

Mikania micrantha Kunth

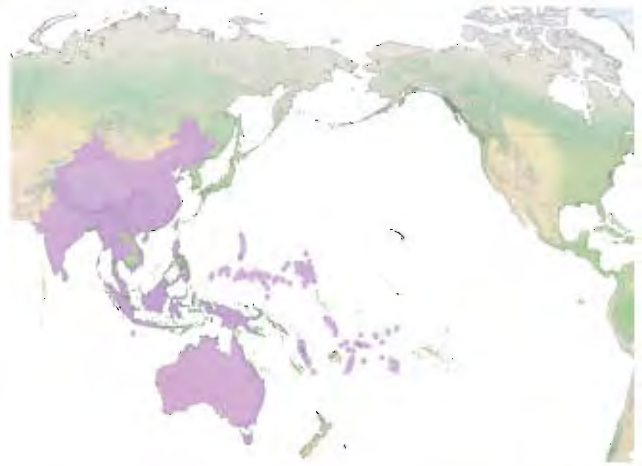
Native : Central and South America

- Family** : Asteraceae
Synonyms : *Eupatorium denticulatum* Vahl
E. orinocense (Kunth) M. Gómez
Common names : American rope, Chinese creeper,
mile-a-minute weed

Mikania micrantha is a perennial vine with climbing, creeping and twining habit. The plant is known for its exceptionally fast growth (8 - 9 cm in 24 hours) and spreading capacity. It grows best where fertility, organic matter, soil moisture and humidity are all high. The weed damages or kills other plants by cutting out light and smothering them. The Global Invasive Species Database ranks this species among the top 100 of the world's worst invaders. *Mikania* is one of the worst weeds of tea in India and Indonesia and of rubber in Sri Lanka and Malaysia. The plant reproduces sexually by seeds, and vegetatively by rooting at nodes. Small sections of the stem can give rise to a new plant. A single plant may cover over 25 square metres within a few months, and release as many as 40,000 viable seeds every year. Each seed has a terminal pappus of white bristles that facilitates dispersal by wind or attachment to the hair of animals.

Description : Robust, fast growing vine, branches slender, stem yellowish, usually terete, slightly striate, internodes 7.5 - 21.5 cm long. Leaves simple, opposite, ovate-deltoid, 8 - 10 x 3 - 8 cm, both surfaces glabrate with numerous glandular spots, base cordate, margin entire to coarsely dentate, apex shortly acuminate, 3 - 5 nerved from the base; petiole 3 - 7 cm long. Inflorescence axillary paniced corymbs, capitula cylindrical, 1.5 mm across; flowers 4 per capitula, involucrel bracts 4, oblong to obovate, acute, green, 1 - 3 mm long. Corolla 5-lobed, white, often with a purple tinge, 4.5 mm long. Achens 2 - 3 mm long, 4-angled, black, glabrous, pappus capillary, uniseriate, 3 mm long, white at first, becoming reddish brown.

Habitat : Grows well on the fringes of natural forests wherever the canopy is open and along stream banks, roadsides, railway tracks and in pastures, plantations, agricultural areas and wastelands. The plant cannot grow under a closed canopy.



Distribution : American Samoa, Australia, Bangladesh, Bhutan, Brunei, China, Christmas Island, Cook Islands, Federated States of Micronesia, Fiji, Guam, Hong Kong S.A.R., India, Indonesia, Malaysia, Marshall Islands, Myanmar, Nepal, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Thailand, Tonga, Tuvalu, Vanuatu, Viet Nam, Wallis and Futuna Islands.

Threat and damage : *Mikania* can smother, penetrate crowns, choke and pull down plants. The damage to crops is extensive, especially in young plantations and nurseries. It also competes with native plants for water and nutrients but perhaps even more importantly, it



inhibits the growth of other plants by releasing allelopathic compounds into the soil. In summer months, the dried aerial parts are a fire hazard. Infestation by the weed hampers collection of non-wood forest products and harvesting of crops such as banana, pine apple and ginger. Reduced crop yield and increased cultivation costs are the main economic impacts due to mikania invasion in agricultural areas.

Uses : Macerated, the plant can be applied to new wounds, scorpion stings and other skin irritations; the leaves after being boiled in saltwater and cooled are applied to the skin to relieve itching. In Jamaica, the plant extracts are used for antibacterial activity.

Management : Uprooting and digging if done before flowering and fruiting are effective. Sickle-weeding is effective only for short durations because vigorous regrowth can occur soon after. All of these methods

are labour-intensive and expensive. In some countries *Mikania* is grazed by cattle or used as a cattle fodder but this needs to be done cautiously as toxicity in cattle has been reported in a few countries. Application of glyphosate or diuron provides temporary control, provided spraying is carried out before the initiation of flowering/seed-setting. Repeated yearly applications may be required for long-term control. A combination of triclopyr and picloram is effective in controlling the weed in forest plantations. A rust fungus viz., *Puccinia spegazzinii* De Toni which is parasitic on mikania in its native range has been imported and released in China, India and Papua New Guinea to control the weed. Preliminary reports from these countries have been encouraging. Recent reports from Papua New Guinea indicate that the fungus has established on native populations of *Mikania* and gives excellent control of the weed.



Mimosa diplotricha C. Wright var. *diplotricha* Sauvalle

Native : Mexico, North and South America and the Caribbean

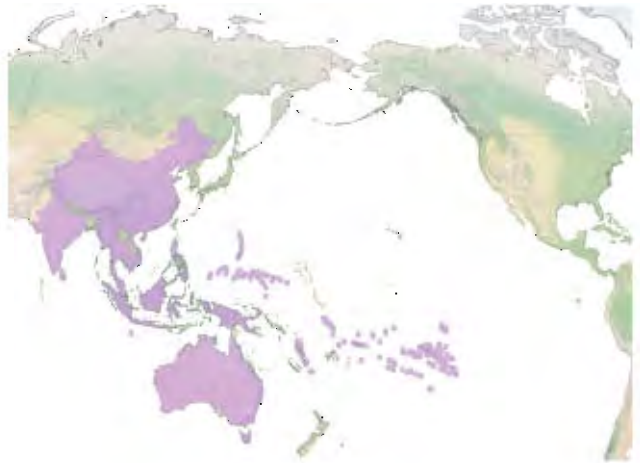
- Family** : Fabaceae
Synonyms : *Mimosa invisa* C. Martius
M. invisa var. *inermis* (Adelb.) Gilli
Common names : Creeping sensitive plant,
giant sensitive plant, nila grass

Mimosa diplotricha is a thorny nitrogen-fixing weed that threatens native flora and fauna in many countries. It can form dense thickets in a short span of time in all invaded ecosystems. The plant was introduced in East Asia in the 1960s as a nitrogen-fixing plant in tea gardens. Both thorny and thornless varieties of the plant are invasive. Seed production is in the range of 8, 000 -12, 000 per square metre. Flowering and seed-setting occurs from August to February. Roots are profusely branched and with root nodules. Seed dispersal occurs via running water, animal fur, clothing, vehicles, agricultural implements and machinery; seeds contaminate soil or seeds of crop plants. Seeds are known to lie dormant for up to 50 years.

