2002 and in King County on the University of Washington Seattle's campus (Zika 23824) in 2008. Infestations are also known by natural resource managers in Skamania County, Clark County and Cowlitz County (Cyndi Soliz pers. comm.). Specific infestations in these counties include: Washougal Oaks (Clark County) with has a patch that is about 75 feet by 100 feet as well as some scattered outliers; along Coal Creek road and 5 documented sites that are ornamental escapees, with each site consisting of 5 to 15 plants (Cowlitz County); near the Franz Lake Wildlife Refuge overlook (Skamania County); and the Steigerwald Wildlife Refuge (Clark County) (Cyndi Soliz, Carlo Abbruzzese and

Angelica Velasquez pers. comm.). Two infestations, each around 100 square feet, of *A. italicum* are known in Snohomish County, one in the Marshland area and one along the Centennial Trail (Sonny Gohrman pers. comm.). Also in Skagit County, *A. italicum* is growing along a roadside area that used to belong to a nursery but now appears to be abandoned and has many nonnative species.

San Juan County:

San Juan County Noxious Weed Control Board (2014) reports that there are two escaped populations of *Arum italicum* in San Juan County and several populations known of in private landscapes. One of the infestations is located on Lopez Island and is spread across three parcels with the bulk of the plants located on public property, about two acres of a preserve. Control has been attempted with heavy tarping but it was not successful. Before it was covered for three years, this large patch had been mowed, both early and often; the leaves torched in the winter; and dug. The owner of the bordering property to the south has observed the infestation in six or seven places on his 35-acre property and finds it appears to be worse each year. The other site in San Juan County is located on San Juan Island and is not as extensive as the Lopez Island infestation. This patch is in a very steep and rocky road bank, which precludes mowing. They have been harvesting the seed stalks before maturity for several years. This population seems to be fairly stable.



Left, map of San Juan Island County with red dots marking its two infestations; center, infestation on Lopez Island; right, densest area of Lopez Island infestation that is covered with a tarp, red circle, but it failed to control its spread (Judy Jackson pers. comm.), all images San Juan County Noxious Weed Control Board.



Arum italicum infestation of fruiting plants in a wetland on City of Seattle right-of-way. Notice the red-orange berries in the understory. Image by Darrell Howe.

King County:

Recently, additional infestations of *Arum italicum* in King County have been reported. Over the last few years, *A. italicum* has been found in a few parks and restoration sites in the City of Kirkland (Collins Klemm pers. comm.). Many infestations have been found in Seattle parklands, with at least six of them in Frink and Leschi natural areas (Darrell Howe pers. comm.). King Conservation District (2014 pers. comm.) reported a large infestation on Vashon Island as well as an infestation near Duvall on private property. King County Parks also found *A. italicum* in Lower Lions Reach and Cedar Grove Road natural areas along the Cedar River (Terrie Foote pers. comm.) It has also been spreading in green

spaces around the University of Washington Campus (Sarah Reichard pers. comm.).

Arum italicum is currently on the Washington State Noxious Weed Control Board's monitor list. It was considered for a Class B listing in 2011 for the 2012 noxious weed list, but it was decided at that time to continue to monitor it so more data could be collected.

Biology:

Growth and Development:

Arum italicum has a rhizomatous tuber with a growing point from where the main shoot forms and where a new tuber forms later in the year, after the ripening and senescence of the aboveground parts (Boyce 1993). Adventitious buds form along the length of the tuber and form additional tubers (daughter tubers) during the growing season. Over time, these tubers detach from the parent plant and form separate plants (Boyce 1993). New leaves emerge in the autumn or early winter and remain all winter in mild climates. In colder winter climates, leaves die back in the winter and then emerge again in early spring (Missouri Botanical Garden 2011). Flowers grow and bloom in late April to June (Jacobson 2008). Flowers are pollinated in an interesting process (for more information see Boyce 1993, Albre et al. 2003) by flies and midges that are attracted to the plant by the smell of the flowers (Jacobson 2008). After blooming, the leaves and spathe die back, leaving only the spadix (Jacobson 2008, Missouri Botanical Garden 2011). Tightly packed fruit mature to a bright orange red in August to September (Jacobson 2008, Missouri Botanical Garden 2011).

Reproduction:

Arum italicum reproduces by seeds and vegetatively by tubers. Berries are eaten and dispersed by birds (Boyce 1993) and may also be spread by water (Weedbusters n.d.). On average, it takes between 4 to 5 years for arums to grow from seed to flower (Boyce 1993). Plants produce daughter tubers, as previously described, which break off the following growing season and form new plants (Méndez 1999). New plants can start producing independent daughter tubers in the second growing season (Méndez and Obeso 1993).

Arum italicum is also being spread by the improper disposal of yard waste that includes propagating parts of the plant. This has been observed occurring in a couple of places in King County, Washington (Sasha Shaw pers. comm., Collins Klemm pers. comm.).

Control:

Land managers in Clark County, Cowlitz County, King County and the Department of Natural Resources have reported little success with various attempts at controlling *Arum italicum* in Washington (Cyndi Soliz pers. comm.). In general, it is noted to be difficult to eradicate once it has established in an area (Emerald Chapter, Native Plant Society of Oregon. 2008).

