DRAFT WRITTEN FINDINGS OF THE WASHINGTON STATE NOXIOUS WEED CONTROL BOARD

SCIENTIFIC NAME: *Imperata cylindrica*

SYNONYMS: *Calamagrostis lagurus, Lagurus cylindricus, Saccharum cylindricum, Saccharum europaeum, Arundo epigeios, Imperata allang, Imperata angolensis, Imperata arundinacea, Imperata arundinacea var. africana, Imperata arundinacea var. europaea, Imperata arundinacea var. glabrescens, Imperata arundinacea var. indica, Imperata arundinacea var. koenigii, Imperata arundinacea var. latifolia, Imperata arundinacea var. pedicellata , Imperata arundinacea var. thunbergii, Imperata cylindrica var. africana, Imperata cylindrica var. europaea, Imperata cylindrica subvar. koenigii, Imperata cylindrica var. koenigii, Imperata cylindrica subsp. koenigii, Imperata cylindrica var. latifolia, Imperata cylindrica var. major, Imperata cylindrica f. pallida, Imperata cylindrica var. parviflora, Imperata cylindrica var. pedicellate, Imperata cylindrica var. thunbergii, Imperata dinteri, Imperata filifolia, Imperata koenigii, Imperata koenigii, Imperata laguroides, Imperata latifolia, Imperata pedicellate, Imperata praecoquis, Imperata ramosa, Imperata robustior, Imperata sieberi, Imperata sisca, Imperata thunbergii, Saccharum alopecurus, Saccharum diandrum, Saccharum indum, Saccharum koenigii, Saccharum laguroides, Saccharum negrosense, Saccharum sisca, Saccharum spicatum, Saccharum spicatum, and Saccharum thunbergii (Plants of the World Online).*

COMMON NAMES: Cogongrass, cogon grass, kunai grass, blady grass, speargrass, sungrass, alang-alang, Lalang grass, kura-kura, etc.

VARIETIES: 'Rubra', Japanese blood grass, 'Red Baron', and red cogongrass

FAMILY: Grass family, Poaceae

LEGAL STATUS: Considered for Class B listing



Thurman Johnson

DESCRIPTION AND VARIATION:

OVERALL HABIT:

Imperata cylindrica is an aggressive, long-lived perennial grass that grows in loose to compact tufts

or dense mats of grass (Nayim *et al.,* 2023; GISD, 2023; Bryson and Carter, 1993; MacDonald, 2004). The plant exhibits an almost stemless, erect growth habit where foliage arises directly from extensive underground rhizomes (Nayim *et al.,* 2023; GISD, 2023; MacDonald, 2004, 2007). It utilizes the C4 photosynthetic pathway, which allows for specialized carbon-fixing metabolic pathway that optimizes water and nitrogen use efficiency under high temperatures and light intensities. This gives it a strong competitive advantage over C3 plants (such as rice or native cool-season species) (Terry *et al.,* 1997; GISD, 2023; Bryson and Carter, 1993; MacDonald, 2007; Fahey *et al.,* 2018; Kato-Noguchi, 2022). Its growth strategy allocates over 60% (and up to 80%) of its total plant biomass belowground into its rhizome network, enabling rapid post-disturbance regeneration and high persistence (GISD, 2023; Daneshgar and Jose, 2009; Kato-Noguchi, 2022).



Matt Conrad

STEMS:

The aboveground structure of *I. cylindrica* possesses no true main stem except during the formation of flowering stalks, known as culms (Nayim *et al.,* 2023; GISD, 2023; MacDonald, 2004; Kato-Noguchi, 2022). The culms are erect, unbranched, smooth, and slender to robust, typically reaching heights of 25 to 120 cm, though under favorable conditions they may extend up to 3 m (Bryson and Carter, 1993; Jung and Shin, 2021; Li *et al.*, 2026). Culms feature 1 to 4 (rarely up to 8) smooth, glabrous (hairless) nodes (joints along the stem) (Bryson and Carter, 1993; Li *et al.*, 2026). At the base, leaf sheaths are tightly rolled together to enclose the culm, forming a false cylindrical stem (Li *et al.*, 2026; Kato-Noguchi, 2022). The leaf sheaths are smooth or ciliate (fringed with small hairs), overlapping one another, and split longitudinally with age to become tough and fibrous (Bryson and Carter, 1993; Li *et al.,* 2026). At the junction between the leaf blade and leaf sheath lies a membranous ligule (a small translucent flap of tissue) measuring approximately 1.5 to 2 mm in length, which is appressed to the back or trimmed with soft hairs at the sheath mouth (Li *et al.,* 2026; MacDonald, 2007; Kato-Noguchi, 2022).

LEAVES:

The leaves of *I. cylindrica* are flat, slender, and linear-lanceolate (narrow and spear-shaped) with narrow, sharp-pointed tips, arising directly from subterranean rhizomes (Nayim *et al.,* 2023; GISD, 2023; Bryson and Carter, 1993; Li *et al.,* 2026). Leaf blades range from 15 to 150 cm in length and 4 to 10 mm in width, depending on soil moisture and fertility (Nayim *et al.,* 2023; GISD, 2023; Bryson and Carter, 1993; MacDonald, 2007). Fresh foliage exhibits a distinct lime-green color and is glaucous (covered with a waxy, bluish-grey bloom) with soft hairs present on the upper surface near the base (Li *et al.*, 2026; Minogue *et al.,* 2018). Popular cultivated varieties have red tints on the leaves, especially on the upper

halves. A key diagnostic feature is the leaf midrib (central vein), which is prominent, bright white, and characteristically located slightly off-center along the upper leaf surface (Nayim *et al.,* 2023; GISD, 2023; Bryson and Carter, 1993; MacDonald, 2007). The leaf margins (edges) are sharply scabrid (serrated and rough) due to the accumulation of microscopic silica crystals (glass-like mineral deposits), which deter herbivory (grazing by livestock and wild animals) (Nayim *et al.*, 2023; GISD, 2023; Bryson and Carter, 1993; MacDonald, 2007; Kato-Noguchi, 2022). Basal leaves gradually narrow downward into petiole-like (stem-like) bases (Bryson and Carter, 1993; Li *et al.,* 2026).



Matt Conrad

FLOWERS:

The inflorescence (flower cluster) is a solitary, terminal, dense, tightly branched, and cylindrical panicle (a branched, loose, cluster of flowers, where each flower has its own stem) that tapers toward the tip (Jung and Shin, 2021; Bryson and Carter, 1993; Li *et al.*, 2026; MacDonald, 2007). It measures 3 to 20 cm in length (occasionally up to 60 cm) and 0.5 to 2.5 cm (up to 3 cm) in diameter (Bryson and Carter, 1993; Li *et al.*, 2026; MacDonald, 2007). The entire flower structure is densely covered in long, silky, silvery-white or cream-colored hairs, giving the seedhead a characteristic fluffy, plume-like appearance (Bryson and Carter, 1993; Li *et al.*, 2026; MacDonald, 2007; Kato-Noguchi, 2022). Spikelets (the basic unit of grass flowers) are 2.5 to 6 mm long, oblong-lanceolate, and borne on unequal pedicels (flower stalks) (Jung and Shin, 2021; Bryson and Carter, 1993; Li *et al.*, 2026; MacDonald, 2004). Each spikelet is enclosed by two nearly equal glumes (outer protective scale-like bracts) that feature 5 to 9 veins and long silky hairs (Jung and Shin, 2021; Bryson and Carter, 1993; Li *et al.*, 2026). Within the glumes, the lower floret is sterile and reduced to a transparent, veinless lemma (inner bract) 1.5 to 4.1 mm long (Bryson and Carter, 1993; Li *et al.,* 2026; MacDonald, 2004). The upper floret is fertile, featuring a smaller ovate lemma and a broad, toothed palea (innermost scale) (Bryson and Carter, 1993; Li *et al.,* 2026). Each fertile floret contains two stamens bearing anthers 2.0 to 4.1 mm long that are purplish-black to orange-



