

Yellow Flag Iris (*Iris pseudacorus*)

Ecological Risk Screening Summary

U.S. Fish & Wildlife Service, October 2014

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1 Native Range and Status in the United States

Native Range

From Stone (2009):

“Pale-yellow iris is native to Europe, northern Africa, and temperate Asia (reviews by [Sutherland 1990; Weber 2003]).”

GISD (2018) lists *Iris pseudacorus* as native in Algeria, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Ex-Yugoslavia, Finland, France, Germany, Greece, Hungary, Iran, Ireland, Israel, Italy, Latvia, Lithuania, Moldova, Morocco, Netherlands,

Norway, Occupied Palestinian Territory, Poland, Portugal, Romania, Russian Federation, Spain, Sweden, Switzerland, Syria, Turkey, Ukraine, and United Kingdom.

Status in the United States

From Morgan et al. (2018a):

“Yellow iris is widespread in the northeastern United States, where it has been found in the wild for close to 140 years. Although recorded from over 40 states, yellow iris is not equally distributed or problematic throughout. It is relatively new to the western United States, where notable early records from California and western Montana date to the 1950s (Rubtsoff 1959; Preece 1964).

Iris pseudacorus was first observed in the Frio River, Texas in 1998, under a bridge where the streambed had been silted out. The established iris population continues to root and spread from that site as more silt is deposited. As of 2000, a dense colony, over 100 yards long, existed in the river proper and was creeping down the shallow river habitat. Texas, and especially the southern Frio River (i.e. outside of its general range). [sic] Only a few scattered records have previously been made in Texas and none compare to the infestation in the Frio River (Jacono 2001).

Iris pseudacorus is reported as invasive in Connecticut, Delaware, Maryland, New Hampshire, North Carolina, Oregon, Tennessee, Virginia, Vermont, Washington, Wisconsin, and West Virginia (Forest Health Staff 2006).

First Great Lakes record: 1886, Lake Ontario (USEPA 2008).”

GISD (2018) lists *Iris pseudacorus* as alien, invasive, and established in Alabama, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, and Wisconsin.

From Ramey and Peichel (2001):

“the unfortunately attractive *Iris pseudacorus* continues to be sold through garden and plant dealers and over the Internet”

From Stone (2009):

“A review of early floras documented pale-yellow iris in Virginia as early as 1771 [Wells and Brown 2000].”

According to USDA, NRCS (2018) *Iris pseudacorus* is listed as a banned invasive species in Connecticut, a prohibited species in Massachusetts and New Hampshire, a Category 3 noxious weed in Montana, a “B” designated weed and quarantine species in Oregon, and a Class C noxious weed in Washington.

Means of Introductions in the United States

From Ramey and Peichel (2001):

“*Iris pseudacorus* was brought to Canada and the U.S. as an ornamental plant in the early 1900s; [...]”

Remarks

From Sutherland (1990):

“No hybrids have been recorded (Hyb. Br. Isl.) despite repeated attempts to make crosses (Dykes 1974). *Iris pseudacorus* is widely grown as an ornamental plant and new cultivars have been produced with variegated leaves (e.g. *variegata* with leaves striped yellow) or a variety of flower colours (e.g. *bastardii* with creamy-yellow flowers) (Dykes 1974).”

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2018):

“Taxonomic Status:

Current Standing: accepted”

“Kingdom Plantae

Subkingdom Viridiplantae

Infrakingdom Streptophyta

Superdivision Embryophyta

Division Tracheophyta

Subdivision Spermatophytina

Class Magnoliopsida

Superorder Lilianae

Order Asparagales

Family Iridaceae

Genus *Iris*

Species *Iris pseudacorus* L.”

Size, Weight, and Age Range

From Stone (2009):

“The largest intact pale-yellow iris clone in its native range measured 2.17 feet (0.66 m) across.”

From Sutherland (1990):

“*Iris pseudacorus* is an erect glabrous perennial, 40-150 cm tall.”

Environment

From Stone (2009):

“Pale-yellow iris needs moisture to establish and survive [Klimes 1997; Wilder and McCombs 1999; Virginia Department of Conservation and Recreation 2003].”

“Water characteristics: Pale-yellow iris is found in fresh (reviews by [Weber 2003; Tu 2004]), brackish ([Dutton and Thomas 1991; Strong and Kelloff 1994], review by [Tu 2004]) and salt (reviews by [Weber 2003; Tu 2004]) water. In its native range, pale-yellow iris persists in the high zones of saltmarshes and may be found surrounded by estuarine water with a salinity of 24‰ during high tides (review by [Sutherland 1990]).

Pale-yellow iris can tolerate water with low levels of oxygen (reviews by [Mulqueen and Gleeson 1988; Sutherland 1990]). One source suggests that it prefers cool water, which may limit its expansion into warm-water areas [Morgan 2008]. [...]

Soils: [...] It is associated with calcareous [Mulqueen and Gleeson 1988; Engin et al. 1998], sandy loams, clay loams, and other loamy or clayey [Engin et al. 1998] soils derived from sandstone and schist [Mulqueen and Gleeson 1988] in its native range. It is present on peat soils in both its native (review by [Sutherland 1990]) and nonnative [Strong and Kelloff 1994] ranges.

Pale-yellow iris occurred on soils with pH ranging from 6.65 to 7.55 in Turkey [Engin et al. 1998] and 3.6 to 7.7 in Britain (review by [Sutherland 1990]). In England, pale-yellow iris occurred in spring and seepage waters with pH ranging from 6.8 to 7.2 [Mulqueen and Gleeson 1988]. One review from its nonnative range suggests that pale-yellow iris prefers acidic soils ranging from pH 3.6 to 7.7 and averaging 6.0 [Tu 2004]. Pale-yellow iris prefers high nutrient sites in both its native ([Klimes 1997], review by [Sutherland 1990]) and nonnative (review by [Tu 2004]) ranges.”