Description : Perennial scandant subshrubs, stem four-angled, hirsute, woody at base, with re-curved thorns (3 - 6 mm long), to 3 m in height. Leaves bright green, feathery, alternate, 10 - 15 cm; petiole and rachis with recurved prickles; pinnae, 4 - 10 pairs, 2 - 4.5 cm, leaflets 10 - 30 pairs per pinna, linear-oblong, 3 - 7 x 1 - 2 mm, both surfaces white villous. Inflorescence a clustered fluffy ball, 12 mm across, on short stalks, 1 cm long. Flowers bisexual, purple pink. Fruit pods in clusters, slightly curved, oblong, 1.5 - 3.5 x 0.4 - 0.5 cm, with or without prickly bristles. Seeds, flat, ovate, glossy, light-brown, 2 - 2.5 x 0.6 - 1.4 mm.

Habitat : Grows best in tropical regions in habitats such as wastelands, pastures, disturbed forests, plantations, agricultural systems and along roadsides and railway tracks up to 2, 000 metres above sea level. In evergreen and semi-evergreen forests, infestation is limited to the fringes of the forest wherever the canopy is open due to disturbance. The weed is heliophytic in adaptation and cannot grow under a closed canopy. It is drought-resistant and can tolerate a wide range of soil conditions.

Threat and damage : *M. diplotricha* is a major threat to forest ecosystems, agricultural land and pastures. It causes heavy damage in crops like sugar cane,



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coconut, rubber, cassava, tea, pineapple and upland rice. Thick growth of the plant prevents regeneration, reproduction and growth of indigenous species in all infested areas. All parts of the plant are toxic to herbivores if ingested. It produces a toxin (mimosin), a non-protein amino acid, which, if ingested, can cause vascular endothelial damage, necroses of the heart and liver and anemia in herbivores. The tangled and thorny growth of *M. diplotricha* hampers movement and access to food and other resources for wild animals like the one-horned rhinoceros (*Rhinoceros unicornis* L.), an endangered species, Asian elephant (*Elephas maximus* L.), swamp deer (*Cervus duvauceli* Cuv.) and tiger (*Panthera tigris* L.) in Kaziranga National Park in Northeast India. Crops infested with *M. diplotricha* are difficult to harvest because of the thorns. Increased cultivation costs, reduced crop yield, loss of crops, reduced land value and soil degradation are the main economic impacts of mimosa.

Uses : Used as a nitrogen-fixing cover crop and green manure. The spineless variety is an excellent soil improver and soil binder. In Indonesia, it is planted in rubber plantations to oust *Imperata cylindrica*.

Management : Uprooting and burning, grubbing and slashing are effective physical control methods. Grazing by animals prevents dominance of *Mimosa* in Queensland, Australia. Use of glyphosate, paraquat, diuron, acetochlor + atrazine, starane, atrazine + metolachlor is reported to be effective. A sap-feeding bug, *Heteropsylla spinulosa* Muddiman, Hodkinson & Hollis, which causes growing tip distortion and reduces seed production in *Mimosa*, was introduced from Brazil into Queensland, Fiji and Papua New Guinea. The release of the bug resulted in successful suppression of *Mimosa*. *Fusarium pallidoroseum* (Cooke) Sacc., a fungus isolated from diseased *M. diplotricha* in the Philippines, provided excellent control of seedlings when sprayed with crude culture filtrate or cell-free filtrate.



Mimosa pigra L.

Native : Mexico, South and Central America and the Caribbean

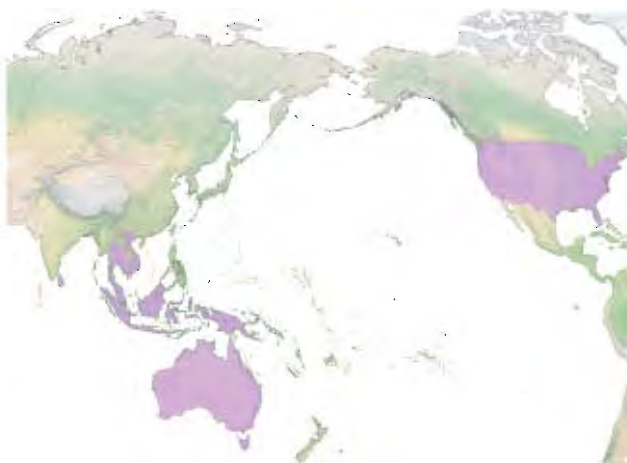
- Family** : Fabaceae
Synonyms : *Mimosa asperata* var. *pigra* Willd.
M. brasiliensis Niederl.
Common names : Bashful plant, catclaw mimosa, giant sensitive plant, mimosa

Mimosa pigra is an aggressive prickly shrub invasive in parts of Southeast Asia and Australia. It is ranked among the top 100 of the world's worst invaders in the Global Invasive Species Database. The shrub is supported by extensive lateral roots and numerous fine roots that have occasional nodules. The leaves are not as sensitive to physical stimulation as those of some other *Mimosa* species. Seeds are extremely hard and can remain dormant for more than 15 years, depending on the environmental conditions. Under ideal conditions, a single plant will produce up to 22,000 seeds per year.

Description : Upright shrubs, to 6 m tall, stem armed with broad-based prickles to 7 mm in length. Leaves bipinnate, sensitive, straight, erect or forward-pointing, pinnae 6-14 pairs, prickles at the junction of pinnae and sometimes with stouter, spreading or deflexed prickles between pairs, leaflets 20 - 42 pairs per pinna, linear-oblong, 0.3-0.8 x 0.05-0.12 cm, margins often bearing minute bristles. Inflorescence of tight, subglobose pendunculate heads to 1 cm in diameter, each head with up to 100 flowers, 1-3, together, in upper axils. Flowers mauve or pink. Fruit a pod, 0.3 - 1.2 x 0.7 - 1.4 cm, clustered, brown, densely bristled all over, breaking transversely into 14-26 partially dehiscent segments, each containing a seed, pod sutures persisting as an empty frame. Seeds light brown or olive green, oblong, flat, 4 - 6 x 2 mm.

