



# Ten of the most notorious invasive plant species around the world

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**Abstract.** This paper presents ten of the most invasive plant species on the globe. The characteristics of each species are presented along with the risk of invasion in certain regions where the plants are native, but especially in those regions where the plants are non-native. Invasive species compete with native species for space, water resources, mineral resources, and light, eliminating the latter through interspecific competition. The impact of invasive species can vary depending on the local ecosystem and environmental conditions. Efforts to control and manage these species are crucial to preserve native biodiversity and ecosystem health.

**Key Words:** *Eichhornia crassipes*, *Fallopia japonica*, *Lythrum salicaria*, *Pueraria montana*.

**Introduction.** Invasive plant species can significantly negatively impact ecosystems by outcompeting native vegetation, altering habitat, and disrupting ecological balance (Petrescu-Mag & Gavrioloaie 2019). Nowadays, we are more aware of the imperative to protect ecosystems and preserve biodiversity (Petrescu-Mag 2023). Within this study, the following list includes ten of the most notorious invasive plant species worldwide.

**Kudzu (*Pueraria montana*).** Kudzu is a fast-growing, invasive vine native to East Asia, particularly China, Japan, and Korea. It belongs to the legume family (Fabaceae) and is known for its vigorous growth and ability to cover and shade out other vegetation. We will present below some key characteristics and information about kudzu.

**Rapid growth.** One of the most distinctive features of kudzu is its rapid growth rate. Under optimal conditions, it can grow up to a foot (30 cm) per day, quickly covering structures, trees, and other vegetation.

**Vine structure.** Kudzu is a woody vine that climbs by twining around vertical structures, such as trees and poles. Its vines can reach lengths of over 100 feet (30 meters), forming thick canopies that block sunlight and inhibit the growth of other plants beneath.

**Leaves and flowers.** The compound leaves of kudzu typically have three broad leaflets, each resembling the shape of a hand. In late summer, the plant produces clusters of fragrant, reddish-purple flowers, which develop into seed pods.

**Propagation.** Kudzu spreads primarily through vegetative means, as it can regenerate from fragments of its root system. It also produces seeds, but seed production is not as prolific as vegetative propagation. The seeds are spread by animals and water.

**Ecological impact.** Kudzu is considered a highly invasive species in many parts of the world, particularly in the southeastern United States, where it was introduced for erosion

control in the 19<sup>th</sup> and early 20<sup>th</sup> centuries. Its aggressive growth outcompetes native vegetation, forming dense monocultures that can alter ecosystems and reduce biodiversity (Harron et al 2020).

**Erosion control and soil improvement.** Despite its negative impact, kudzu was initially introduced for erosion control, as its extensive root system helps prevent soil erosion. However, its aggressive growth has outweighed any potential benefits in many cases.

**Control and management.** Controlling kudzu is challenging due to its rapid growth and ability to regenerate from roots. Various methods, including mechanical removal, herbicide application, and animal-controlled grazing, are used to manage kudzu infestations. However, long-term control often requires persistent efforts.

**Cultural references.** Kudzu has become a cultural symbol of invasive species and the unintended consequences of introducing non-native plants. It has been the subject of jokes, stories, and documentaries highlighting its impact on landscapes and ecosystems.

**Japanese Knotweed (*Fallopia japonica*).** The Japanese knotweed is a highly invasive perennial plant species native to East Asia, including Japan, China, and Korea. It is a member of the knotweed or smartweed family (Polygonaceae). The Japanese knotweed is known for its aggressive growth, rapid spread, and the difficulties associated with its control. Here are some key features and information about the Japanese knotweed.

**Growth habit.** The Japanese knotweed is a robust herbaceous perennial plant with bamboo-like stems that can reach heights of 7 to 10 feet (2 to 3 meters). The stems are hollow, jointed, and reddish-brown. The plant forms dense thickets, outcompeting native vegetation.

**Leaves.** The leaves are broad, shield-shaped, and alternate along the stems. They have a distinctive heart or spade shape and are green with a characteristic zigzag pattern along the stems.

**Flowers.** The Japanese knotweed produces small, creamy-white to greenish-white flowers in late summer to early fall. The flowers are arranged in clusters on panicles at the tips of the stems. While the individual flowers are not showy, their sheer number contributes to the plant's overall impact.