Climate/Range

From Stone (2009):

“Pale-yellow iris occurs in temperate climates (review by [Tu 2003]). Few authors report climate data for sites with pale-yellow iris in North America. The Ipswich River Wildlife Sanctuary in northeastern Massachusetts has a mean low [air] temperature of 27.0 °F (-2.8 °C) in January and a mean high of 71.6 °F (22.0 °C) in July. Mean annual precipitation is 44 inches (1,120 mm) [Anderson 1991]. In southwestern Louisiana average maximum temperatures range from 60.1 °F (15.6 °C) in January to 90.0 °F (32.2 °C) in July and average precipitation is 56.32 inches (143.05 cm) [Dutton and Thomas 1991].

Elevation: Pale-yellow iris occurs from sea level to 1,080 feet (330 m) in Britain (review by [Sutherland 1990]). In North America, it occurs at sea level in Louisiana [Dutton and Thomas 1991] up to 328 feet (100 m) in California [Hickman 1993]. Pale-yellow iris occurs at 4,200 to 4,315 feet (1,280-1,315 m) near Salt Lake City, Utah [Welsh et al. 1987].”

From Sutherland (1990):

“Its distribution ranges between 68°N to 28°S and extends to 65°E (Vergi. Chor.). It is present in coastal regions mainly near the arid southern limit and towards its northern limit in Scandinavia. It is absent from the Alps and the Pyrenees. It occurs throughout Britain except for the higher regions and tends to be absent from areas of chalk. The restriction to relatively low altitudes and coastal sites in Scandinavia suggests that it is intolerant of low temperatures.”

Distribution Outside the United States

Native

From Stone (2009):

“Pale-yellow iris is native to Europe, northern Africa, and temperate Asia (reviews by [Sutherland 1990; Weber 2003]).”

GISD (2018) lists *Iris pseudacorus* as native in Algeria, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Ex-Yugoslavia, Finland, France, Germany, Greece, Hungary, Iran, Ireland, Israel, Italy, Latvia, Lithuania, Moldova, Morocco, Netherlands, Norway, Occupied Palestinian Territory, Poland, Portugal, Romania, Russian Federation, Spain, Sweden, Switzerland, Syria, Turkey, Ukraine, and United Kingdom.

Introduced

GISD (2018) lists *Iris pseudacorus* as alien, invasive, and established in Canada and New Zealand.

From GISD (2018):

“*I. pseudacorus* has been designated as a Surveillance Pest by the Auckland Regional Pest Management Pest Management Strategy 2002-2007.”

DAISIE (2018) lists *Iris pseudacorus* alien and established in Faroes and Madeira.

From NIES (2018):

“Keeping of this species in Saga Pref. [Japan] are controled [sic] by a prefectural ordinance.”

Pagad et al. (2018) list *I. pseudacorus* as alien in Australia, Canada, Chile, Korea, Iceland, India, Japan, New Zealand, Portugal, South Africa, and Uruguay.

Means of Introduction Outside the United States

From Ramey and Peichel (2001):

“the earliest New World record of this plant was made by Fernald who collected it in the wild in Newfoundland in 1911; it was established in British Columbia by 1931; by 1950, Gray’s Manual

reported its distribution as “Newfoundland to Minnesota”; by 1961 yellow flag was reported to be so plentiful in Canadian swamps as to “have the appearance of a native plant” (Cody 1961)”

Short Description

From Stone (2009):

“The few to several leaves of pale-yellow iris are stiff and erect [Gleason and Cronquist 1991], linear, and 10 to 35 inches (25-90 cm) long [Welsh et al. 1987]. Single or multiple flowering stems are 20 to 39 inches (50-100 cm) tall, usually shorter than or equaling leaves [Gleason and Cronquist 1991]. Plants take 3 years to mature before flowering (review by [King County Noxious Weed Control Program 2007]). Flowers are bright yellow or cream-colored and 3 to 4 inches (7-9 cm) wide [Gleason and Cronquist 1991]. Pale-yellow iris fruits are 6-angled capsules, 2 to 4 inches (5-9 cm) long [Gleason and Cronquist 1991]. The dark brown, smooth, disk-like seeds are closely packed into 3 rows within the capsule (review by [Sutherland 1990]). Seeds have a hard seed coat beneath which there is a gas space, allowing seeds to float in water [Coops and Van der Velde 1995].”

“Pale-yellow iris has rhizomes that are 0.4 to 2 inches (1-4 cm) in diameter (reviews by [Sutherland 1990, Weber 2003]). [...] Roots are usually 4 to 8 inches (10-20 cm) long but can be up to 12 inches (30 cm) long (review by [Sutherland 1990]).”

Biology

From Stone (2009):

“Pale-yellow iris reproduces both vegetatively and by seed. In Poland, reproduction from vegetative fragmentation was more common than seedling establishment (review by [Sutherland 1990]). In Montana, reproduction by seed was thought to be more important than vegetative reproduction [Preece 1964]. The method of reproduction used may depend on local site conditions. On the fringes of saltmarshes in Ireland, shore level influenced reproductive method. On high saltmarsh sites, rhizomes were long-lived and seedlings were rare, whereas at low saltmarsh sites, rhizomes were short-lived and there were "considerable" numbers of seedlings [Sutherland and Walton 1990].”