Habitat : It is common along the edges of reservoirs, canals, riverbanks and roadside ditches, and in agricultural land and over-grazed flood plains. The plant prefers a wet tropical climate for growth and may not pose a major problem in regions with less than 750 mm or greater than 2,250 mm of rainfall, except in cases of clear-cutting. Though it does not prefer any soil type for growth, good growth is observed on flood plains and riverbanks with black clay and sandy clay soil and coarse siliceous sand.

Threat and damage : The plant will establish rapidly on disturbed areas and bare soils that lack competitive



Distribution : Australia, Cambodia, Indonesia, Malaysia, Papua New Guinea, Singapore, Sri Lanka, Thailand, United States, Viet Nam.



pressure from other seedlings. River floodplains and swamp forests in Northern Australia are threatened by dense thickets of *Mimosa pigra*. It prevents traditional food gathering by aboriginal people on otherwise resource-rich wetlands. It has the potential to harm a wide number and variety of different types of primary production systems. If large infestations occur on farmland, *M. pigra* may threaten the health of pastoral industries by reducing the area of grazing land and their carrying capacity. Furthermore, it blocks access of livestock to natural water sources.

Uses : In Thailand, *M. pigra* serves as a pollen source for bees. The dry stems and branches are often collected and utilized as fuelwood. It is used in tropical Africa as a tonic and to treat diarrhoea, gonorrhoea and blood poisoning. In Tanzania, the powdered leaf is taken internally to relieve swelling. The root yields 10 percent tannin.

Management : Mechanical removal of *M. pigra* may involve bulldozing, chaining or burning. Napalm

delivery from aircraft is used to burn the stands. Chemicals like 2,4,5-T, tebuthiuron, fluroxypyr, metsulfuron methyl and hexazinone are used to control *M. pigra*. Seed-feeding bruchid beetles viz., *Acanthoscelides quadridentatus* Schaeffer and *A. puniceus* Johnson and two stem-boring moths viz., *Neurostrotta gunniella* Busck and *Carmenta mimosa* Eichlin & Passoa, were released in Australia to control the weed. *N. gunniella* established readily. The fungus *Phloeosporrella* sp. attacks leaves, branches, main stems and seed pods, causing leaf fall and cankers of the stems leading to ring-barking and die-back. *Diabole cubensis* (Arthur & J.R. Johnst.) Arthur, another fungal pathogen, causes chlorosis in stems and leaves, resulting in premature leaf fall. Both fungi are attacked by hyperparasitic fungi in their native range and it seems likely that their effect on *M. pigra* could be even more damaging in Australia if they were to be introduced without their natural enemies. These fungi are under investigation as biocontrol agents in Mexico and the United Kingdom.



Mimosa pudica L.

Native : Central and South America

Family : Fabaceae

Synonyms : *Mimosa hispida* Kunth
M. pudica L. var. *tetrandra* (Willd.) DC.

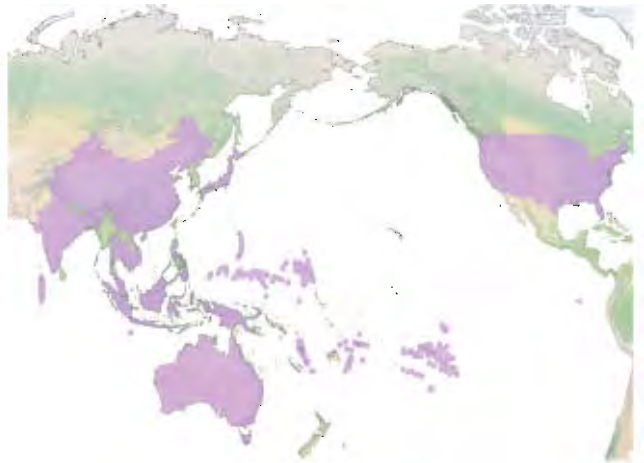
Common names : Common sensitive plant, shame plant, sleeping grass, touch-me-not

Mimosa pudica is a pantropical weed that was introduced as an ornamental to non-native areas. Accidental introductions may also have transpired. If touched, the plant will quickly fold its leaflets and pinnae and droop downward at the petiole. The leaves also droop at night and when exposed to rain or excessive heat. The plant can fix atmospheric nitrogen. In tropical countries the weed flowers all year round and each plant may produce up to 700 seeds.

Description : Perennial subshrubs, stem cylindrical, branched, with reflexed bristles and scattered, curved prickles; stipules lanceolate, 0.5 - 1 cm, bristly. Leaves bi-pinnate, usually 2 pairs, digitate, 3 - 8 cm, pinnae and leaflets sensitive; leaflets 10-20 pairs, linear-lanceolate, 0.6-1.5 × 0.15-0.3 cm, abaxially slightly hispid, adaxially glabrous, margin ciliate, apex acute. Inflorescence a head, solitary or two, axillary, globose, ca. 1 cm in diameter; peduncle long, bracts linear. Flowers numerous, pink, small. Fruit a legume, star shaped, slightly recurved, flat, oblong, 1-2 × 0.5 cm, consisting of 3 - 5 one-seeded segments that fall away from persistent, bristly sutures. Seeds light brown, ovoid, ca. 3.5 mm.

Habitat : Invades agricultural areas, planted forests, croplands, roadsides, wasteland and disturbed areas aggressively. It is shade-intolerant and frost-sensitive and may grow as a single plant or in tangled thickets. The plant cannot compete with tall vegetation or grow under forest canopies. It is common on soils with low nutrient status and is easily outcompeted on richer soils.

Threat and damage : Mimosa is a serious weed in many agricultural and crop systems and plantations. It can form dense ground cover and prevent reproduction/regeneration of other plants. Repeated burning encourages its spread in pastures and its thickets can be a fire hazard when dry. Roots of mimosa produce carbon disulphide that inhibits colonization of the rhizosphere by mycorrhizal and



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pathogenic fungi. The thorns of the plant can cause painful wounds in animals and people.

Uses : It is a popular ornamental plant. It has been identified as having potential for phytoremediation of arsenic-polluted areas in Thailand. The plant is used in traditional medicine in Asia. Aqueous extracts of the roots of the plant have shown significant

neutralizing effects on the lethality of the venom of the monocled cobra (*Naja kaouthia* Lesson).

Management : Intensive grazing can control the weed. Herbicides like dicamba, picloram and triclopyr are effective. In Cuba, *Mimosa pudica* is the larval food plant of butterflies.



Morella faya (Aiton) Wilbur

Native : Canary, Madeira and Azores Islands

Family : Myricaceae

Synonyms : *Myrica faya* Aiton

Common names : Fire tree

Morella faya has been introduced to several countries including the United States (Hawaii), New Zealand and Australia as an ornamental tree. The stem and branches of the tree are covered with reddish peltate hairs and hence the name 'fire tree'. The tree is a prolific seed producer with the seeds remaining viable in the soil for a long period of time. Seed dispersal is aided by fruit-eating birds. An average adult female tree will produce more than 400,000 fruits per year.