**Rhizomes.** The plant spreads mainly through an extensive underground network of rhizomes (underground stems). These rhizomes can grow deep into the soil and horizontally over long distances, making eradication challenging.

**Invasive nature.** The Japanese knotweed is highly invasive and has become a significant problem in many parts of the world, including North America, Europe, and New Zealand. It can colonize various habitats, including riverbanks, roadsides, and disturbed areas (Drazan et al 2021).

**Impacts.** The aggressive growth of the Japanese knotweed can lead to the displacement of native vegetation, negatively affecting biodiversity. Its ability to form dense stands along watercourses can contribute to soil erosion.

**Human infrastructure damage.** The plant's powerful rhizome system has been known to cause damage to buildings, roads, and other structures. Its growth near foundations and cracks in the pavement can result in costly and difficult-to-repair damage.

**Control and management.** Managing the Japanese knotweed is challenging due to its extensive rhizome system. Control methods include herbicide application, cutting and

removing above-ground vegetation, and, in some cases, excavating and removing rhizomes. Long-term management often requires persistent efforts to prevent regrowth.

**Regulations and legal considerations.** The Japanese knotweed is recognized as an invasive species in many regions, and there may be legal obligations to control or eradicate it on private or public lands. Failure to manage infestations can have legal consequences.

**Water Hyacinth (*Eichhornia crassipes*).** The water hyacinth is a free-floating aquatic plant native to the Amazon basin in South America. It is known for its rapid growth, ability to spread across water surfaces, and impact on aquatic ecosystems. While the plant is often cultivated for its attractive flowers, it has become a notorious invasive species in many parts of the world. The following section will present some key features and information about the water hyacinth.

**Habitat and growth.** The water hyacinth thrives in freshwater habitats such as ponds, lakes, rivers, and slow-moving streams. It has broad, glossy, green leaves arranged in rosettes, and its buoyant, bulbous stems allow it to float on the water's surface.

**Reproduction.** The water hyacinth reproduces rapidly through both sexual and asexual means. It produces striking lavender to violet flowers with a yellow spot in the center, held above the water on a stalk. The plant also forms daughter plants (offsets) that detach and float away, helping it spread across water bodies.

**Invasive nature.** The water hyacinth is considered one of the world's most invasive aquatic plants (Zarkami et al 2021). When introduced to non-native environments, it can form dense mats on the water surface, limiting sunlight penetration and oxygen exchange and negatively impacting aquatic life.

**Impact on ecosystems.** The dense mats created by the water hyacinth can block sunlight, preventing the growth of submerged aquatic plants and disrupting the balance of the ecosystem. This reduction in sunlight penetration can lead to decreased oxygen levels, negatively affecting fish and other aquatic organisms. Additionally, the decomposition of accumulated plant material can further deplete oxygen levels.

**Economic consequences.** The water hyacinth can clog waterways, impede navigation, and interfere with irrigation systems. It poses economic challenges in areas where it has become invasive, affecting fishing, agriculture, and water transport.

**Control and management.** Managing water hyacinth is challenging due to its rapid growth and ability to reproduce sexually and asexually. Various control methods are employed, including mechanical removal, biological control using natural enemies (such as herbivorous insects), and herbicides. Integrated management strategies are often necessary to achieve effective and sustainable control.

**Use in wastewater treatment.** Despite its invasive nature, the water hyacinth has been used in some regions for wastewater treatment. The plant can absorb and accumulate nutrients, making it helpful in removing pollutants from water bodies. However, caution is required to prevent unintended spread and invasion.

**Legal status.** The water hyacinth is considered a noxious weed in many countries, and its import, sale, and transport are often regulated to prevent its introduction into new areas.

**Purple Loosestrife (*Lythrum salicaria*).** The purple loosestrife is a perennial herbaceous plant known for its striking purple-pink flowers and ability to form dense stands in wetland areas. While native to parts of Europe and Asia, the purple loosestrife

has become invasive in North America, where it can displace native vegetation and impact wetland ecosystems. We will discuss further some key features and information regarding the purple loosestrife.