“Pollination and breeding system: Pale-yellow iris is a cross-fertilizing species [Fryxell 1957]. In its native range, pale-yellow iris is pollinated by bees (*Bombus* spp.) and long-tongued flies (review by [Sutherland 1990]). Pale-yellow iris was visited by a syrphid fly in Europe (review by [Cockerell 1902]). It attracts hummingbirds and butterflies in its nonnative range (review by [Limpert 1993]).

Seed production: In its native range, pale-yellow iris produced an average of 5.6 capsules/plant with an average of 120 seeds/capsule. At least 30% of these seeds failed soon after fertilization (review by [Sutherland 1990]). In Montana, flowering stalks produced 3 to 4 capsules, each containing 50 to 60 seeds [Preece 1964].

Seed dispersal: Pale-yellow iris seeds are dispersed by water [Whitehead 1971] (reviews by [Weber 2003; King County Noxious Weed Control Program 2007]). Seeds float on the water

surface in fall and early spring [Whitehead 1971] and germinate along shorelines when water recedes (reviews by [Tu 2004; King County Noxious Weed Control Program 2007]). [...]”

“Germination: Pale-yellow iris germination is best in moist [Thomas 1980; Coops and Van der Velde 1995] but not waterlogged [Thomas 1980; Lenssen et al. 1988] conditions. One review suggests that pale-yellow iris germination may be more dependent on temperature than light [Tu 2004]. In the field, pale-yellow iris germination in its native range is said to be poor due to fat-like substances present on the inner seed coat. Seedlings were rare in most habitats (review by [Sutherland 1990]). However, one author states that a "large number" of pale-yellow iris seeds in Great Britain germinate and put out roots [Whitehead 1971]. In Montana, one author suggests that pale-yellow iris germination rates were high based on the high number of seedlings observed in the field and from observations of field-collected seed [Preece 1964].”

“Seedling establishment and plant growth: Pale-yellow iris generally establishes in areas that are moist but not waterlogged. In many cases, pale-yellow iris establishes on the edges of water features (see Site characteristics [in source material]), as water-dispersed seeds are often deposited along the high water mark (reviews by [Tu 2004; King County Noxious Weed Control Program 2007]). On Theodore Roosevelt Island in the Potomac River, pale-yellow iris established on trash, river debris, and tree roots that were above the general water level of the marsh [Thomas 1980]. As a young plant, pale-yellow iris invests heavily in developing a root system to adapt to fluctuating water levels [Whitehead 1971].”

“On Theodore Roosevelt Island in the Potomac River near Washington, DC, the length of time that pale-yellow iris was inundated by water was the factor most limiting to its growth; areas experiencing short inundation exhibited greater growth than areas with long inundation [Thomas 1980]. In contrast, in Montana, pale-yellow iris plants growing in 2 to 3 feet (1 m) of water were larger and more "vigorous" than plants that were not inundated [Preece 1964]. Pale-yellow iris occurred in areas that were flooded for as long as 6 months in its native range [Mulqueen and Gleeson 1988; Vecrin et al. 2007]. One author reports that in England, pale-yellow iris seeds germinated and seedlings grew well in marshes burned in late summer and flooded over winter (review by [Sutherland 1990]).

Studies in Poland show most mortality of pale-yellow iris seedlings occurs in the first 2 months after germination, most likely due to desiccation. Heavy seedling mortality also occurs the first winter due to freezing surface water. In Poland, between 28% and 72% of seedlings survive their 1st year; only 3% to 6% grow to a size at which the rhizomes fragment (review by [Sutherland 1990]) (see Vegetative regeneration [in source material]).”

“Vegetative regeneration: Pale-yellow iris regenerates vegetatively via rhizomes [Whitehead 1971; Hickman 1993; Diggs et al. 1999], (review by [Sutherland 1990]). When plants reach about 10 years of age (review by [Sutherland 1990]) rhizomes fragment and contribute to new plant establishment (reviews by [Sutherland 1990; Weber 2003; King County Noxious Weed Control Program 2007]).

Rhizomes may break off during floods (review by [Sutherland 1990]) and are moved to new locations by water (reviews by [Sutherland 1990; Weber 2003]). Dry rhizomes remain viable for

more than 3 months and may establish if they encounter moisture (reviews by [Sutherland 1990; King County Noxious Weed Control Program 2007]). Individual rhizomes may persist for 10 years ([Sutherland and Walton 1990], review by [Sutherland 1990]). In its native range, the conditions in wet fens preserve pale-yellow iris rhizomes for many years, making it possible to observe 30 to 40 years of flowering extent, branching, and annual incremental increases in plant size [Whitehead 1971].

Thick rhizomes tend to prevent mixing of adjacent clones, but often 2 or 3 clones may lie on top of each other, with the bottom rhizome occurring at a depth of about 4 inches (10 cm) (review by [Sutherland 1990]). Up to several hundred flowering plants may be connected rhizomatously (review by [King County Noxious Weed Control Program 2007]). Rhizomes may grow over the soil (review by [Weber 2003]), rocks (review by [Sutherland 1990]), or as mats floating in water (reviews by [Sutherland 1990; Weber 2003]).”

Human Uses

From Ramey and Peichel (2001):

“*Iris pseudacorus* was brought to Canada and the U.S. as an ornamental plant in the early 1900s; it is also used as an erosion control plant, is used in sewage treatment cells (Gedebo and Froud-Williams 1998), and is reportedly used as a dye plant and as a fiber plant (Kartesz 1999).”