Matt Conrad

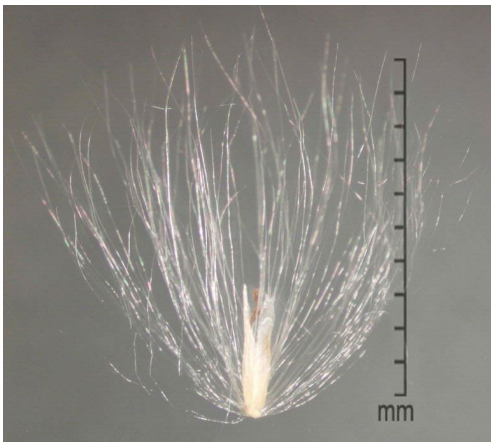
brown (Jung and Shin, 2021; Bryson and Carter, 1993; Li *et al.,* 2026; MacDonald, 2004). The female organs consist of a single ovary with two slender styles united at the base, terminating in two purplish-black, feathery, plumose stigmas (~4 mm long) that protrude from the apex of the spikelet (Li *et al.,* 2026; MacDonald, 2004).



Matt Conrad

FRUITS/SEEDS:

The fruit of *I. cylindrica* is a caryopsis (a dry, single-seeded fruit where the outer seed coat is permanently fused to the fruit wall), often referred to as an achene (a seed that does not release the fruit when ripe) or grain (Bryson and Carter, 1993; Li *et al.,* 2026). The caryopsis is solitary, small, 0.9 to 1.3 mm long, elliptical to oblong, and brown in color (Bryson and Carter, 1993; Li *et al.,* 2026). Attached to each seed unit is a dense plume of fine, silky white hairs (fluffy plumes) that act as a parachute, enabling wind dispersal over distances averaging 15 meters and extending up to 24 kilometers under open, windy conditions (GISD, 2023; Bryson and Carter, 1993; MacDonald, 2007; Kato-Noguchi, 2022). Individual plants are prolific seed producers, generating 500 to over 3,000 seeds per panicle (GISD, 2023; Bryson and Carter, 1993; MacDonald, 2007; Kato-Noguchi, 2022). The seeds lack innate physiological seed dormancy (a mechanism delaying germination until specific environmental triggers occur). Consequently, seed viability is very short-lived, displaying rapid viability loss over time and complete mortality within one year of shedding (GISD, 2023; Bryson and Carter, 1993; MacDonald, 2007; Minogue *et al.,* 2018).



Julia Scher, USDA APHIS

ROOTS:

The belowground architecture of *I. cylindrica* consists of an extensive, highly branched fibrous root system anchored by thick, creeping underground stems called rhizomes (Nayim *et al.,* 2023; Bryson and Carter, 1993; Minogue *et al.,* 2018). The rhizomes comprise over 60% to 80% of the total plant biomass, forming an impenetrable subterranean matrix yielding up to 40 metric tons of fresh rhizome weight per hectare (Sajise, 1976; GISD, 2023; MacDonald, 2007; Burrell *et al.,* 2015; Daneshgar and Jose, 2009). Anatomically, rhizomes are tough, fleshy, white, and segmented with short internodes (segments between joints) (MacDonald, 2007; Minogue *et al.*, 2018; Kato-Noguchi, 2022). They are protected by light-brown to dark-brown cataphylls (scale-like reduced leaves) (Ayeni, 1985; MacDonald, 2007; Minogue *et al.,* 2018; Kato-Noguchi, 2022). The growing tips of the rhizomes feature sharp, heavily lignified root caps that can physically pierce the roots, bulbs, and fleshy tubers of co-occurring native plants and agricultural crops (Terry *et al.,* 1997; GISD, 2023; Bryson and Carter, 1993; MacDonald, 2007;

Kato-Noguchi, 2022). Although rhizomes can penetrate heavy clay soils down to 0.15 m and sandy soils to 0.4 m (with exceptional penetration reaching depths of 1.2 m), the vast majority of active rhizome biomass is concentrated in the top 15 to 20 cm of the soil profile (GISD, 2023; Bryson and Carter, 1993; MacDonald, 2004, 2007; Rusdy, 2020). The roots frequently form endomycorrhizal associations (symbiotic relationships with soil fungi that colonize root cells), which significantly enhances the plant's capacity for phosphorus and nitrogen acquisition in nutrient-impoverished soils (Terry *et al.,* 1997; GISD, 2023; MacDonald, 2007; Kato-Noguchi, 2022).



Matt Conrad



Above: Johnsongrass, photo by Richard Old.
Below: Barnyard grass, photo by David Giblin.



SIMILAR SPECIES:

Johnsongrass (*S. halepense*) is a non-native ornamental and Sorghum (*Sorghum bicolor*) is a non-native crop. They both have wide green leaves with very apparent midribs that are slightly off-center and can get red tinges to the leaves. When flowering, these species have very spreading flowering panicles, which are not fluffy (Burke Herbarium).

Barnyard grasses (*Echinochloa crus-galli* and *E. muricata*) are non-native and potentially native (respectively) species have similar looking leaves to cogongrass, but when flowering, they have very stiff panicles that are not fluffy (Burke Herbarium).

Silvergrass (*Miscanthus sinensis*) is a non-native ornamental which have fluffy flowers, but each stalk of the flowering panicle are long and arching. The stems of Silvergrass can be lightly hairy (NC State Extension).

Red switch grass (*Panicum virgatum*) ‘Shenandoah’, ‘Cheyenne Sky’, and ‘Red Flame’ cultivars are all ornamentals native to the Great Plains, that have been bred



Left: silvergrass. Middle: red switch grass, photo by Baker Environmental Nursery. Right: Fountain grass.

to have red on the leaves, but the flowering panicles spread out, antenna like, and are not fluffy (Wisconsin Horticulture).

Fountain grasses (*Cenchrus longisetus* and *Cenchrus setaceus*) are non-native ornamentals with fluffy panicles, like cogongrass, when flowering, and some cultivars have red coloration in the leaves. Fountain grasses grow from a clump, and their leaves are long and arching away from the center of the bunch (Wisconsin Horticulture).

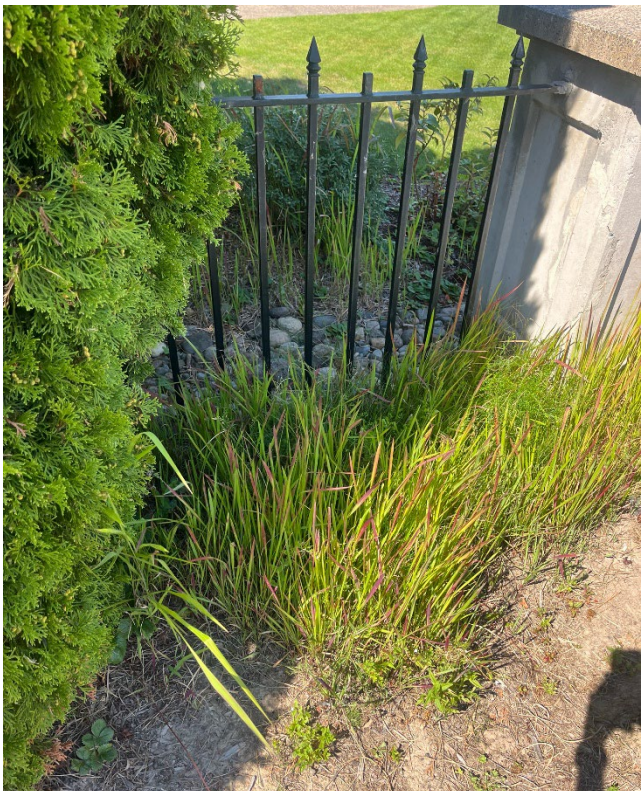
Cottongrasses (*Eriophorum* species) are a few, mostly native, species of sedges that have very fluffy flowering spikes. However, these spikes are usually drooping and much fluffier than cogongrass. Additionally, the leaves are very narrow (Burke Herbarium).