**Habitat and growth.** The purple loosestrife is commonly found in wetlands along riverbanks, marshes, ponds, and lakes. It prefers moist to wet soils and is adapted to various conditions. The plant typically grows 3 to 7 feet (1 to 2 meters) tall and has a robust, upright stem with multiple branches.

**Leaves.** The lance-shaped leaves of the purple loosestrife are arranged in pairs or whorls along the stem. The leaves are usually opposite or whorled and have a smooth margin.

**Flowers.** The most distinctive feature of the purple loosestrife is its spike-like inflorescence of bright purple to magenta flowers. The flowers are arranged in dense, vertical spikes at the top of the stems and bloom from late spring to early fall. Each flower has five to seven petals.

**Reproduction.** The purple loosestrife reproduces both by seed and vegetatively. A single plant can produce many seeds dispersed by wind, water, and animals. Additionally, the plant can spread through rhizomes, forming dense colonies.

**Invasive nature.** The purple loosestrife is considered invasive in North America, where it has been introduced. It is capable of forming dense stands, outcompeting native wetland vegetation, and reducing biodiversity (Geerts & Adedoja 2021). The invasive nature of the purple loosestrife is partly due to its ability to produce a large number of seeds and establish itself in a variety of wetland habitats.

**Impact on wetlands.** The invasion of the purple loosestrife can have negative ecological consequences for wetland ecosystems. It can alter the composition of plant communities, impact water flow, and affect the habitat of native species. The dense growth of the purple loosestrife can also lead to a reduction in open water areas within wetlands.

**Control and management.** Managing the purple loosestrife is challenging due to its prolific seed production and ability to spread vegetatively. Control methods include using herbicides, manual removal, and introducing biological control agents, such as specific beetles that feed on the plant. Biological control is often favored to minimize impacts on non-target species.

**Legal status.** Due to its invasive nature, the purple loosestrife is regulated in some regions, and efforts are made to prevent its introduction into new areas. In some cases, the sale and distribution of the purple loosestrife plants may be restricted.

**Giant Hogweed (*Heracleum mantegazzianum*).** The giant hogweed is a large and invasive perennial plant known for its impressive size, toxic sap, and potential health hazards. Native to the Caucasus region in Southwest Asia, it has become invasive in various parts of North America, Europe, and other regions. Some key features and information about the giant hogweed are presented below.

**Size and appearance.** The giant hogweed is a towering plant that can reach heights up to 15 feet (4.5 meters) or more. It has a stout, hollow stem with purple spots and coarse white hairs. The leaves are deeply lobed and can span several feet in width, resembling large, palmate structures.

**Flowers.** The plant produces large, umbrella-like flower clusters measuring up to 2.5 feet (75 cm) in diameter. The individual flowers are white and form a dense and showy inflorescence.

**Toxic sap.** One of the most distinctive and hazardous features of the giant hogweed is its sap, which contains furanocoumarins. These chemicals can cause phytophotodermatitis, a severe skin reaction that occurs when the sap comes into contact with the skin and is exposed to sunlight. This reaction can lead to painful blisters, burns, and long-lasting scars.

**Spread and invasiveness.** The giant hogweed is highly invasive and has the potential to outcompete native vegetation. It is often found in disturbed areas, riverbanks, roadsides, and open woodlands. The plant is a prolific seed producer, and its seeds can be dispersed by water, wind, and human activities.

**Ecological impact.** The invasive nature of the giant hogweed can result in the displacement of native plant species, reducing biodiversity. Its aggressive growth can also impact the structure of ecosystems and alter habitats (Anibaba et al 2022).

**Identification.** It is important to properly identify giant hogweed to avoid accidental exposure to its toxic sap. Key identification features include the large size, deeply lobed leaves, purple-spotted stems, and the characteristic umbrella-like flower clusters.

**Control and management.** Managing giant hogweed is challenging due to its size, prolific seed production, and potential health hazards associated with its sap. Control methods include herbicide application, manual removal (with protective clothing to prevent sap contact), and mowing before the plant flowers and sets seed. Long-term management efforts are often required to prevent re-establishment.