From Stone (2009):

“Pale-yellow iris has been used as a rehabilitation plant to reduce bacterial loads (review by [Sutherland 1990]), absorb heavy metals from contaminated water ([Barbolani et al. 1986], reviews by [Sutherland 1990; Tu 2004]), and provide erosion control (review by [Tu 2004]). One review states that it is "one of the few plants flourishing after a nuclear holocaust" (review by [Sutherland 1990]). Pale-yellow iris was smoked by people during World War II (review by [Sutherland 1990]). In Turkey, pale-yellow iris rhizomes are used as a diuretic, to prevent gas, and to treat eczema. Seeds are used as a coffee substitute after drying [Engin et al. 1998]. One author experienced severe attacks of dermatitis from contact with the syrupy covering of the endosperm of pale-yellow iris seeds [Crocker 1906].”

From Morgan et al. (2018b):

“The rhizomes of *I. pseudacorus* can also reduce populations of *Escherichia coli*, *Salmonella*, and *Enterocoli* by 50-70% in a 24-hour period (Jacobs et al. 2011).”

“Water-soluble polysaccharides extracted from *I. pseudacorus* appear promising for pharmaceutical uses (Sanavova and Rakhimov 2004). Ethanol extracts of *I. pseudacorus* show larvicidal and mirscidiacidal/cercarcidal (compounds that kills trematode larvae) properties (Ahmed and Hamshary 2005).”

“Historically, the flowers of *I. pseudacorus* have been used to yellow dye and the rhizomes were used as a powerful herbal laxative and emetic (Jacobs et al. 2011).”

Diseases

No information on parasites or pathogens of *Iris pseudacorus* was found.

Threat to Humans

From Stone (2009):

“Pale-yellow iris is considered poisonous ([Diggs et al. 1999], review by [Tu 2004]) due to large amounts of glycosides found in foliage and rhizomes (review by [Tu 2004]).”

From Swearingen and Barger (2016):

“Caution should be used when hand-pulling, as it can cause skin irritation.”

From Morgan et al. (2018b):

“All parts of *I. pseudacorus* are poisonous (Idaho Invasives 2007). Its resins can cause skin irritation and blistering; if ingested, this plant will cause gastric distress in humans (ISCBC 2012, Lui et al. 2010, Sutherland 1990). Yellow iris (live or dried) can cause gastroenteritis in cattle and sicken other livestock if ingested, although grazing animals tend to avoid it (Lui et al. 2010, Sutherland 1990). Because palatable species go relatively untouched when intermingled with *I. pseudacorus*, the quality of pastureland can be reduced (Bossuyt et al. 2005).”

3 Impacts of Introductions

From Morgan et al. (2018a):

“By 1970 yellow iris was found growing to the complete exclusion of *Typha* and other native marsh plants along the Merced River in California (Raven and Thomas 1970).”

From Morgan et al. (2018b):

“Yellow iris (live or dried) can cause gastroenteritis in cattle and sicken other livestock if ingested, although grazing animals tend to avoid it (Lui et al. 2010, Sutherland 1990). Because palatable species go relatively untouched when intermingled with *I. pseudacorus*, the quality of pastureland can be reduced (Bossuyt et al. 2005).”

From GISD (2018):

“Cox (1999, in Tu 2003) reports that, in Connecticut, *I. pseudacorus* was able to exclude the native arrow-wood (*Peltandra virginica*), a plant whose fruits are an important food of wood ducks during the nesting season.”

“Tu (2003) states that, Along [sic] the lower Potomac River near Washington, D.C., *I. pseudacorus* contributed to the conversion of riparian marshes into mesic forest dominated by *Fraxinus* spp. It formed a thick rhizome mat which elevated the seed bed further above the water

table, and created a drier habitat type that is favored by ashes (*Fraxinus* spp.) rather than willows (*Salix* spp.), a historic component of these marshes (Crawford 2000; Thomas 1980).”

“Tu (2003) states that, In Oregon, *I. pseudacorus* is common in coastal brackish marshes and is able to displace native *Carex lyngbyei* marshes, as well as *Scirpus acutus*, *Carex* spp. and *Equisetum fluviatile* marshes (D. Pickering, in Randall & Rice 2003, in Tu 2003).”

From Ramey (2001):

“*Iris pseudacorus* is a fast-growing and fast-spreading invasive plant that can outcompete other wetland plants, forming almost impenetrable thickets, in much the same as cattails (*Typha*) do. ‘Individuals produce from several dozen to several hundred rooted rosettes and flowering shoots connected by durable rhizomes (Falinska 1986).’”

From Stone (2009):

“The tendency for pale-yellow iris to grow in large, radially spreading clones allows it to form dense stands that may replace native vegetation ([Preece 1964; Thomas 1980; Morgan 2008], reviews by [Raven and Thomas 1970; Clark et al. 1998; Weatherbee et al. 1998; Weber 2003; Tu 2004; MIPAG 2005; King County Noxious Weed Control Program 2007]), including 2 native irises in Massachusetts (review by [Weatherbee et al. 1998]) and characteristic California marsh plants such as cattails (*Typha* spp.) (Fuller personal communication cited by [Raven and Thomas 1970]). Pale-yellow iris may also reduce habitat needed by waterfowl and fish ([Thomas 1980], reviews by [Tu 2004; King County Noxious Weed Control Program 2007]), including several important salmon species (review by [King County Noxious Weed Control Program 2007]). Pale-yellow iris may also reduce available forage for livestock [Preece 1964].