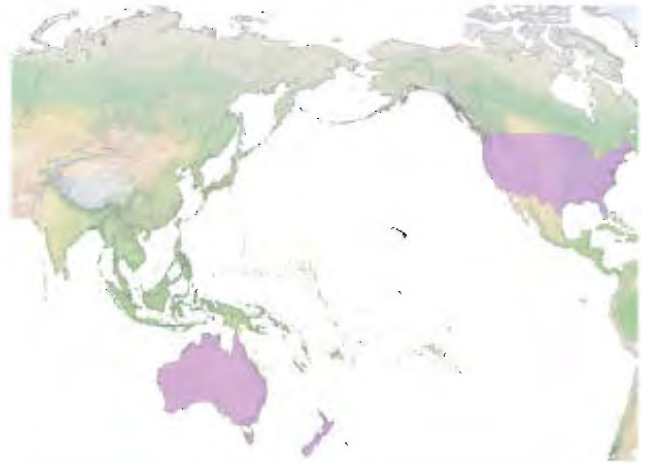
Description : Small trees, up to 8 m tall, branchlets with reddish peltate hairs. Leaves simple, alternate, coriaceous, oblanceolate, glabrous, 4 - 11 x 1 - 2.5 cm, margins revolute, remotely serrulate or serrate in the upper half, apex rounded, base acute. Inflorescence a spike or catkin. Flowers unisexual, generally on separate trees, yellow, without perianth. Fruit a drupe, edible, ca. 6 mm in diameter, dark red or blackish when mature. Seeds 1 - 5.

Habitat : Occurs in various types of native forests, pastures and along roadsides and is most abundant on steep slopes. It can adapt to a wide range of habitats and soil types. In Hawaii, the plant has invaded wet and mesic forests where it forms dense, monotypic stands. It can fix nitrogen and can grow under a closed forest canopy, taking advantage of any disturbance to grow rapidly.

Threat and damage : *Morella* can grow in dense stands which negatively impact recruitment and persistence of native plant species. As an actinorrhizal nitrogen-fixer, it alters primary successional ecosystems by enhancing nitrogen availability in soil. The leaves of the plant are suspected to have allelopathic properties.

Uses : Used for ornamental and medicinal purposes.

Management : Fruit-eating birds and feral pigs are important dispersal agents of fire tree seeds. Management options should include control of these dispersal agents to limit further spread. Goats can also be used to control the tree. Saplings are susceptible to



Distribution : Australia, New Zealand, United States.

foliar applications of triclopyr and cut-stump treatments of imazapyr, glyphosate and to frill application of triclopyr amine. They are also susceptible to basal bark applications of triclopyr. A moth viz., *Caloptilia* sp. nr. *schinella* Walsingham, a native of the Azores and Madeira Islands in the Eastern Atlantic, was released in Hawaii as a potential biological control agent. *Botrytis cinerea* Pers., the first pathogen reported on the fire tree, is reported to cause widespread fruit rot. *Septoria hodgesii* D.E. Gardner, a common fungal leaf pathogen of *Myrica cerifera* L., is identified as a potential biocontrol agent.



Opuntia stricta (Haw.) Haw.

Native : The Carribean region

Family : Cactaceae

Synonyms : *Cactus strictus* Haw.
Cereus mollis Pfeiff.

Common names : Araluen pear, Australian pest pear, common prickly pear, erect prickly pear

Opuntia stricta is a cactus commonly found in urban areas and along riverbanks. It is considered Australia's worst-ever weed. *Opuntia* is also invasive in South Africa, where biological options are currently being explored to control infestation. According to the Global Invasive Species Database, *Opuntia stricta* is among the top 100 of the world's worst invaders. Segments of the plant will take root from the 'eyes' if left in contact with the ground. As the plant is a succulent, it remains capable of rooting for several months after being detached from the parent plant. The plants can move in floods leading to infestations along riverbanks.

Description : Sprawling or erect, succulent shrubs with inconspicuous leaves; stem segments not disarticulating, green, flattened, narrowly elliptic or obovate, 10-40 x 7.5-25 cm, tuberculate, making margins scalloped between raised areoles, glabrous. Areoles 3-5 per diagonal row across mid-stem segment, oval, 0.3 - 0.65 x 0.35 cm; wool dense, 1 to 11 spines per areole, spreading, yellow, brown after ageing, straight or curving, the longest stout, oval in cross-section, 1.2 - 6 cm. Glochids inconspicuous, few to many in a crescent at the adaxial edge of the areoles, yellow, brown after ageing, often incurved, subequal to increasing in length toward the adaxial edge of the areole, to 4 mm. Flowers yellow, 2.5 - 3 cm across. Fruit purplish throughout, stipitate, ellipsoid or barrel-shaped, 4 - 6 x 2.5 - 4 cm, juicy, spineless, 6 - 10 areole. Seeds tan, subcircular, pale brown, 4 - 5 x 4 - 4.5 mm, with slightly irregular surfaces.

Habitat : Originally a garden plant or used for fencing, it occurs close to old buildings, but can also spread far from habitation. Rocky slopes, riverbanks, open woodlands, roadsides, disturbed areas, grass lands and urban areas are favoured habitats.

Threat and damage : *Opuntia* can dominate the vegetation of rocky outcrops displacing native species, which are rare and restricted in distribution.



Distribution : Australia, India, New Caledonia, Solomon Islands, Sri Lanka.

Uses : Cultivated for medicinal/culinary uses in some areas. In the Bahamas, crushed joints are used to treat arthritis, rheumatism and dandruff. In the outer islands of the Bahamas, the joint's adhesive flesh is mashed with water and drunk to alleviate urinary burning. It is also used as a barrier fence.

Management : Plants can be dug out, but need to be disposed of very carefully because of their ability to take root again if left on the ground. Deep burial or burning is the safest method. Spraying with woody weed-specific herbicides can be effective, but a high concentration may be needed. The biological control of *Opuntia*, through the introduction of the phycitid moth *Cactoblastis cactorum* Berg from Argentina was successful. It can also be controlled by a cochineal insect, *Dactylopius opuntia* Cockerell, which weakens the plant and prevents seeding.



Parthenium hysterophorus L.