Velvet grasses (*Holcus lanatus* and *H. mollis*) are two non-native species planted to be forage for livestock. When emerging and from a distance, the flowering panicles can have a fluffy appearance but mature to a spread and not fluffy panicle. The leaves and stems are covered in soft hair (Burke Herbarium).

Left: cottongrass, photo by Ben Legler.
Right: velvet grass, photo by Gerald D. Carr

HABITAT:



Matt Conrad

I. cylindrica occupies an exceptionally wide array of terrestrial habitats across humid tropical, subtropical, and warm temperate zones, from sea level to elevations exceeding 2,000 to 2,700 m (GISD, 2023; Bryson and Carter, 1993; Li *et al.,* 2026; Adhikari *et al.,* 2025). It colonizes degraded natural forests, longleaf pine savannas, grasslands, flatwoods, sand dunes, riverbanks, wetlands, agricultural fields, orchards, timber plantations, mined reclamation sites, roadsides, and urban transportation corridors (GISD, 2023; Bryson and Carter, 1993; Li *et al.,* 2026; Adhikari *et al.,* 2025; Redowan *et al.,* 2025). The species thrives in environments receiving an annual precipitation ranging from 50 to 500 cm (GISD, 2023; Bryson and Carter, 1993; Kato-Noguchi, 2022). The plant is adaptable to diverse soil textures, ranging from highly dry coarse sands to fine sandy loams, heavy clays, and organic peat soils (Bryson and Carter, 1993; MacDonald, 2007; Rusdy, 2020). Although tolerant of varied soil fertility, moisture levels, and salinity, *I. cylindrica* achieves maximum development on acidic soils (GISD, 2023; Bryson and Carter, 1993; MacDonald, 2007; Rusdy, 2020). Optimum growth occurs under high light intensity in full sun, but as a light-demanding C4 grass, it possesses a low light compensation point, allowing small patches to persist under moderate forest canopy shade (Terry *et al.,* 1997; GISD, 2023; Bryson and Carter, 1993; MacDonald, 2007).

BIOLOGY

GROWTH AND DEVELOPMENT:

I. cylindrica seed germination requires light and is favored by acidic soil pH and temperatures between 11°C and 43°C (optimal at 30°C) (GISD, 2023; MacDonald, 2007; Rusdy, 2020). Germination is severely suppressed under completely inundated or submersed water conditions (King and Grace, 2000;



Matt Conrad

MacDonald, 2007; Rusdy, 2020). Following germination, early seedling establishment is delicate, with field survival often under 20% due to poor competitive ability against established turf or sod cover (>75% cover) (GISD, 2023; MacDonald, 2004, 2007; Rusdy, 2020). However, surviving seedlings rapidly develop rhizomes within 3 to 8 weeks post-emergence (GISD, 2023; MacDonald, 2004, 2007).

Initial rhizome development grows at a downward at an angle before shifting to horizontal growth and eventually turning vertically upward between the 5th and 6th leaf stages to initiate secondary aerial shoots (Ayeni, 1985; MacDonald, 2004). Individual young plants display explosive growth, capable of producing 31 distinct rhizomes totaling 12 meters in length within 10 months, or 350 emerging shoots covering 4 m^2 in 11 weeks (Terry *et al.,* 1997; Kato-Noguchi, 2022). Optimal temperatures for shoot and rhizome growth are 29°C during the day and 23°C at night (GISD, 2023). Dormant mature stands can survive low air temperatures down to -14°C, but exposure of rhizomes to temperatures of -4.5°C or lower for 24 hours is lethal (GISD, 2023; Adhikari *et al.,* 2025; Rad *et al.,* 2025).

Growth displays strong seasonal dynamics: during dry seasons, shoot emergence drops and older leaf blades die back to conserve nutrients and water within the robust rhizome network; during rainy seasons, shoot emergence accelerates (Terry *et al.,* 1997; MacDonald, 2004). Rhizome buds exhibit strong apical (rhizome tip) dominance mediated by growth hormones produced at the shoot tip, which keep lateral axillary buds dormant along the rhizome strand (MacDonald, 2004, 2007; Rusdy, 2020). When apical tips are severed or fragmented by soil disturbance, apical dominance is broken, triggering rapid sprouting of multiple dormant axillary buds (MacDonald, 2004, 2007; Rusdy, 2020).

REPRODUCTION:

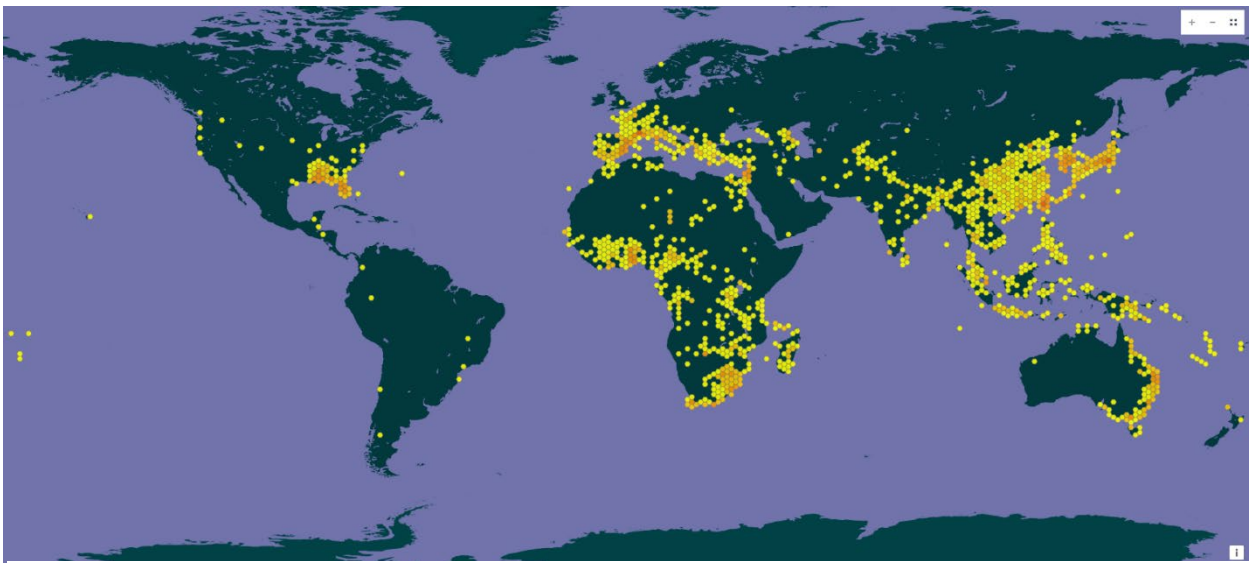
I. cylindrica possesses a dual reproductive strategy, reproducing sexually via wind-dispersed seeds and asexually via its extensive subterranean rhizome system (GISD, 2023; Bryson and Carter, 1993; Minogue *et al.,* 2018). The plant is an obligate outcrossing species (requiring cross-pollination between genetically distinct populations to produce fertile seeds due to self-incompatibility) (MacDonald, 2007; Minogue *et al.,* 2018). Cross-pollinated plants produce high volumes of plumed seeds (up to 3,000 seeds per plant), which are widely dispersed by wind currents (GISD, 2023; Bryson and Carter, 1993; MacDonald, 2007; Kato-Noguchi, 2022). However, in many invaded regions (such as central Florida), isolated clonal stands fail to produce viable seeds due to a lack of genetically distinct pollen partners (Minogue et al., 2018).