On Theodore Roosevelt Island in the Potomac River near Washington, DC, pale-yellow iris changed local site conditions to the extent that it facilitated its own spread; rhizome growth compacted the soil, a hardpan developed, and species other than pale-yellow iris were unable to establish and persist. Pale-yellow iris clones eventually replaced the native green arrow arum, an important plant for wood ducks. Mats of pale-yellow iris rhizomes also prevented the germination and seedling development of willows (*Salix* spp.), particularly black willow. By suppressing willows and providing a raised surface, pale-yellow iris promoted the spread of species not needing a mineral surface for establishment (e.g., green ash). In turn, this change in species composition facilitated the succession from marsh to swamp vegetation communities. The author concluded that pale-yellow iris “apparently speeds up the destruction of the marsh by promoting expansion of the swamp and apparently preempts space and thus reduces the food supply of the wood duck which occurs on the island” [Thomas 1980].

As of 2001, pale-yellow iris occurred along 1,300 miles (2,100 km) of irrigation canals and lateral channels near Flathead Lake in northwestern Montana (Lake County Weed District, Pablo, Montana, 2001 personal communication cited in [Morgan 2008]). Pale-yellow iris plants may clog small streams and irrigation systems, and seeds clog water control structures and pipes ([Preece 1964], review by [King County Noxious Weed Control Program 2007]). One review cites a study from Montana suggesting that pale-yellow iris plants may reduce stream width by

up to 10 inches (25 cm) annually by trapping sediment. This process creates new streambanks which may be dominated by pale-yellow iris seedlings (Tyron 2006 unpublished study cited in [King County Noxious Weed Control Program 2007]).”

“In grazing experiments in Belgium, pale-yellow iris was considered unpalatable to cattle and ponies [Bossuyt et al. 2005]. In its native range pale-yellow iris is usually ignored by domestic ponies, cattle, sheep, goats, and rabbits, though foliage was eaten down to the rhizomes by domestic cattle in autumn when other vegetation was unavailable. Domestic sheep have been observed browsing early-season leaves. Fallow deer browsed pale-yellow iris in England. In Britain, gastroenteritis occurred after livestock ate hay containing pale-yellow iris, and acute diarrhea occurred in domestic cattle after rhizome consumption (review by [Sutherland 1990]).”

4 Global Distribution

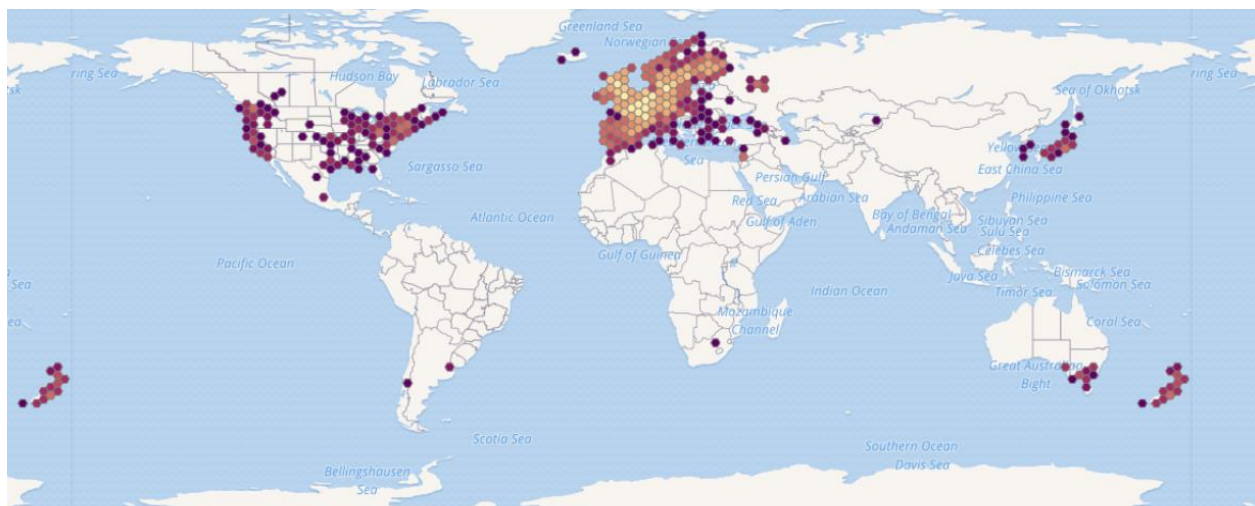


Figure 1. Known global distribution of *Iris pseudacorus*. Map from GBIF Secretariat (2018).

5 Distribution Within the United States

yellow iris (*Iris pseudacorus*)