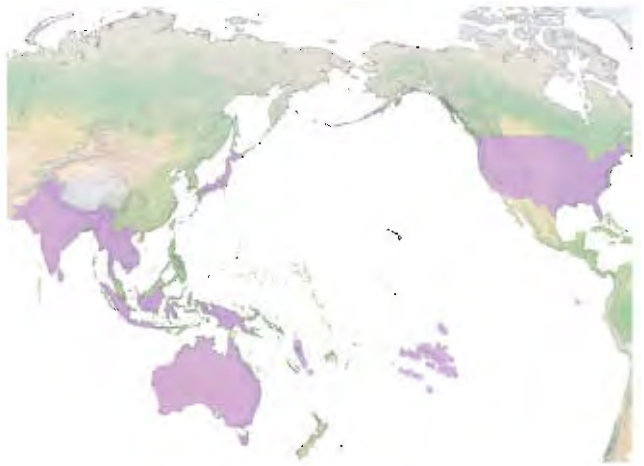
Native : Mexico, Central and South America and the Caribbean

- Family** : Asteraceae
Synonyms : *Argyrochaeta bipinnatifida* Cav.
A. parviflora Cav.
Common names : Carrot weed, congress grass,
star weed, white top

Parthenium hysterophorus is an invasive herb that has spread to most continents posing a serious threat to various ecosystems. The Global Invasive Species Database ranks *Parthenium* among the top 100 of the world's worst invaders. The plant is unpalatable to cattle. It can displace native vegetation through allelopathic effects and by forming monospecific thickets. Seeds do not have a dormancy period and are capable of germinating at any time when moisture is available. The root system has one main branched taproot and many finer roots. The seeds are mainly dispersed through water currents, animals and the movement of vehicles, machinery, livestock, grain and feedstock. Seeds are viable for approximately 20 years.

Description : Annual erect herbs, to 2 m tall. Leaves pinnately 1 or 2 lobed, ovate to elliptic, 3-18 x 1-9 cm, ultimate lobes lanceolate to linear, 0.5-5 x 0.3-1.5 mm, both surfaces sparsely to densely scaberulose and gland-dotted. Inflorescence a panicle, capitula obscurely radiate, head creamy-white, peduncles 0.1-1.5 cm; outer phyllaries of 5-6, elliptic-lanceolate, 2-4 mm, inner 5 or 6, ovate to orbicular, 2.5-4 mm, female florets 5 or 6, disk florets 12-50. Fruit an achene, obovoid, 1.5-3.5 mm; pappus absent or with two short hooks, 5 seeded. Seeds wedge-shaped, black, 2 mm long with thin white scales. A large single plant produces up to 100,000 seeds in its life cycle.

Habitat : *Parthenium* grows luxuriantly in wastelands, vacant lands, orchards, forest lands, floodplains, agricultural areas, scrub-shrublands, urban areas, overgrazed pastures and along roadsides and railway tracks. Drought, and subsequent reduced pasture cover creates the ideal situation for *Parthenium* to establish itself. It prefers alkaline, clay loam to heavy black clay soils, but tolerates a wide variety of soil types. *Parthenium* grows well in areas where the annual rainfall is greater than 500 mm and falls dominantly in summer. It can grow up to an elevation of 2,200 metres above sea level.



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Threat and damage : Infestation by *Parthenium* degrades natural ecosystems. It aggressively colonizes disturbed sites, reduces pasture growth and depresses forage production. Its pollen is known to inhibit fruit-setting in many crops. The germination and growth of indigenous plants are inhibited by its allelopathic effect. In humans, the pollen, air-borne pieces of dried plant materials and roots of *Parthenium* can cause allergic responses like hay fever, photodermatitis, asthma, skin rashes, peeling skin, puffy eyes, excessive water loss, swelling and itching of mouth and nose, constant cough, running nose and eczema. In animals, the plant can cause anorexia, pruritus, alopecia, dermatitis and diarrhoea. *Parthenium* can taint mutton and make dairy milk unpalatable due to its irritating odour.

Uses : *Parthenium* is reported to have insecticidal, nematicidal and herbicidal properties. It is used for composting. The odour of the plant is apparently disagreeable to bees and they can be easily kept away by carrying a handful of *Parthenium* flower heads. A root decoction of the plant is used in treating amoebic dysentery. Sublethal doses of parthenin, a toxin recovered from *Parthenium*, exhibited antitumour activity in mice and the drug can either cure mice completely or increase their survival time after they

had been injected with cancer cells.

Management : Manual uprooting of *Parthenium* before flowering and seed-setting is the most effective method. Competitive replacement of *Parthenium* can be achieved by planting species like *Cassia sericea* Sw., *Croton bonplandianus* Baill., *C. sparsiflorus* Morong, *Amaranthus spinosus* L., *Sida acuta* Burm. f. and *Tephrosia purpurea* (L.) Pers. The use of herbicides such as glyphosate, atrazine and metribuzin has been recommended. The timing of chemical control is critical. The plants should be treated before flowering and seed-setting and when other plants, especially grass, are actively growing and can recolonize the infested area. In open wastelands, non-cropped areas and along railway tracks and roadsides, the spraying of a solution of common salt (sodium chloride) at 15-20 percent concentration is effective. Several insects and pathogens have been tested from time to time to control *Parthenium*. Of these, the leaf-feeding beetle *Zygogramma bicolorata* Pallister and the stem-galling moth *Epiblema strenuana* (Walker) are widely used in several countries to manage *Parthenium*. *Z. bicolorata* is now widely used in India to control the weed. In Australia, both insects and a rust fungus, viz., *Puccinia abrupta* var. *partheniicola* (H.S. Jacks.) Parmelee are being used successfully.



Passiflora tarminiana Coppens & V.E. Barney

Native : Tropical South America

- Family** : Passifloraceae
Synonyms : *Passiflora mollissima* (Kunth) L. H. Bailey
Common names : Banana passion flower,
banana passion fruit, banana poka

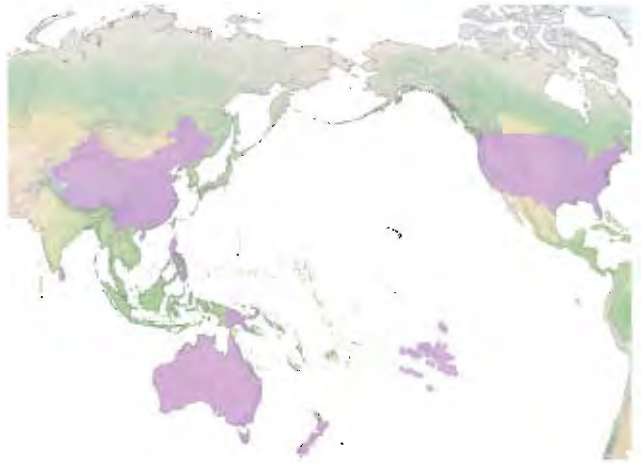
Passiflora is a widely cultivated ornamental liana. The plant can aggressively invade natural habitats, smothering trees and affecting the diversity of flora and fauna. In Hawaii, *Passiflora* is considered a noxious weed. Fruits of the plant are the main food source of feral pigs, which aid in seed dispersal. Flowering occurs throughout the year and fruits contain numerous seeds. The adult plant will live up to 20 years. Reproduction is mainly through seeds but asexual reproduction also occurs by producing adventitious roots from stem sections. Birds and humans also aid in seed dispersal.