Mechanical Methods:

Information is lacking on possible mechanical methods of control for *Arum italicum*. One method recommended from New Zealand is to dig out scattered plants all year round, making sure to remove all pieces of root and dispose of them at a refuse transfer station (WeedBusters n.d.). Carefully digging around the stem with a narrow digging tool, all the way down to the tuber, removing the tuber and daughter tubers, and disposing the tubers in a sealed bag in the garbage, can provide some control after many years (Wendy DesCamp pers. obs.). If the tuber is not removed from the soil, the plant will resprout. Controlled areas need to be monitored for resprouts and follow up control will be needed for a number of years. Do not move soil from infested sites to new areas or to compost piles. Gloves and

protective clothing should be worn to protect the skin from the plant's toxic properties.

Cutting and bagging the fruits will prevent seeds from being spread and beginning new infestations.

Vern Holm with the Western Invasives Network has tried many different control methods on *Arum italicum* and so far the only way he has found to control them is to pour boiling water on roots. He notes that trying to dig them up seems to only spread them around more and damage other plants that may be providing competition (Vern Holm pers. comm.).

Cultural Methods:

Cultural control methods were not found for *Arum italicum*. Some experimenting is being done with shading plants with landscape fabric, but it is too soon to know the results.

Biological Control:

Biological controls are not known for *Arum italicum*.

Chemical methods:

There is limited published information on herbicide control of *Arum italicum*. Dr. Timothy Miller (pers. comm.), research scientists at WSU Extension did run a one year greenhouse trial of herbicide control on *A. italicum*. He found that several herbicides had fairly good activity on reducing *A. italicum* top growth, but may not have had an effect on the tubers. Oust (1.5 oz/a) and Roundup (3%) resulted in no regrowth, while Escort (1.5 oz/a) reduced growth by 99%, Habitat (1%) reduced growth by 98%, and Weedmaster reduced growth by 86% (all these were statistically equal in response). Other tested products resulted in 50% or less reduction (Plateau, Crossbow, Milestone, Curtail, Garlon 3A, and Transline). When the tubers were dug up at the end of the trial though, all appeared healthy. Overall these five herbicides show good activity on greenhouse grown *A. italicum* but additional research is needed as the tubers appeared to be unharmed from these initial treatments.

King Conservation District is testing out two different control treatments. In April of 2014, they sprayed half an infestation with a 1% solution of triclopyr (Element) with 1% Competitor surfactant, and over the other half they laid down black fabric weed barrier. The site will be monitored for three years and evaluated to see how well the treatments are working (Jacobus Saperstein pers. comm.).

Vern Holm with the Western Invasives Network has tried many different herbicide treatments on *Arum italicum* in Oregon and has not had successful control (Vern Holm pers. comm.). At the Washougal Oaks site in Washington, treatments tried have included glyphosate, milestone and imazapyr and there has been little to no success with control (Carlo Abbruzzese pers. comm.).

New Zealand (Weed Busters n.d.) provides some recommendations using Escort (metsulfuron). They specifically detail cutting and painting the plant stems with a mixture of 1g metsulfuron + 100 ml glyphosate + 10 ml penetrant/1L followed by mulching. Other treatments they recommend include using a weed wipe with 1g metsulfuron + 150 ml glyphosate + 10 ml penetrant /L water; digging and soaking tubers in herbicide or bury them deep in the ground; spraying the plants with a mixture of 3g metsulfuron + 150 ml glyphosate + 10 ml penetrant /10 L water (Weed Busters n.d.). When using herbicides for control, make sure to thoroughly read and follow the label.

Currently, herbicide treatment information on *Arum italicum* is not available in the Pacific Northwest Weed Management handbook, but check back as information is continually updated.

Economic Importance:

Detrimental:

In New Zealand, *Arum italicum* is noted to form dense cover in open sites, shades out small native plants and prevent native plant establishment (Weedbusters n.d.). In Washington, several populations have been discovered in sensitive riparian areas (Cyndi Soliz pers. comm.) and control of these populations has been largely unsuccessful.

All parts of the plant are poisonous. It contains large quantities of calcium oxalate in the form of needle-shaped crystals that occur in the cells of all plant parts (Boyce 1993). These crystals can irritate the skin, mouth, tongue and throat and result in throat swelling, breathing difficulties, burning pain and stomach upset (California Poison Control System 2000) and children may require medical treatment (Boyce 1993). One New Zealand source (Hawke's Bay Regional Council 1997) noted horses can be poisoned by consuming *Arum italicum*. No other supporting information has been found in regards to *Arum italicum's* effect on horses.

Beneficial:

Arum italicum is cultivated ornamentally for its attractive foliage as well as colorful berries (Boyce 1993). A number of cultivars have been named based on the various leaf coloring and markings found within the species (Boyce 1993).

Rationale for Listing:

Italian arum, *Arum italicum*, is a nonnative perennial that was originally introduced as an ornamental plant. It has now naturalized in a number of counties in Western Washington and appears to be spreading more rapidly as additional infestations are being discovered. Due to it establishing in riparian areas and other habitats, its toxicity, and being very difficult to control once established, it is being proposed as a Class C noxious weed to raise awareness and promote appropriate control methods.

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