EDDMapS

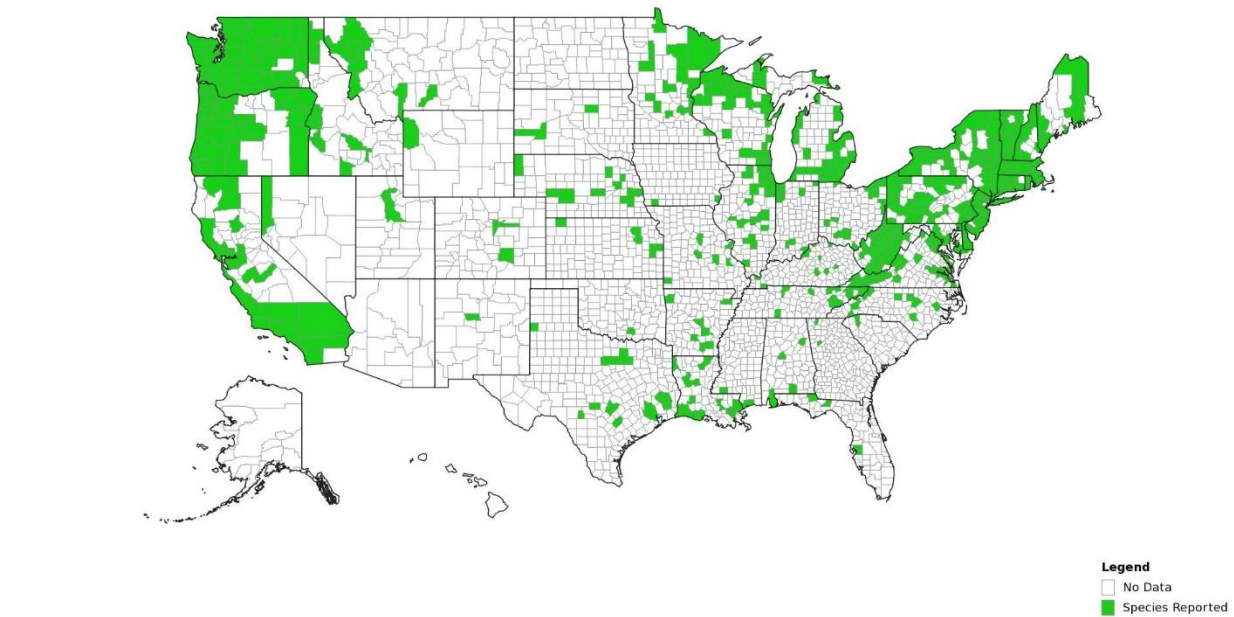


Figure 2. Counties in the United States with known locations of *Iris pseudacorus*. Map from EDDMapS (2018).

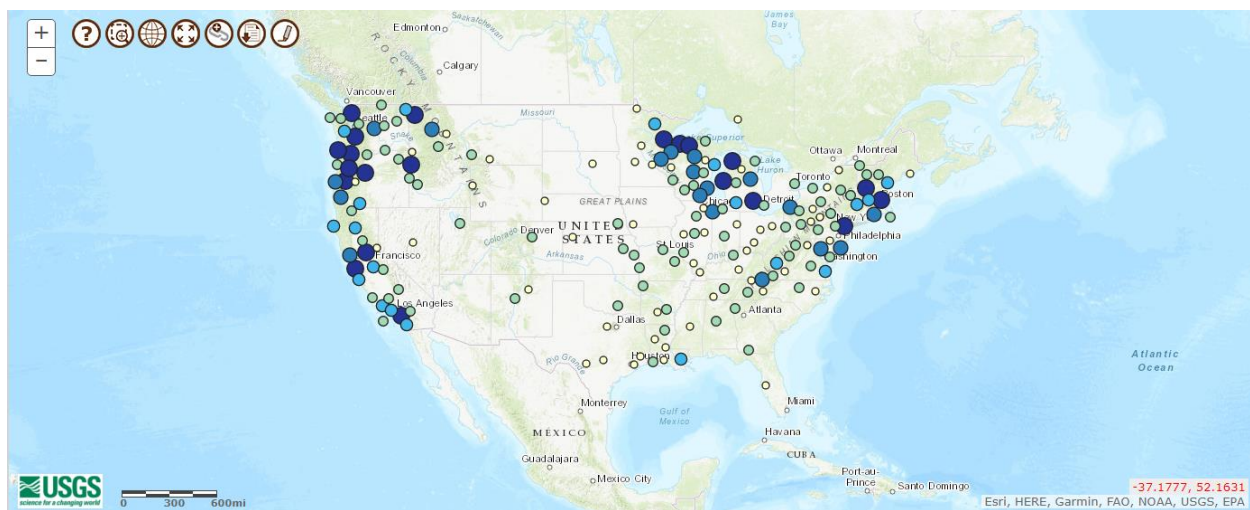


Figure 3. Known distribution of *Iris pseudacorus* in the contiguous United States. Map from Morgan et al. (2018a).

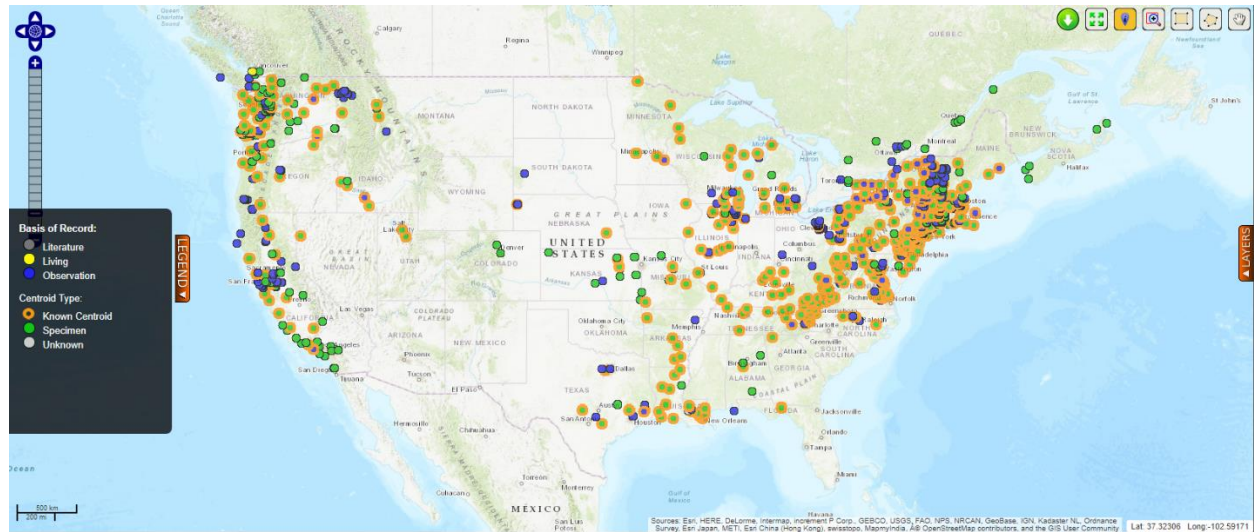


Figure 4. Additional known distribution of *Iris pseudacorus* in the contiguous United States. Map from BISON (2018).