Description : Woody tendrillate climbers, to 20 m tall. Leaves simple, 6-16 x 7-20 cm, deeply three-lobed, softly pubescent on lower or both surfaces; 4-6 scattered petioles, 1.5 - 4 cm long, stipules obliquely ovate, ca. 6 mm long, apex setaceous, deciduous. Flowers pendent, salverform, pink, 6-9 cm in diameter; peduncles solitary, 3.8-10 cm long, bracts ovate, coherent at base, forming an enlarged tube over hypanthium; hypanthium green, tubular, 5-7 cm long. Fruit a berry, yellow or pale orange at maturity, pericarp softly coriaceous, obovate to oblong, 6-8 x 2.5-4 cm, pubescent; aril orange. Seeds asymmetrical, numerous, reddish-brown when dry, reticulate, acute, cordate, aromatic.

Habitat : *P. tarminiana* grows near agricultural areas, natural forests and planted forests. It is commonly seen up to 4, 500 metres in areas with mean annual rainfall between 800 and 1, 300 mm. The plant can tolerate both high and low light levels; soil pH and soil type are not critical factors for growth.

Threat and damage : The plant can smother disturbed forest areas rapidly. It can suppress, eliminate or kill other plants by shading out and thus reducing species richness in invaded areas.

Uses : Cultivated as an ornamental plant for its attractive flowers. The fruits are edible and hence grown as a food crop in its native range. The stem is used to weave baskets.



Distribution : Australia, China, New Caledonia, New Zealand, Papua New Guinea, Philippines, Sri Lanka, United States.

Management : Grazing is an effective control measure in Hawaii. Small plants can be hand-pulled and older ones dug out. Herbicides such as tordon and glyphosate applied at the cut area are effective. *Cyanotricha necryia* Felder, a leaf-feeding moth, and *Pyrausta perelegans* Hampson, a moth that feeds on buds, leaves, fruits and shoot tips were released and established in Hawaii in 1991 but are now uncommon. *Septoria passiflorae* Syd., a leaf spot pathogen, released in Hawaii in 1996 is now widespread and results in significant disease epidemics.



Paulownia tomentosa (Thunb.) Siebold & Zucc. ex Steud.

Native : China

- Family** : Scrophulariaceae
Synonyms : *Bignonia tomentosa* Thunb.
Paulownia imperialis Siebold & Zucc.
Common names : Empress tree, foxglove-tree,
karri tree, princess tree

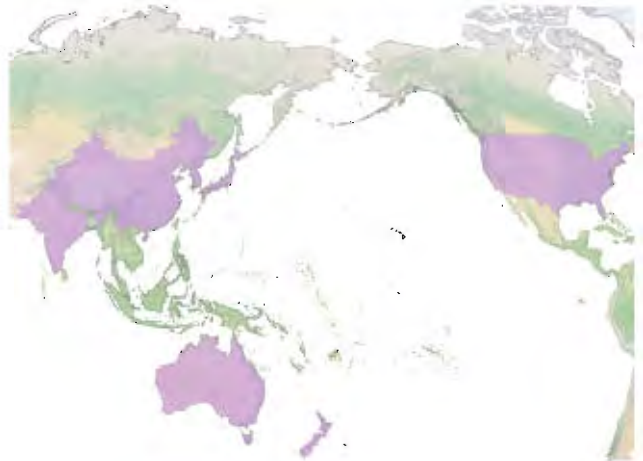
Paulownia tomentosa is a deciduous tree introduced and cultivated in several countries for ornamental purposes. The tree is popular in the modern gardening styles. It aggressively invades disturbed areas and displaces the native vegetation. Mature trees are often structurally unsound and rarely live more than 70 years. The plant can reproduce from seed or from root sprouts. Roots are shallow to deep and well developed.

Description : Small to medium trees, to 20 m tall, crown broad, umbelliform, bark brownish-grey, twigs conspicuously lenticellate, viscid glandular when young. Leaves simple, alternate, cordate, abaxially densely to sparsely hairy, adaxially sparsely hairy, apex acute. Thyrses pyramidal to narrowly conical, to 50 cm; cymes 3 or 4 - flowered; peduncle 1 - 2 cm, as long as the pedicels. Flowers purple, funnel-like or campanulate, 5 - 7.5 cm across. Fruit a capsule, ovoid, 3-4.5 cm, densely viscid-glandular hairy; pericarp ca. 1 mm; calyx lobes persistent, flat. Seeds 2.5 - 4 mm, winged.

Habitat : Occurs along roadsides, fringes of natural forests and riverbanks. It can tolerate infertile soils, acidic conditions and drought. *Paulownia* grows best in moist, uncompacted and well-drained soils. It quickly adapts to fire-affected areas, forests defoliated by pests and areas affected by landslides and other disturbances. It does not thrive under shade.

Threat and damage : The tree causes maintenance problems along roadsides and in gardens. It colonizes rocky cliffs and riparian zones competing with rare plants in these habitats. The plant can survive wildfires because the roots can regenerate quickly. A single tree is capable of producing several millions of seeds that are easily transported long distances by wind and water. Seedlings grow quickly and flower in eight to ten years.

Uses : The wood is used for carving and the nitrogen-rich leaves are a good fodder. It is planted to prevent



Distribution : Australia, China, Democratic People's Republic of Korea, India, Japan, New Zealand, Pakistan, Republic of Korea, United States.

soil erosion. A decoction of the leaves is used to wash ulcers and to treat warts. Flowers are used to treat skin ailments.

Management : Hand-pulling of small seedlings along with root system is effective. Treating cut stumps with glyphosate or triclopyr prevents sprouting. Biological control is unknown.



Physalis peruviana L.

Native : Tropical South America

- Family** : Solanaceae
- Synonyms** : *Alkekengi pubescens* Moench,
Boberella peruviana (L.) E.H.L. Krause
- Common names** : Gooseberry tomato, golden berry,
Peruvian ground cherry

The most notable feature of *Physalis peruviana* is the inflated calyx that covers its fruit. Because of the fruit's decorative appearance, it is sometimes used in restaurants as an exotic garnish for desserts.