**Health risks.** Direct contact with giant hogweed sap can lead to severe skin burns and irritation. It is essential to take precautions when handling or attempting to control this plant, including wearing protective clothing, gloves, and eye protection. If contact occurs, affected areas should be washed immediately, and medical attention may be required.

**Chinese Tallow Tree (*Triadica sebifera*).** The Chinese tallow tree, also known as the popcorn tree, candleberry tree, or chicken tree, is a deciduous tree native to eastern Asia, particularly China and Japan. It has been introduced to various parts of the world, including North America, where it has become invasive in some regions.

**Appearance.** Chinese tallow trees are medium to large-sized trees that can reach heights of 30 to 40 feet (9 to 12 meters) or more. The tree has a distinctive appearance with large, heart-shaped leaves that are bright green. In the fall, the leaves turn vibrant shades of red, orange, and yellow.

**Seed pods.** One of the characteristic features of the Chinese tallow tree is its seed pods. These waxy, three-lobed capsules contain white, tallow-like seeds. When the seeds mature and are released, they often have a popcorn-like appearance, giving rise to the tree's nickname.

**Invasiveness.** Chinese tallow trees are considered invasive in some regions, particularly in the southeastern United States. They can colonize disturbed areas and outcompete native vegetation, forming dense stands. The invasive nature of the tree can negatively impact local ecosystems and reduce biodiversity (Sheng et al 2022).

**Reproduction.** Chinese tallow trees are prolific seed producers, and the seeds are dispersed by wind and water. The tree can also sprout from its root system, further contributing to its ability to spread rapidly.

**Ecological impact.** The invasive nature of Chinese tallow trees can lead to the displacement of native plant species. They are often associated with altered fire regimes

and changes in nutrient cycling, potentially affecting the structure and function of ecosystems where they become established.

**Cultural uses.** In its native range, the Chinese tallow tree has been traditionally valued for various uses. The waxy coating of the seeds can be used to produce tallow, which has been used in candle and soap making. However, the ecological impacts of the tree in non-native areas often outweigh its cultural uses.

**Control and management.** Managing Chinese tallow trees is challenging due to their rapid growth and ability to produce abundant seeds. Control methods include mechanical removal, herbicide application, and efforts to prevent seed spread. However, control efforts may need to be ongoing to prevent re-establishment.

**Legislation and regulations.** The Chinese tallow tree is considered a noxious weed in some regions, and regulations may be in place to control its spread. Efforts are made to prevent the introduction of this species into new areas and to manage existing populations.

**Australian Pine (*Casuarina equisetifolia*).** The Australian pine, also known as the she-oak, ironwood, or horsetail tree, is a tree species native to Southeast Asia, Northern Australia, and some Pacific islands. Despite its common name, the Australian pine is not a true pine or closely related to the pine family. It belongs to the genus *Casuarina* within the Casuarinaceae family.

**Appearance.** The Australian pine is an evergreen tree with a distinctive appearance. It has slender, jointed branches resembling pine needles, but they are modified branchlets known as cladodes. The tree's crown is open and irregular and can reach heights of 100 feet (30 meters) or more.

**Leaves.** The "needles" of the Australian pine are small, scale-like structures arranged in whorls along the jointed branches. These branchlets are green and have a feathery appearance. The tree's true leaves are reduced to tiny scales at the joints.

**Reproduction.** The Australian pine is dioecious, meaning that individual trees are either male or female. The trees produce small, inconspicuous flowers, with males bearing pollen cones and females producing seed cones. The wind disperses the tiny seeds within the cones.

**Invasiveness.** The Australian pine is considered invasive in many coastal regions worldwide, particularly in tropical and subtropical areas. It has been introduced to various countries for erosion control, windbreaks, and as an ornamental tree, but its aggressive growth can lead to the displacement of native vegetation.

**Ecological impact.** The invasive nature of the Australian pine can have negative ecological consequences. The tree forms dense stands that can outcompete native plants, alter soil chemistry, and impact local ecosystems. Its ability to tolerate salt spray makes it well-suited to coastal environments.

**Coastal erosion control.** The Australian pine is often planted for coastal erosion control due to its ability to stabilize sandy soils with its extensive root system. However, while it may effectively reduce erosion, its invasiveness can result in unintended ecological consequences.