6 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Iris pseudacorus* was high for most of the contiguous United States. There was a small area of medium match in the southwest. The Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.989, high (scores 0.103 and greater are classified as high). All States in the contiguous United States had a high individual Climate 6 score.

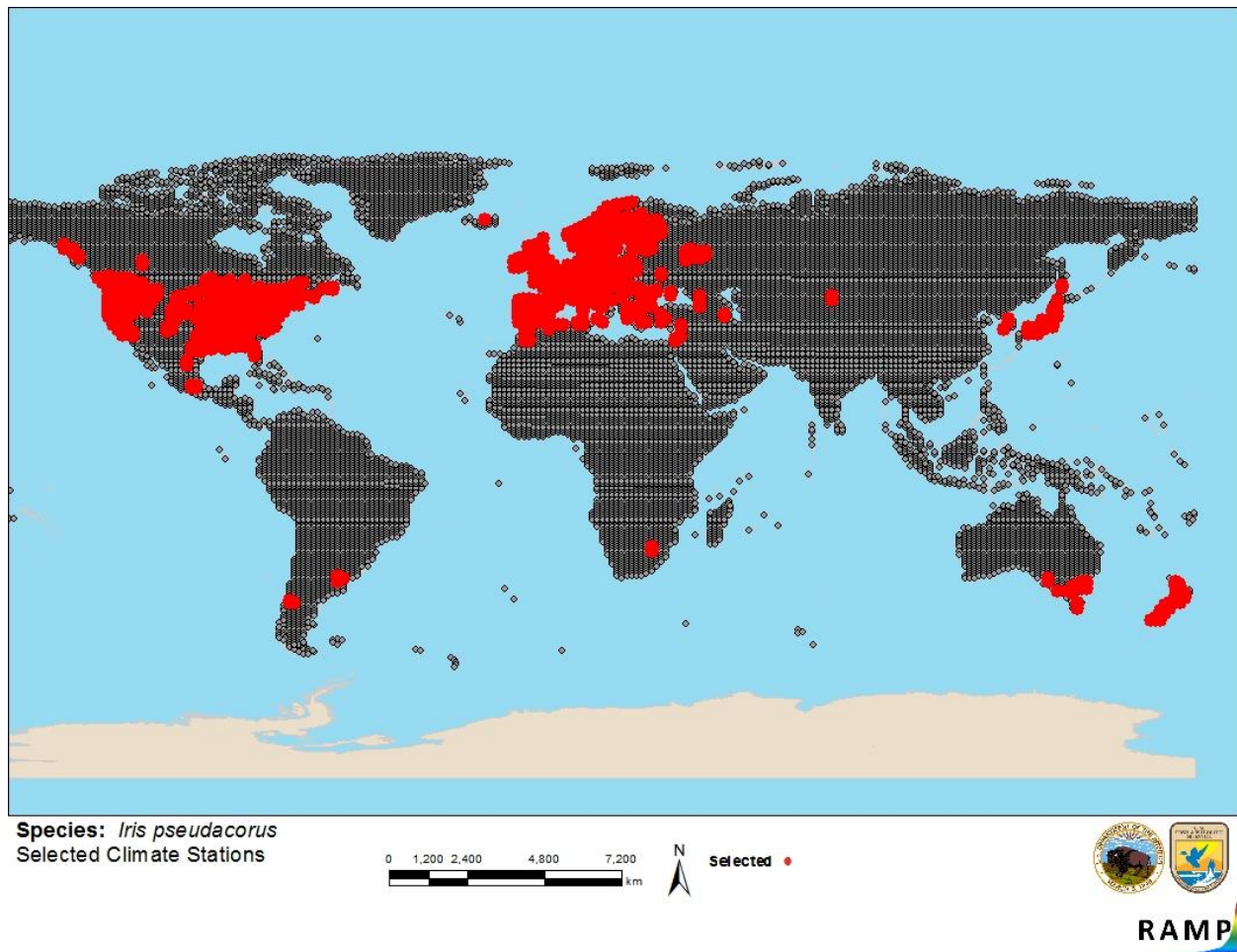


Figure 5. RAMP (Sanders et al. 2018) source map showing weather stations in North America, southern South America, Europe, southern Africa, western Asia, Japan, Korea, Australia, and New Zealand selected as source locations (red) and non-source locations (gray) for *Iris pseudacorus* climate matching. Source locations from BISON (2018), EDDMapS (2018), GBIF Secretariat (2018), and Morgan et al. (2018a). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