Some researchers hypothesize that viable seed production in certain populations may also occur via asexual seed development without fertilization (Burrell *et al.,* 2015; Rusdy, 2020). Seed viability drops rapidly, expiring completely after one year (GISD, 2023; Bryson and Carter, 1993; MacDonald, 2007; Minogue *et al.,* 2018). Vegetative propagation via rhizomes is the primary mechanism for local patch expansion, long-term persistence, and short-distance spread (Lucardi *et al.,* 2014; Burrell *et al.,* 2015). Rhizome fragments as small as 0.1 g or 1 to 5 cm in length containing at least one node can successfully sprout and establish independent colonies (Terry *et al.*, 1997; GISD, 2023; Bryson and Carter, 1993; Kato-Noguchi, 2022). Environmental stress and physical disturbance, including fire, mowing, slashing, overgrazing, winter frost, and heavy nitrogen fertilization, disrupt apical dominance and stimulate massive, synchronized flowering as well as dense shoot re-sprouting from subterranean buds (Terry *et al.,* 1997; GISD, 2023; Bryson and Carter, 1993; MacDonald, 2007; Rusdy, 2020).

GEOGRAPHIC DISTRIBUTION:

NATIVE DISTRIBUTION

I. cylindrica is indigenous to tropical, subtropical, and warm temperate ecosystems across the Eastern Hemisphere. Its recognized native ranges span large expanses of Southeast Asia, East Africa, South Africa, China, Japan, Australia, the Philippines, India, and select temperate coastal habitats ringing the Mediterranean Sea (Bryson and Carter, 1993; MacDonald, 2004; Nayim *et al.,* 2023). Botanical varieties exhibit specific native ranges: *var. major* is native to tropical Asia, Australia, and East Africa; *var. africana* is native to West Africa; var. *europaea* spans the Mediterranean to Afghanistan; *var. latifolia* is native to northern India; and *var. condensata* is native to coastal Chile and Argentina in South America (Li *et al.*, 2026; MacDonald, 2004; Rusdy, 2020).



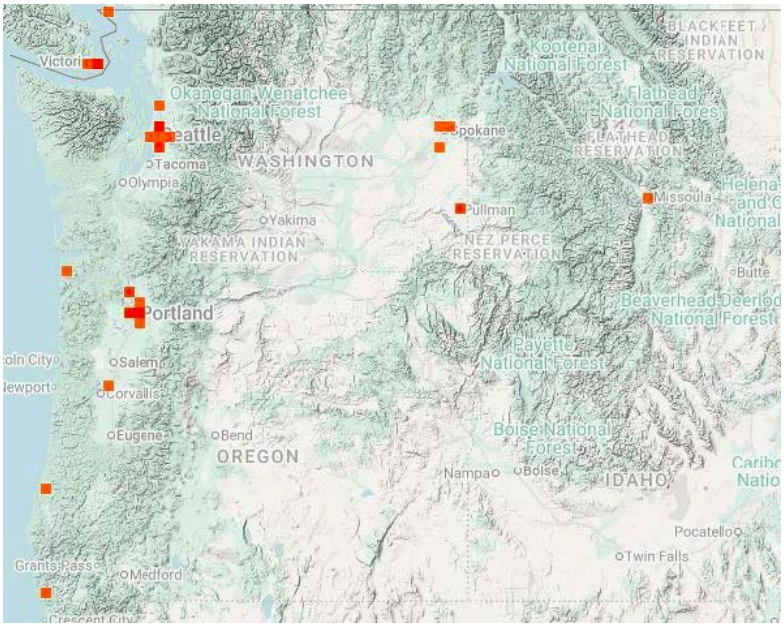
Global Biodiversity Information Facility

NON-NATIVE DISTRIBUTION

Globally considered an insidious invasive pest, the species has naturalized on almost every continent, except for Antarctica, with global infestations covering over 500 million hectares (Butler *et al.,* 2021; MacDonald, 2007; Estrada and Flory, 2015). It now maintains severe ecological strongholds across the Southeastern United States, spanning Florida, Alabama, Mississippi, Louisiana, Georgia, South Carolina, and Texas. Furthermore, invasions currently span into non-native regions of South America, the Caribbean, New Zealand (Bryson and Carter, 1993; Minogue *et al.*, 2018; Redowan *et al.*, 2025), and some countries of Europe, such as Spain, Greece, and Poland (Adhikari *et al.,* 2025; Rad *et al.,* 2025).

HISTORY:

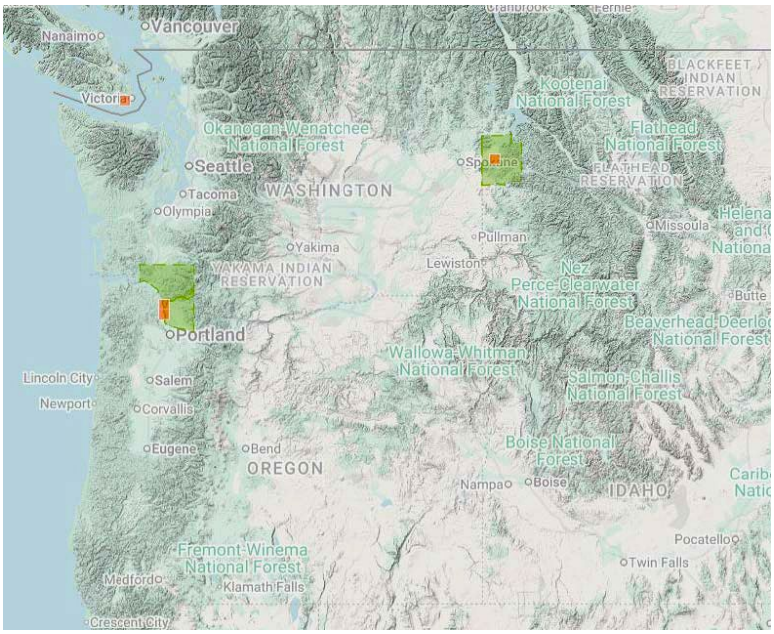
I. cylindrica came into North America through accidental maritime shipping pathways and intentional forage plantings during the early 1900s, it aggressively established itself across the southeastern United States (Bryson and Carter, 1993). There are very few records of I. cylindrica in any herbaria in western North America, or on citizen science databases, such as EDDMapS or iNaturalist. Grasses are generally difficult to identify, especially for the general public. However, the “Red Baron” cultivar is very popular in ornamental plantings across the Pacific Northwest, including throughout Washington. There is a potential that this cultivar can revert to its “wild type” which could begin spreading in the future with more introductions (Conrad and Mendoza, 2026).



iNaturalist, captive records

WASHINGTON:

There are very few records of *I. cylindrica* in Washington on iNaturalist, just a few near Vancouver, WA and Olympia, as wild individuals, and captive records in Spokane, Pullman, Vancouver, and Seattle. The Consortium of Pacific Northwest Herbaria has one record near Pullman. There are known instances in Pullman, Cheney, and Ridgefield of ‘Red Baron’ cultivars reverting to the green ‘wild’ variety. While these infestations are not known to have spread from human-managed areas yet, and the flowers are not yet confirmed to produce viable seed, they may be able to in the future with future plantings, due to *I. cylindrica* not being self-compatible (Conrad and Mendoza, 2026).



iNaturalist, wild records

NEARBY TO WASHINGTON:

OREGON:

iNaturalist has a few records of captive *I. cylindrica* in the Portland, Corvalis, and Astoria areas, as well as a couple points along the coast. There are no wild records of I. cylindrica in Oregon (iNaturalist). Plants of the World Online has one record in Oregon.