**Wood use.** The wood of the Australian pine is durable and has been used for various purposes, including construction, fencing, and fuel. It is resistant to termites and decay, making it suitable for outdoor applications.

**Control and management.** Controlling Australian pine can be challenging due to its adaptability and rapid growth. Management strategies include mechanical removal, herbicide application, and the promotion of native vegetation to outcompete the invasive species. Ongoing efforts are often required to prevent the tree from re-establishing.

**Legislation and regulations.** In some regions, the Australian pine is recognized as an invasive species, and there may be regulations in place to control its planting, sale, or spread. Efforts are made to raise awareness about this species' ecological impacts and encourage the use of native vegetation in coastal restoration projects.

**Himalayan Balsam (*Impatiens glandulifera*).** The Himalayan balsam is an invasive annual plant native to the Himalayan region of Asia. It was introduced to other parts of the world, including Europe and North America, as an ornamental plant. However, due to its aggressive growth and prolific seed production, it has become invasive in many regions, particularly along riverbanks and other moist habitats.

**Appearance.** The Himalayan balsam is a herbaceous plant that can grow up to 10 feet (3 meters) tall. It has a succulent stem, lance-shaped leaves with serrated edges, and showy, orchid-like flowers. The flowers are usually pink or purple, although white varieties also exist. The plant blooms from late spring to early fall.

**Reproduction.** One of the key characteristics contributing to its invasiveness is its prolific seed production. Each plant can produce up to 2500 seeds, explosively released from the seed capsules when touched. The seeds are buoyant and can be easily dispersed by water, aiding the plant's spread along riverbanks.

**Habitat.** The Himalayan balsam thrives in moist, disturbed habitats and is often found along riverbanks, streams, ditches, and other watercourses. Its ability to spread rapidly and outcompete native vegetation in these habitats has contributed to its invasive nature.

**Aggressive growth.** The Himalayan balsam is known for its rapid growth, and it can quickly form dense stands, displacing native plants. Its tall stature and large leaves create dense canopies, shading out other vegetation and reducing biodiversity.

**Impact on ecosystems.** The invasive nature of the Himalayan balsam can have adverse effects on local ecosystems (Coakley & Petti 2021). Its rapid growth and dense stands can lead to soil erosion along riverbanks, alter nutrient cycling, and impact the habitat of native plant and animal species.

**Control and management.** Managing the Himalayan balsam can be challenging due to its explosive seed dispersal and rapid growth. Control methods include manual removal, cutting, and mowing before the seeds set. However, removal efforts must be coordinated and repeated over several years to be effective. Herbicide application is another control option, but care must be taken to minimize harm to non-target species.

**Cultural uses.** While the Himalayan balsam is considered an invasive species, it has been cultivated in gardens for its attractive flowers. However, its invasive nature has led to increased awareness of the potential ecological impact, and efforts are made to discourage its cultivation.

**Legal status.** In many regions, the Himalayan balsam is recognized as an invasive species, and regulations may be in place to control its spread. Landowners and conservation organizations often work together to implement control measures and prevent further spread.

**The Brazilian pepper tree (*Schinus terebinthifolius*).** The Brazilian pepper tree, also known as the Florida holly or Christmasberry tree, is a highly invasive species native to South America, particularly Brazil, Argentina, and Paraguay. It belongs to the cashew family (Anacardiaceae) and has been introduced to various parts of the world, where it has become a problematic invasive plant.

**Appearance.** The Brazilian pepper tree is an evergreen shrub or small tree that can grow up to 33 feet (10 meters) in height. It has compound leaves with numerous small leaflets, giving it a feathery appearance. The leaves release a peppery scent when crushed.

**Fruit.** One of the distinctive features of the Brazilian pepper tree is its fruit, a small, round, red or pink berry. The berries grow in clusters and are often present throughout the year. Despite the name "Christmasberry," the berries are not recommended for consumption, and the plant is considered toxic.

**Invasiveness.** The Brazilian pepper tree is considered one of the most invasive plant species in Florida and other parts of the southeastern United States. It has invaded natural habitats, disturbed areas, and urban landscapes, displacing native vegetation and altering ecosystems (Osland & Feher 2020).