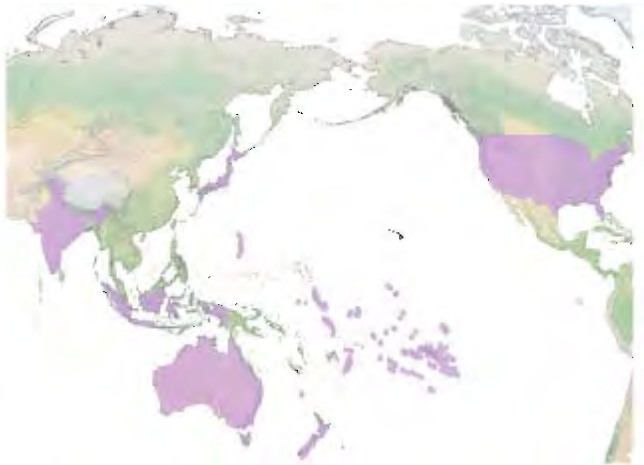
Description : Perennial herbs or subshrubs, 1-2 m tall, stem erect, sparingly branched, densely pubescent. Leaves simple, alternate, broadly ovate to cordate, 6-15 x 4-10 cm, base cordate, apex short acuminate, margin entire or with a few indistinct teeth. Flowers solitary, axillary, yellow, spotted in the throat, 12-15 x 12-20 mm; pedicel ca.1.5 cm, fruiting calyx green, ovoid, with 5 - 10 weak angles, 25-40 mm, pubescent. Fruit a berry, yellow, 10-15 mm across, smooth, waxy, orange-yellow skin, aromatic, enclosed in the inflated calyx. Seeds many, pale brown, ca. 2 mm across.

Habitat : An annual in temperate regions and a perennial in the tropics. It may be found in mesic to wet forests, subalpine woodland, disturbed sites, gardens, mountain slopes and agricultural systems and may occur at altitudes of 450 to 2,000 metres. The plant prefers well-drained soil though it can grow in nutritionally-poor soil as well.

Threat and damage : The plant poses an indirect threat to agriculture since it may harbour plant pests, pathogenic fungi, viruses and bacteria, when imported.

Uses : Used as an ornamental; berries are used for making jams. The plant has anti-inflammatory and anti-oxidant properties. It is used as a medicinal herb for cancer, malaria, asthma and rheumatism.

Management : Hand-pulling or digging out the seedlings. The herbicide tebuthiuron is often used to control the plant. Biological control is unknown.



Distribution : Australia, Cook Islands, Fiji, French Polynesia, Guam, India, Indonesia, Japan, Kiribati, Nauru, New Caledonia, New Zealand, Niue, Norfolk Island, Northern Mariana Islands, Palau, Tonga, Tuvalu, United States.



Pinus pinaster Aiton

Native : Northwest Africa and South Europe

Family : Pinaceae

Synonyms : *Pinus lemoniana* Benth.
P. maritima Lam.

Common names : Cluster pine, maritime pine

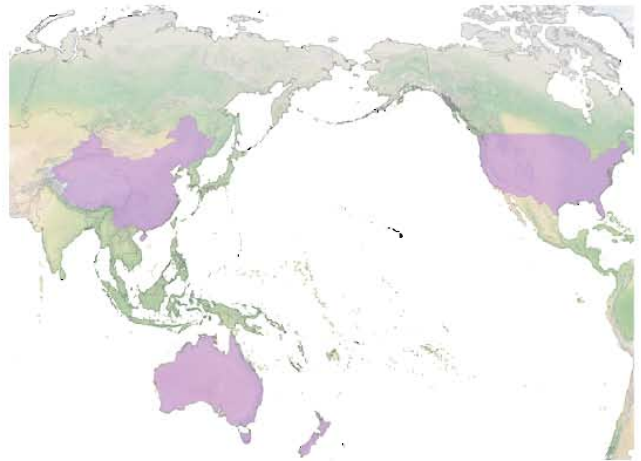
Pinus pinaster is one of the most important forest species in France, Portugal and Spain and has been planted in non-native areas for wood and resin production. It regenerates almost everywhere and invades native vegetation. The plant is ranked among the top 100 of the world's worst invaders in the Global Invasive Species Database. There are two subspecies of *P. pinaster* in Europe. It produces abundant seeds which are dispersed by wind.

Description : Medium-sized trees, to 40 m tall, bark brown, deeply and irregularly longitudinally furrowed, crown pyramidal, branchlets pale reddish-brown, producing one to a few nodes each year; winter buds brown, oblong, resinous, needles two per bundle, bright green, usually twisted, 10 - 20 × 0.1 - 0.2 cm, stiff, six resin canals, median. Seed cones clustered, shortly pedunculate, conical or ellipsoid-ovoid, slightly deflexed, symmetrical, brown, 9-18 cm; apophyses brown, lustrous, conspicuously pyramidal; umbo slightly projecting and pungent. Seeds 6-8 mm long, winged.

Habitat : It is commonly found near agricultural areas, natural forests, planted forests and urban areas at elevations up to 600 metres, but in certain areas it also grows up to 2 000 metres. The tree is drought-tolerant and adapted to fires.

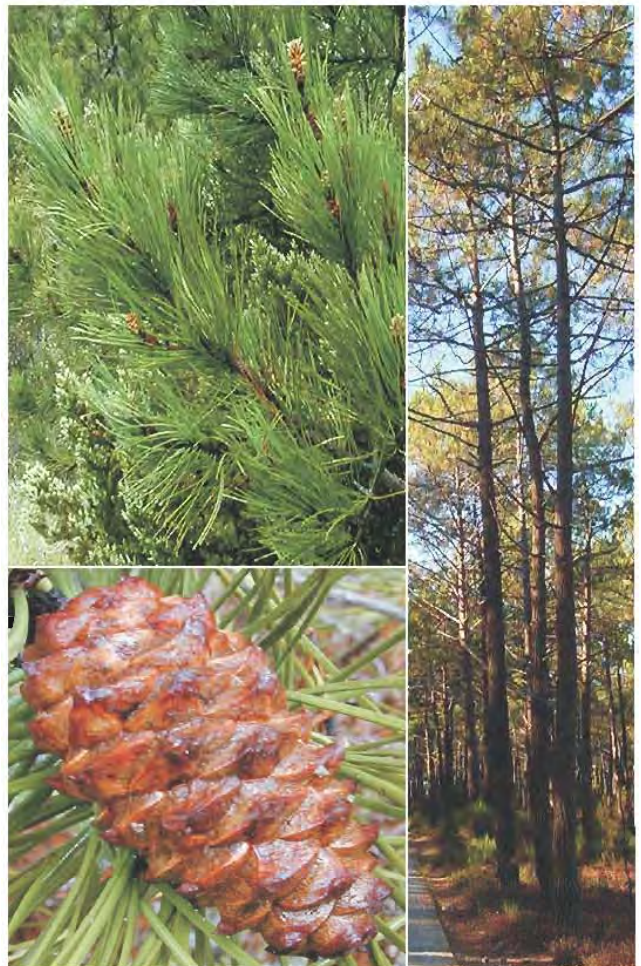
Threat and damage : *Pinus* regenerates profusely after fire, often resulting in dense thickets of plants close to deceased adult plants. These dense thickets suppress native plants, change fire regimes and hydrological properties and alter habitats for many animals. The thick litter layer prevents seedling establishment of native plants.