IDAHO:

There are records of wild *I. cylindrica* in the Cour d'Alene area of Idaho (iNaturalist). An infestation in the Boise foothills prompted an emergency listing (High Country News, 2022)

BRITISH COLUMBIA:

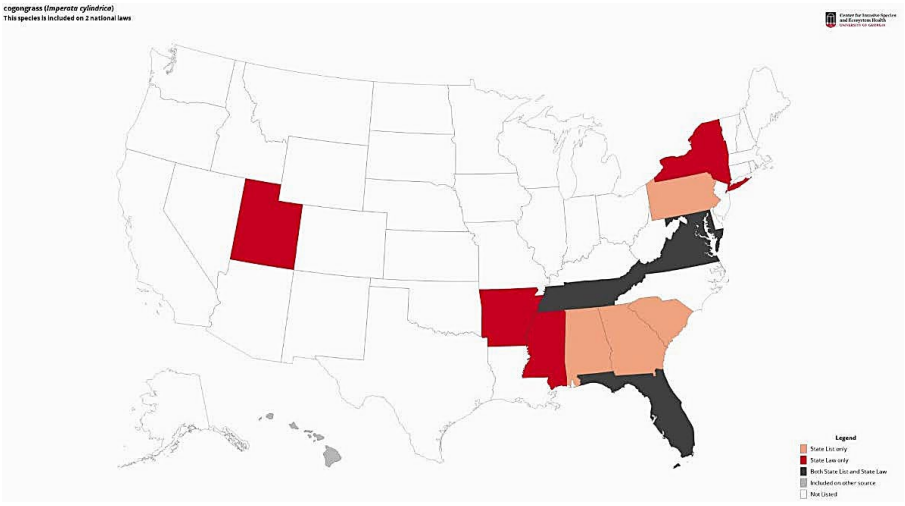
There are wild and captive records of *I. cylindrica* on Vancouver Island, British Columbia (iNaturalist)

CALIFORNIA

Calflora does not have any records of *I. cylindrica* in California.

LISTINGS:

I. cylindrica is on several state weed lists, including most of the southeastern United States, as well as Utah, New York, and Pennsylvania (EDDMapS). Due to concern of the 'Red Baron' cultivar reverting to the "wild" version, several of these southeastern states also prohibit the sale of this cultivar (Conrad and



EDDmapS map of listings

Mendoza, 2026). It is listed as a federal noxious weed (except for the 'Red Baron' cultivar) by USDA Animal and Plant Health Inspection Service - Plant Protection and Quarantine program. New Zealand considers *I. cylindrica* an ecological weed (New Zealand Plant Conservation Network).

ECONOMIC AND ECOLOGICAL IMPORTANCE:

DETRIMENTAL:

Globally, *I. cylindrica* inflicts devastating economic blows by acting as a premier agricultural pest to 35 crops across 73 countries. It is ranked among the top ten worst weeds globally due to its severe negative impacts on agriculture, silviculture (forestry), and infrastructure (Terry *et al.*, 1997; GISD, 2023; MacDonald, 2007; Rad *et al.,* 2025). Its intense belowground nutrient theft drives crop yields (including maize, cassava, soybeans, and rice) down by 50% to 80% across Southeast Asia and Africa, and infests over 35 economic crop species worldwide (MacDonald, 2007; Estrada and Flory, 2015; Rad *et al.,* 2025).Due to its tough, piercing rhizome tips, it frequently physically penetrates root crops, introducing fungal infections, causing tissue rot, and reducing market value (Terry *et al.,* 1997; MacDonald, 2007). The grass has no meaningful long-term agricultural value, as grazing cattle typically shun older plants due to leaf margins enriched with lacerating silica crystals. Additionally, sharp leaf blades cause cuts and puncture wounds to farmworkers and the faces and feet of grazing livestock (Terry *et al.,* 1997; MacDonald, 2007). In forestry, seedling pines are routinely strangled of light and resources, stunting the timber trade. It slows growth by 85% to 96% and increases seedling mortality in tree plantations, including rubber, teak, loblolly pine, longleaf pine, oil palm, coconut, tea, cocoa, citrus, and banana (Terry *et al.,* 1997; MacDonald, 2004, 2007; Daneshgar and Jose, 2009; Rusdy, 2020). Weeding *I. cylindrica* accounts for up to 54% of total crop production budgets in West Africa, forcing smallholder farmers to abandon millions of hectares of agricultural land due to intense labor demands (requiring up to 75 to 200 man-days per hectare for manual control) (Terry *et al*., 1997; MacDonald, 2007). Chemical and mechanical suppression requires extensive capital investments; a single herbicide application costs ~$400 per hectare, with the state of Florida alone spending an estimated $30.2 million annually on control efforts (Estrada and Flory, 2015; Rusdy, 2020). Dense, dry standing leaf biomass fuels intense roadside and wildland fires, reducing visibility on transportation corridors, destroying valuable timber stands, and threatening



Thurman Johnson

residential structures (MacDonald, 2004, 2007). It also serves as a primary harbinger and breeding habitat for migratory locust swarms and crop rust pathogens (*Puccinia* spp.) (MacDonald, 2004, 2007; Rusdy, 2020).

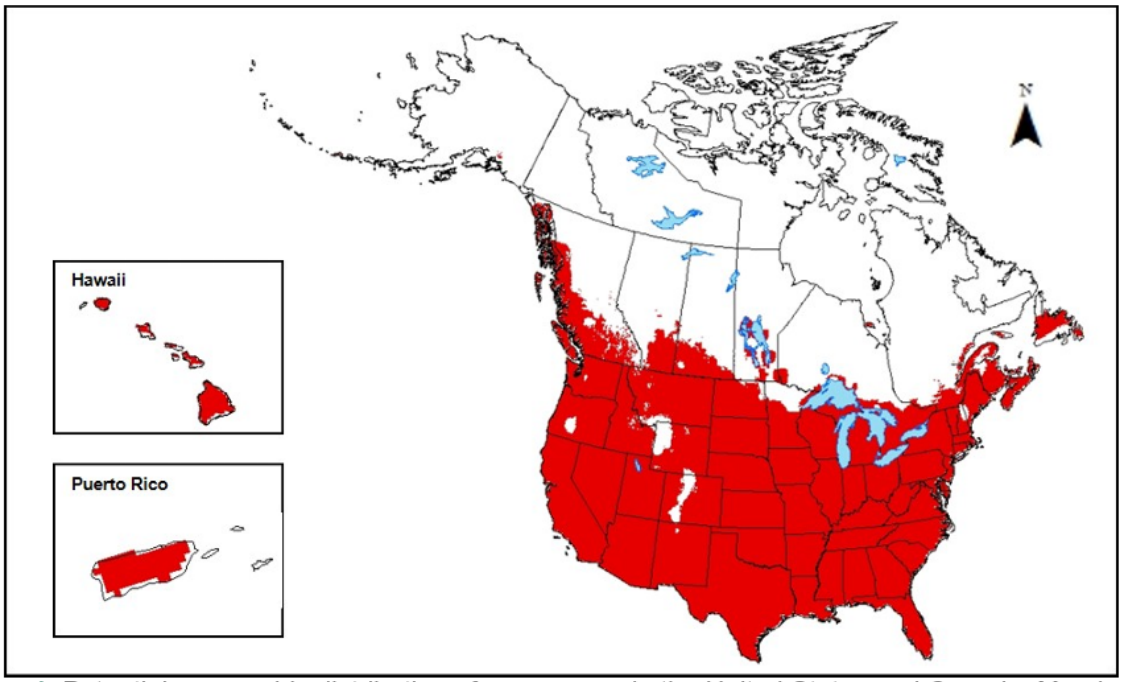


Figure 1. Potential geographic distribution of cogongrass in the United States and Canada. Map insets for Hawaii and Puerto Rico are not to scale.