**Reproduction.** The plant reproduces through seeds, which are spread by birds and other animals that consume the berries. The seeds have a high germination rate, and the plant can establish itself quickly, forming dense thickets.

**Habitat.** The Brazilian pepper tree thrives in various habitats, including coastal areas, wetlands, disturbed sites, and open woodlands. It is highly adaptable to different soil types and environmental conditions, contributing to its invasive success.

**Impact on ecosystems.** The invasiveness of the Brazilian pepper tree has significant ecological consequences. It outcompetes native vegetation, reducing plant diversity and altering the structure of natural habitats. The dense thickets formed by the plant can create a monoculture, negatively impacting the overall health of ecosystems.

**Control and management.** Managing the Brazilian pepper tree is challenging due to its rapid growth, prolific seed production, and ability to resprout after cutting. Control methods include herbicide application, mechanical removal, and biological control using introduced insects that feed on the plant. However, achieving effective control often requires a combination of these methods and ongoing efforts.

**Legal status.** The Brazilian pepper tree is considered a noxious weed in many regions, and efforts are made to control its spread. There may be regulations to prevent the sale, distribution, or cultivation of this invasive species.

**Public awareness.** Public education and awareness campaigns are crucial in preventing the spread of the Brazilian pepper tree. Landowners, gardeners, and the general public are encouraged to recognize the plant, report sightings, and avoid planting it in landscaping.

**Cogon Grass (*Imperata cylindrica*).** The cogon grass is a highly invasive grass species native to Southeast Asia, but it has spread to various regions worldwide, becoming a serious threat to ecosystems and agriculture. Commonly known as cogon grass, lalang, or Japanese bloodgrass, this plant is known for its rapid spread, ability to form dense monocultures, and resistance to control measures.



**Appearance.** Cogon grass is a perennial grass typically growing 2 to 4 feet (0.6 to 1.2 meters) tall. It has long, slender, cylindrical stems and linear leaves with serrated edges. The leaves are typically pale green and can have a distinctive, silvery color at the base.

**Rhizomatous growth.** One of the key features contributing to the invasiveness of cogon grass is its extensive and robust rhizome system. The plant spreads rapidly through its underground rhizomes, forming dense mats of interconnected plants.

**Invasiveness.** Cogon grass is considered one of the world's worst invasive species. It has invaded various ecosystems, including forests, pastures, roadsides, and disturbed areas. Its aggressive growth allows it to outcompete native vegetation, reducing biodiversity and altering ecosystem structure (Lucardi et al 2020).

**Ecological impact.** The invasion of cogon grass has significant ecological consequences. It can alter nutrient cycling, create a fire hazard due to its high flammability, and negatively impact the habitat of native plants and animals. The dense mats formed by cogon grass can suppress the germination and growth of native vegetation.

**Fire adaptation.** Cogon grass is well-adapted to fire-prone ecosystems. The plant's dense, dead thatch fuels wildfires, and its ability to resprout from rhizomes after a fire contributes to its persistence and spread in fire-affected areas.

**Seed production.** While cogon grass primarily spreads through rhizomes, it also produces seeds that can be dispersed by wind, water, and human activities. The high seed production and dispersal contribute to the plant's ability to colonize new areas.

**Control and management.** Managing cogon grass is challenging due to its extensive rhizome system and resistance to many herbicides. Control methods include mechanical removal, prescribed burning, and specific herbicides. However, successful control often requires long-term and integrated management strategies.

**Economic impact.** Cogon grass poses economic threats to agriculture and forestry. It can reduce the productivity of pastures and negatively impact the growth of timber plantations. The invasion of cogon grass can also increase the risk of wildfires, potentially damaging property and infrastructure.

**Legislation and regulations.** Cogon grass is recognized as a noxious weed in many regions, and regulations may be in place to control its spread. Efforts are made to prevent its introduction into new areas and to implement control measures in affected regions.

**Conclusions.** The impact of invasive species can vary depending on the local ecosystem and environmental conditions. Efforts to control and manage these species are crucial to preserve native biodiversity and ecosystem health.

**Conflict of Interest.** The authors declare that there is no conflict of interest.

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