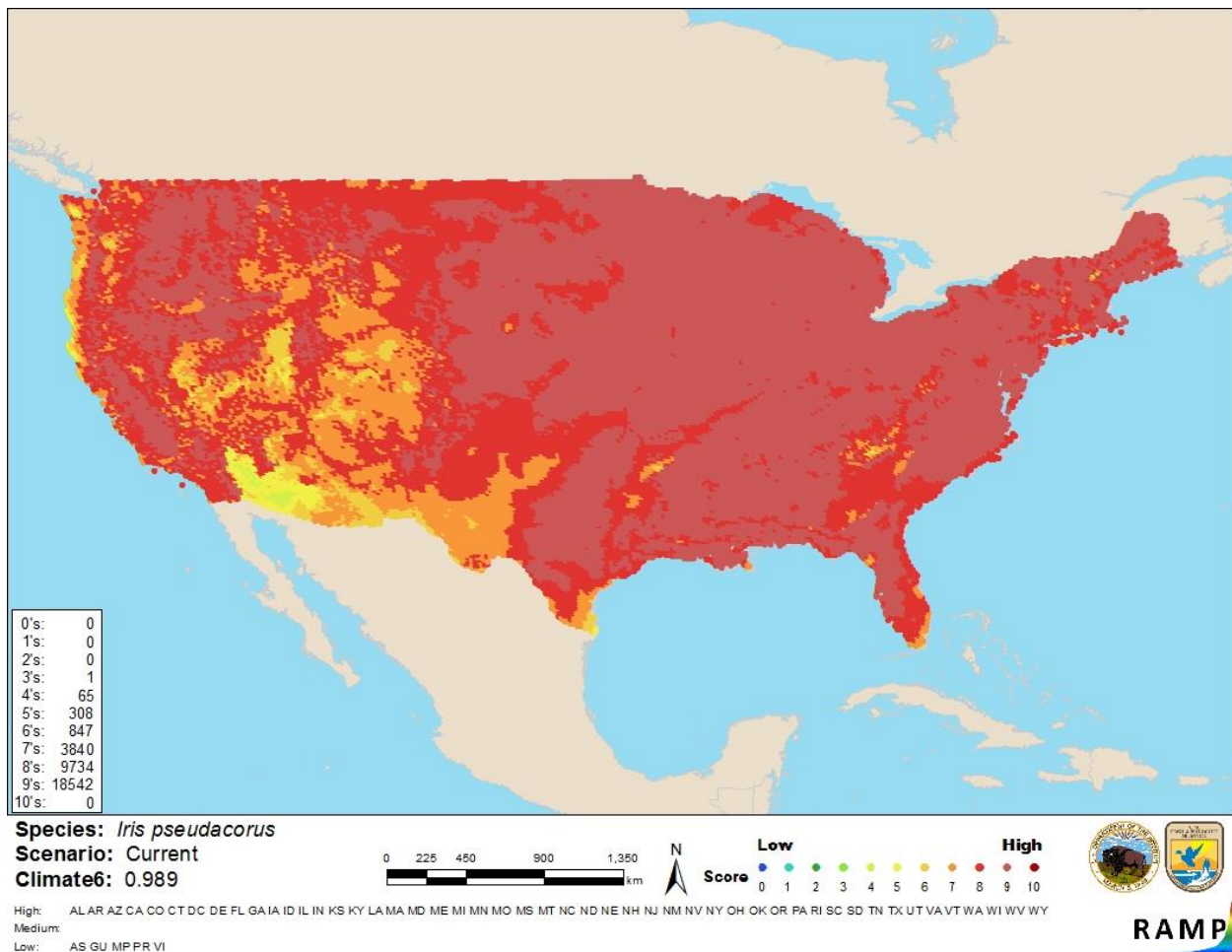


Figure 6. Map of RAMP (Sanders et al. 2018) climate matches for *Iris pseudacorus* in the contiguous United States based on source locations reported by BISON (2018), EDDMapS (2018), GBIF Secretariat (2018), and Morgan et al. (2018a). Counts of climate match scores are tabulated on the left. 0 = Lowest match, 10 = Highest match.

The High, Medium, and Low Climate match Categories are based on the following table:

Climate 6: Proportion of (Sum of Climate Scores 6-10) / (Sum of total Climate Scores)	Climate Match Category
$0.000 \leq X \leq 0.005$	Low
$0.005 < X < 0.103$	Medium
≥ 0.103	High

7 Certainty of Assessment

Certainty of this assessment is high. Information on the invasion history and impacts of this species is available. Information regarding impacts comes from peer-review literature but was accessed through scientific databases. The original literature was not available. There is enough information available to describe the risks posed by this species.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Yellow flag iris (*Iris pseudacorus*) is a wetland plant native to parts of Europe, Western Asia and North Africa. The history of invasiveness is high. The species has spread worldwide as an ornamental plant. It has resulted in exclusion of native species and complete alteration of habitats from non-forested to forested wetlands. Climate matching indicated the contiguous United States has a high climate match. There are established populations of *I. pseudacorus* in many states. The plant is prolific and has adapted to a wide variety of environmental conditions. The certainty of assessment is high. The overall risk assessment category is high.

Assessment Elements

- **History of Invasiveness (Sec. 3): High**
- **Climate Match (Sec. 6): High**
- **Certainty of Assessment (Sec. 7): High**
- **Remarks/Important additional information: No additional information.**
- **Overall Risk Assessment Category: High**

9 References

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 10.

BISON. 2018. Biodiversity Information Serving Our Nation (BISON). U.S. Geological Survey. Available: <https://bison.usgs.gov>. (March 2018).

DAISIE European Invasive Alien Species Gateway. 2018. *Iris pseudacarus*. Available: <http://www.europe-aliens.org/speciesFactsheet.do?speciesId=1789>. (March 2018).

EDDMapS. 2018. Early Detection & Distribution Mapping System. University of Georgia, Center for Invasive Species and Ecosystem Health, Tifton, Georgia. Available: <http://www.eddmaps.org/>. (March 2018).

GBIF Secretariat. 2018. GBIF backbone taxonomy: *Iris pseudacorus* L. Global Biodiversity Information Facility, Copenhagen. Available: <https://www.gbif.org/species/5298231>. (March 2018).

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