USDA, Weed Risk Assessment for *Imperata cylindrica*

I. cylindrica initiates dramatic ecological regime shifts via its pyrogenic (fire-inducing) ecology. Fires in *I. cylindrica* stands burn 15% to 20% hotter, with higher vertical flame heights and greater heat intensity than natural grass fires (Butler *et al.*, 2021; MacDonald, 2007; Holzmueller and Jose, 2012; Fahey *et al.*, 2018). These high-temperature fires kill native fire-tolerant tree saplings, pine seedlings, and soil seed banks, while the heat-resistant rhizomes of *I. cylindrica* rapidly resprout, converting biodiverse woodlands and savannas into permanent, low-diversity *I. cylindrica* grasslands (Butler *et al.,* 2021; MacDonald, 2007; Holzmueller and Jose, 2012; Fahey *et al.*, 2018). Invasions form monotypic (single-species) stands that suppress plant species richness by 40% to 60%, displacing native understory herbaceous plants, habitat specialists, and threatened endemic species in ecosystems such as longleaf pine savannas (GISD, 2023; Butler *et al.*, 2021; Brewer, 2008; Estrada and Flory, 2015; Fahey *et al.,* 2018). Dense live canopy and thick leaf thatch cause up to 99% ground-level light shading, preventing native seed germination and establishment (Brewer, 2008; Fahey *et al.,* 2018). Its rapid nutrient uptake deprives co-occurring plants of soil nitrogen and phosphorus, locking up massive amounts of nitrogen belowground in its rhizome network (Butler *et al.*, 2021; Daneshgar and Jose, 2009). Alters soil microbial communities, suppressing beneficial arbuscular mycorrhizal fungal colonization in native tree and herb roots and inhibiting nitrogen-fixing root nodes in leguminous plants (GISD, 2023; Kato-Noguchi, 2022). Its root exudates dump targeted allelopathic chemicals (phytotoxins that inhibit other plant's growth)

directly into the soil to directly inhibit seed germination and seedling root growth of native plant species (GISD, 2023; Xuan *et al.,* 2009; Kato-Noguchi, 2022). These sharp rhizome tips also physically puncture native plant roots, causing tissue damage and secondary infections (GISD, 2023; Kato-Noguchi, 2022).



Thurman Johnson

BENEFICIAL:

I. cylindrica leaves and stems are widely harvested and utilized as low-cost roofing thatch for houses, temples, and farm structures across Asia and Africa (GISD, 2023; Li *et al.*, 2026; MacDonald, 2004). In Indonesia, it is cultivated as a commercial cash crop for thatch export driven by traditional eco-tourism (MacDonald, 2004). It is used locally to weave mats, hats, ropes, and baskets, as a pulp raw material for papermaking, and as a biomass fuel source (GISD, 2023; Li *et al.,* 2026; Rusdy, 2020). Extracts of stem and leaf cellulose can yield industrial chemicals like xylitol and fuel ethanol (Li *et al.,* 2026). It has been planted intentionally by highway departments and civil engineers to stabilize steep slopes, road banks, canal walls, earthen dams, and coastal sand dunes against water and wind erosion (GISD, 2023; MacDonald, 2004; Rusdy, 2020). It can serve as short-term pasture fodder for cattle, sheep, goats, and camels when grazed or cut in its young, tender vegetative stage prior to leaf toughening and silica accumulation (GISD, 2023; MacDonald, 2004; Rusdy, 2020). Ornamental cultivars such as 'Rubra', 'Red Baron', or 'Japanese Blood Grass' are commercially propagated and sold globally for landscape aesthetics (GISD, 2023; Bryson and Carter, 1993; MacDonald, 2007). Dried rhizomes are extensively traded and processed into commercial patented pharmaceuticals, health teas, jellies, beverages, and non-toxic toothpastes for their cooling, diuretic, and bleed-stopping properties (Nayim *et al.*, 2023; Jung and Shin, 2021; Li *et al.,* 2026). Cold-water rhizome extracts serve as natural fruit preservatives to delay strawberry spoilage and act as bio-pesticides against plant pathogens like *Phytophthora infestans* in potato crops (Li *et al.,* 2026).

Demonstrates hyper-accumulation capacity and high physiological tolerance for toxic heavy metals, including copper, lead, manganese, cadmium, and nickel, accumulating them safely in belowground rhizome tissues without experiencing biomass or growth reductions. It is utilized as a plant-based remediator for cleaning up polluted soils, mining tailing waste, and industrial wastewater (Nayim *et al.,* 2023; Li *et al.,* 2026; Burrell *et al.,* 2015). It can serve as a visible spatial bioindicator for landscape degradation, soil erosion, climate warming stress, and altered fire disturbance patterns (Adhikari *et al.,* 2025; Redowan *et al.,* 2025). Its deeply webbed, robust root system offers highly successful applications for aggressive soil stabilization, mitigating acute soil erosion on vulnerable railway cuts, denuded banks,

and severely compromised agricultural landscapes. In native sub-tropical grassland ecosystems, natural *I. cylindrica* grasslands create essential ecotones (transitional vegetation zones) between forests and savannas that support endangered wildlife (MacDonald, 2004).

CONTROL:

MECHANICAL:



Chris Evans, University of Illinois

Hand-pulling, hand tilling, or using crowbars and grubbing hoes can be used to extract individual grass tufts and dig out underground rhizome mats (Terry *et al.,* 1997; Rusdy, 2020). Manual cutting of aerial leaf blades can be done using sickles, scythes, or brush knives at ground level (Terry *et al.*, 1997; Rusdy, 2020). Manual methods are extremely labor-intensive, requiring 75 to 200 man-days per hectare (Terry *et al.,* 1997; Rusdy, 2020). Manual slashing alone fails to eliminate stands because it affects only shoots while leaving rhizomes intact; slashing must be repeated at very short intervals (every 10–30 days) over 3 consecutive years to exhaust rhizome carbohydrate reserves (Terry *et al.,* 1997; Rusdy, 2020).

Deep mechanical soil cultivation to a depth of 30–40 cm using disc plows, tractor-drawn harrows, or rotovators can be done. Tillage fragments rhizomes into short pieces, brings them to the surface for desiccation (drying out) under hot sunlight, or buries them deeper than 8 to 15 cm where sprouted shoots cannot reach the surface (Terry *et al.,* 1997; GISD, 2023; Bryson and Carter, 1993; MacDonald, 2004; Rusdy, 2020). Tillage is most effective when executed during the dry season (Terry *et al.,* 1997; Rusdy, 2020). Repeated tractor-mowing reduces standing leaf biomass and height, temporarily inhibiting growth, but does not provide long-term control or eradication when used alone (Bryson and Carter, 1993; Minogue *et al.,* 2018; Rusdy, 2020). A low-cost mechanical technique, called pressing, rolling or lodging, utilizes heavy coconut logs, weighted steel drums, or foot-planks to bend and crimp grass culms flat to the ground surface (~1 meter tall) without breaking the stems (Terry *et al.,* 1997; Rusdy, 2020). Crimping stops sap flow, causing 40% to 80% reduction in regrowth, accelerating thatch decomposition within 1 month, and opening the canopy for planted cover crops without disturbing the soil (Terry *et al.*, 1997; Rusdy, 2020).

CULTURAL:



USDA APHIS

Because *I. cylindrica* is an obligate light-requiring C4 grass intolerant of deep shade (Terry *et al.*, 1997; GISD, 2023; MacDonald, 2004)., establishing fast-growing tree canopies or dense understory shade reduces light below the light compensation point, exhausting rhizome carbohydrate reserves and eliminating grass stands within 2 to 3 years (Terry *et al.,* 1997; GISD, 2023; MacDonald, 2004, 2007; Rusdy, 2020). Intercropping or planting aggressive, fast-growing herbaceous leguminous cover crops or persistent turfgrasses smothers grass shoots, fixes atmospheric nitrogen, and depletes rhizome viability over 1 to 2 years (Terry *et al.,* 1997; Minogue *et al.,* 2018; Rusdy, 2020). Short-lived, high-level pulses of phosphorus fertilizer application alter soil nitrogen/phosphorus ratios, suppressing the growth advantage of *I. cylindrica* while selectively stimulating co-occurring desired legumes and herbaceous species (GISD, 2023; Butler *et al.,* 2021; MacDonald, 2004, 2007). Controlled burning or mowing alone is counterproductive because it stimulates seedhead production and bud sprouting; however, burning or mowing 1 to 4 months *prior* to herbicide spraying or tillage depletes rhizome food reserves and forces uniform, tender green shoot emergence that maximizes herbicide spray interception and absorption (Terry *et al.,* 1997; GISD, 2023; Minogue *et al.,* 2018; Rusdy, 2020).

BIOLOGICAL:

One identified predator, an Asian gall midge (*Orseolia javanica*), a host-specific midge whose larvae attack and destroy shoot meristems (growing points). However, it requires prior cutting of leaves and rhizome debilitation to establish, and its field effectiveness is severely limited by native parasitic wasps (Bryson and Carter, 1993; MacDonald, 2004; Rusdy, 2020). Promising host-specific stem borers and gall-forming midges in native ranges include species in the genera *Emmalocera*, *Chilo*, and *Contarinia* (Minogue *et al.,* 2018; Rusdy, 2020). Native North American skipper butterfly larvae (*Ancyloxypha numitor*, *Atalopedes campestris*, *Hylephila phyleus*) feed on *I. cylindrica* foliage but are unsuitable as biocontrol agents because they also consume commercial grass crops like corn and turfgrasses (Bryson and Carter, 1993; MacDonald, 2004). Pathological biocontrol demonstrates substantially superior potential, chiefly using isolated fungus solutions like *Bipolaris sacchari*, *Drechslera gigantea*, and a species of agaric fungus known as *Marasmius palmivorus*. Suspended inside specialized oil-in-water

emulsions tailored to protect spores and degrade grass leaves, these biological spray treatments effectively induce massive necrotic leaf blights and rapid withering. Even so, this intervention alone largely damages just leaf canopies while permitting rhizomes the ultimate potential to regenerate (Yandoc *et al*., 2005; Tamur *et al.,* 2019; Rusdy, 2020).

CHEMICAL:

Systemic broad-spectrum herbicides that translocate from foliage down into underground rhizomes are the only reliable chemical option (Terry *et al.,* 1997; GISD, 2023; Minogue *et al.,* 2018; Rusdy, 2020).

Glyphosate can be applied at rates of 1.0 to 4.48 kg of active ingredient. It leaves no soil residual activity, allowing immediate crop planting, but requires a 6–8-hour rain-free window post-application and multiple applications over 3 years to achieve 90% rhizome elimination (Terry *et al.,* 1997; Minogue *et al.,* 2018; Rusdy, 2020).

Imazapyr, when applied at rates of 0.5 to 1.12 kg active ingredient per hectare. It is more effective and persistent than glyphosate, providing soil residual control for 18 to 24 months. However, its long soil residual half-life causes "bare ground" and damages non-target hardwood trees and crops via root absorption or rainfall runoff (Terry *et al.,* 1997; Minogue *et al.,* 2018; Rusdy, 2020).

Tank-mixing glyphosate (3.0 lb. active ingredient per hectare) and imazapyr (0.5 lb. acid equivalent per acre) provides superior, longer-lasting suppression than either chemical applied alone (Minogue *et al.,* 2018; Rusdy, 2020). Dalapon, glufosinate-ammonium, fluazifop-P-butyl, sethoxydim, and sulfometuron yield short-term foliar burn, but rapid regrowth from rhizomes occurs within weeks to months (Terry *et al.,* 1997; Minogue *et al.,* 2018; Rusdy, 2020). Adding non-ionic surfactants or 1% methylated seed oil improves herbicide uptake through waxy leaf cuticles (Minogue *et al.,* 2018). Optimal application timing is late summer or autumn before plant dormancy, when carbohydrates actively translocate downward into the rhizome network (Minogue *et al.,* 2018; Rusdy, 2020). Spot-application of systemic herbicides using hand-held rope-wick applicators or herbicide-soaked sponge pads wiped directly onto individual tall grass leaves to avoid non-target plant injury (Terry *et al.,* 1997).



I. cylindrica, being sold as “Japanese Blood Grass”, at a nursery in Western Washington.

RATIONALE FOR LISTING:

I. cylindrica is considered the seventh worst weed in the world, by USDA APHIS. In USDA’s weed risk assessment, has the potential geographic

distribution to be across all of Washington, except for alpine areas. The extensive rhizomatous spread, adaptation to a variety of soil types, changes in fire regimes, impacts to agriculture, threats to biodiversity, and high cost to manual control (USDA, 2018) all make this grass a good candidate for listing, due to its treats to Washington's agriculture and natural resources.

REFERENCES:

1. Adhikari, P., Lee, Y. H., Thorne, J. H., Adhikari, P., Poudil, A., Lee, E., Brooks, D. R., Maharjan, P. M., Hong, S. H., & Seo, C. (2025). Ecological Drivers of Cogon Grass (Imperata cylindrica) Invasion: A Global Assessment of Range Expansion under Wildfire and Climate Change.
2. Animal and Plant Health Inspection Service. Imperata search. Retrieved on July 28th, 2026, from https://www.aphis.usda.gov/plant-imports/regulated-pest-list?page=1
3. Atlas of Living Australia. Imperata cylindrica. Retrieved on July 28th, 2026, from https://bie.ala.org.au/species/https://id.biodiversity.org.au/node/apni/2920993
4. Brewer, S. (2008). Declines in plant species richness and endemic plant species in longleaf pine savannas invaded by Imperata cylindrica. Biological Invasions, May 1992, 1257–1264. https://doi.org/10.1007/s10530-007-9200-3
5. Bryson, C. T., & Carter, R. (1993). Cogongrass, Imperata cylindrica, in the United States. Weed Technology, 7, 1005–1009.
6. Burrell, A. M., Pepper, A. E., Hodnett, G., & Goolsby, J. A. (2015). Exploring origins, invasion history and genetic diversity of Imperata cylindrica (L.) P. Beauv. (Cogongrass) in the United States using genotyping by sequencing. Molecular Ecology, 24, 2177–2193. https://doi.org/10.1111/mec.13167
7. Butler, O. M., Lewis, T., & Chen, C. (2021). Do Soil Chemical Changes Contribute to the Dominance of Blady Grass (Imperata cylindrica) in Surface Fire-Affected Forests? Fire, 4(23).
8. Conrad, Mattew & Mendoza, Jennifer (2026). Proposal for 2026 Washington State Noxious Weed List Cogongrass (Imperata cylindrica). Cowlitz County Noxious Weed Control Board
9. Consortium of Pacific Northwest Herbaria. Imperata cylindrica search. Retrieved on July 28th, 2026, from https://www.pnwherbaria.org/data/results.php?DisplayAs=WebPage&ExcludeCultivated=Y&GroupBy=ungrouped&SortBy=Year&SortOrder=DESC&SearchAllHerbaria=Y&QueryCount=1&IncludeSynonyms1=Y&Genus1=Imperata&Species1=cylindrica&Zoom=4&Lat=55&Lng=-135&PolygonCount=0
10. Daneshgar, P., & Jose, S. (2009). Imperata cylindrica, an alien invasive grass, maintains control over nitrogen availability in an establishing pine forest. Plant Soil, 320, 209–218. https://doi.org/10.1007/s11104-008-9886-8
11. EDDMapS. Cogongrass. Retrieved on July 28th, 2026, from https://www.eddmaps.org/species/subject.cfm?sub=2433
12. Estrada, J. A., & Flory, S. L. (2015). Cogongrass (Imperata cylindrica) invasions in the US: Mechanisms, impacts, and threats to biodiversity. Global Ecology and Conservation, 3, 1–10. https://doi.org/10.1016/j.gecco.2014.10.014

13. Fahey, C., Angelini, C., & Flory, S. L. (2018). Grass invasion and drought interact to alter the diversity and structure of native plant communities. https://doi.org/10.1002/ecy.2536
14. GISD. (2023). Full Account for: Imperata cylindrica (Issue November).
15. Global Biodiversity Information Facility. Imperata cylindrica. Retrieved on July 28th, 2026, from https://www.gbif.org/taxon/9KCTL
16. iNaturalist. Blady Grass search. Retrieved on July 28th, 2026, from https://www.inaturalist.org/observations?taxon_id=164056
17. High Country News. Botanists find one of 'the world's worst weeds' spreading in the Boise foothills. Retrieved on August 27th, 2026, from https://www.hcn.org/articles/botanists-find-one-of-the-worlds-worst-weeds-spreading-in-the-boise-foothills/
18. Holzmueller, E. J., & Jose, S. (2012). Response of the Invasive Grass Imperata cylindrica to Disturbance in the Southeastern Forests, USA. Forests, 3, 853–863. https://doi.org/10.3390/f3040853
19. Jung, Y.-Y., & Shin, D. (2021). Imperata cylindrica: A Review of Phytochemistry, Pharmacology, and Industrial Applications. Molecules, 26.
20. Kato-Noguchi, H. (2022). Allelopathy and Allelochemicals of Imperata cylindrica as an Invasive Plant Species. Plants, 11, 11–14.
21. King, S. E., & Grace, J. B. (2000). The effects of soil flooding on the establishment of cogongrass (Imperata cylindrica), a nonindigenous invader of the southeastern United States. Wetlands, 20(2), 300–306.
22. Li, J., Wang, C., Zhan, H., Wang, X., Guan, W., Zhao, Y., & Xu, Z. (2026). Imperata cylindrica (L.) Raeusch.: a narrative review of phytochemistry, pharmacology, comprehensive utilization. Frontiers in Pharmacology, July, 1–26. https://doi.org/10.3389/fphar.2026.1875167
23. Lucardi, R. D., Wallace, L. E., & Ervin, G. N. (2014). Invasion Success in Cogongrass (Imperata cylindrica): A Population Genetic Approach Exploring Genetic Diversity and Historical Introductions. Invasive Plant Science and Management, 7, 59–75. https://doi.org/10.1614/IPSM-D-13-00029.1
24. MacDonald, G. E. (1998). Cogongrass (Imperata cylindrica): Biology, Distribution and Impacts in the Southeastern U.S.
25. Macdonald, G. E. (2010). Cogongrass (Imperata cylindrica) - Biology, Ecology, and Management. Critical Reviews in Plant Sciences, 23(5), 37–41. https://doi.org/10.1080/07352680490505114
26. Minogue, P. J., Brodbeck, B. V, & Miller, J. H. (2025). Biology and Control of Cogongrass (Imperata cylindrica) in Southern Forests 1 Control of Cogongrass. University of Florida Extension, 1–6.
27. National Invasive Species Information Center. Cogongrass. Retrieved on July 28th, 2026, from https://www.invasivespeciesinfo.gov/terrestrial/plants/cogongrass "Cogongrass, Imperata cylindrica (L.), is considered the seventh worst weed in the world and listed as a federal noxious weed by USDA Animal and Plant Health Inspection Service - Plant Protection and Quarantine. "
28. NC State Extension. Miscanthus sinensis. Retrieved on July 29th, 2026, from https://plants.ces.ncsu.edu/plants/miscanthus-sinensis/

29. Nayim, P., Mbaveng, A. T., Sudhir, K., Wamba, B. E. N., & Kuete, V. (2023). Phytochemistry and pharmacology of Imperata cylindrica: A comprehensive review. Investigational Medicinal Chemistry & Pharmacology, 6(1).
30. New Zealand Plant Conservation Network. Imperata cylindrica. Retrieved on July 28th, 2026, from https://www.nzpcn.org.nz/flora/species/imperata-cylindrica-var-major/
31. Parvin, S., Rad, H., Duque, T. S., Flory, S. L., Gonçalves, V., Mendes, D. S., & Maciel, J. C. (2025). Predicting the spread of invasive Imperata cylindrica under climate change: A global risk assessment and future distribution scenarios. PLoS ONE, 1–12. https://doi.org/10.1371/journal.pone.0321027
32. Plants of the World Online. Imperata cylindrica (L.) Raeusch. Retrieved on July 28th, 2026, from https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:30138371-2
33. Redowan, M., Hewson, M., Al, K., Abir, M., Erfana, F., Dey, B., & Hossain, A. (2025). Geomatica Climate-induced shifts in the spatial distribution of invasive weed Sungrass (Imperata cylindrica) in the Asia-Pacific. Geomatica, 77(2). https://doi.org/10.1016/j.geomat.2025.100068
34. Rusdy, M. (2020). Imperata cylindrica: reproduction, dispersal, and controls. CAB Reviews, 15(38). https://doi.org/10.1079/PAVSNNR202015038
35. Tamur, H. A., Al-janabi, H. J., Al-janabi, J. K. A., Mohsin, L. Y., & Al-Yassiry, Z. A. N. (2019). Characterization and Antagonistic Activity of New Causal Agent of Wilt Disease in Imperata cylindrica (Marasmius palmivorus). Journal of Pure and Applied Microbiology, 13(3), 1525–1536.
36. Terry, P. J., Adjers, G., Akobundu, I. O., Anoka, A. U., Drilling, M. E., Tjitrosemito, S., & Utomo, M. (1997). Herbicides and mechanical control of Imperata cylindrica as a first step in grassland rehabilitation. Agroforestry Systems, 36, 151–179.
37. USDA (2018). Weed Risk Assessment for Imperata cylindrica (L.) P. Beauv. (Poaceae) – Cogongrass
38. Wisconsin Horticulture. Switchgrass, Panicum virgatum. Retrieved on July 29th, 2026, from https://hort.extension.wisc.edu/articles/switch-grass-panicum-virgatum/
39. Xuan, T. D., Toyama, T., Fukuta, M., Khanh, T. D., & Tawata, S. (2009). Chemical Interaction in the Invasiveness of Cogongrass (Imperata cylindrica (L.) Beauv.). Agricultural and Food Chemistry, 57(ii), 9448–9453. https://doi.org/10.1021/jf902310j
40. Yandoc, C. B., Charudattan, R., & Shilling, D. G. (2005). Evaluation of Fungal Pathogens as Biological Control Agents for Cogongrass (Imperata cylindrica). BioOne, 19(1), 19–26.