Uses : The turpentine obtained from the resin of the tree is antiseptic, diuretic and vermifuge. It is used internally to treat kidney problems and as a rub and steam bath in the treatment of rheumatic complaints. The tree is planted as a shelterbelt along exposed coasts and also to stabilize sandy soils. A tan or green dye is obtained from the needles.



Distribution : Australia, China, New Caledonia, New Zealand, United States.

Management : Young seedlings and saplings are easy to pull out and large trees can be cut. Trees can also be killed by ring barking. Chemical and biological control methods are unknown.



Piper aduncum L.

Native : West Indies and tropical America

Family : Piperaceae

Synonyms : *Artanthe adunca* (L.) Miq.
A. adunca f. *angustifolia* Miq.

Common names : Bamboo piper, matico, spiked pepper

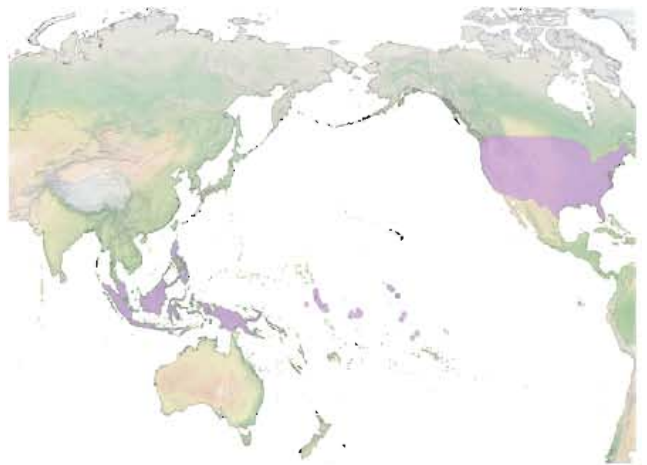
Piper aduncum is a common invader of disturbed areas where it spreads through sprouts and suckers. The plant has an invasive advantage over other pioneer species because of its dominance in the seed bank, rapid growth rate and high biomass accumulation. It is now treated as a common pantropical weed throughout the world. In many places it has readily escaped from cultivation to become a dominant part of the landscape. All plant parts have a peppery taste and odour. The tiny seeds are mainly dispersed by birds. In Fiji, the red-vented bulbul, *Pycnotus cafer* L., is the main dispersal agent.

Description : Shrubs or small trees, to 7 m tall, sparsely pubescent. Leaves simple, alternate, oblong, ovate, widely lanceolate to elliptic, 11-24 × 4-8 cm, base obliquely rounded to obliquely cuneate, apex acuminate, surfaces abaxially soft-pubescent, adaxially scabrous; petiole 1-2.5 cm. Inflorescence a spike, flowers white to pale yellow, turning green with maturity. Flowers crowded in regular transverse ranks. Fruit a berry, one-seeded, oblong, two sides flattened longitudinally, both ends truncate, apex depressed, regularly pitted or reticulate, beak minute, ca. 1mm. Seeds brown to black, compressed, surface reticulate.

Habitat : It grows well in areas with 1,500 to 4,000 mm of annual rainfall and commonly invades agricultural areas, natural forests and disturbed areas. The plant can colonize most soil types, but in excessively well-drained soils, it only grows in areas with heavy rainfall.

Threat and damage : The weed is known to dry out the soil and absorb large amounts of nutrients. In Fiji, it aggressively invades secondary forests and forest ridges but is rarely found in intact rain forests. In Papua New Guinea, it is a serious weed of grazing land, agricultural areas and abandoned gardens.

Uses : The plant contains a chemical called safrol which is used in the production of insecticides, fragrances, soaps and detergent products. It provides



Distribution : Fiji, Indonesia, Kiribati, Malaysia, Papua New Guinea, Philippines, Singapore, Solomon Islands, United States.

food and cover for wildlife and can be used for revegetating disturbed areas, and to prevent soil erosion. The wood is used for construction purposes, fuel and for fences. Tea made from the leaves and roots is used to treat diarrhoea, dysentery, vomiting and to control bleeding.

Management : Young plants can be uprooted. Basal bark application or cut stump application with tripropyl is effective. Biological control is unknown.



Pittosporum undulatum Vent.

Native : East Australia

Family : Pittosporaceae

Common names : Australian cheesewood, mock orange, orange pittosporum, victorian box

Pittosporum is a large genus which extends beyond Australia to the warmer regions of Africa, Asia, the Pacific islands and New Zealand. It is an evergreen tree with fragrant flowers. The tree is widely cultivated for ornamental purposes and has aggressively spread to various parts of the world. A single tree can produce more than 37,500 seeds.

Description : Shrubs or small trees, to 14 m tall, bark smooth, grey. Leaves simple, alternate, 3 - 8 x 10 - 15 cm, lanceolate, pointed at both ends, shiny, with prominently wavy margins, often crowded at the ends of slender, light brown branches. Flowers bell-shaped, creamy-white, few, fragrant, borne on the youngest branches in terminal umbellate clusters, 2.5 cm long, male and female flowers on different plants. Fruit a capsule, globose, compressed, ca. 1 cm in diameter, to 25 seeded. Seeds angular, 0.25 cm long, dark brown, smooth.

Habitat : The plant commonly invades natural forests, grasslands and open and disturbed areas up to an elevation of 1 200 metres. It is hardy and well adapted to most acidic soils. It is also shade-tolerant and can withstand extended dry periods once established.

Threat and damage : Invades native forests and suppresses other vegetation. The leaves contain toxins that can inhibit the growth of native plants. As the berries are attractive to birds, seeds are spread to distant areas.

Uses : The plant makes very good fuelwood, produces good charcoal and may also be used as timber. The high rate of nectar production makes the tree a good source of food for honey bees.

Management : Hand-pulling of the seedlings is suggested. Application of 2,4,5-T mixed with diesel and glyphosate to stumps cut just above ground level prevents coppicing. Biological control is unknown.



Distribution : Australia, China, Guam, India, New Zealand, Norfolk Island, United States.



Polygonum cuspidatum Siebold & Zucc.

Native : East Asia

Family : Polygonaceae

Synonyms : *Fallopia japonica* (Houtt.) Ronse Decr.
Reynoutria japonica Houtt.

Common names : Crimson beauty, German sausage,
Japanese bamboo, Japanese knotweed

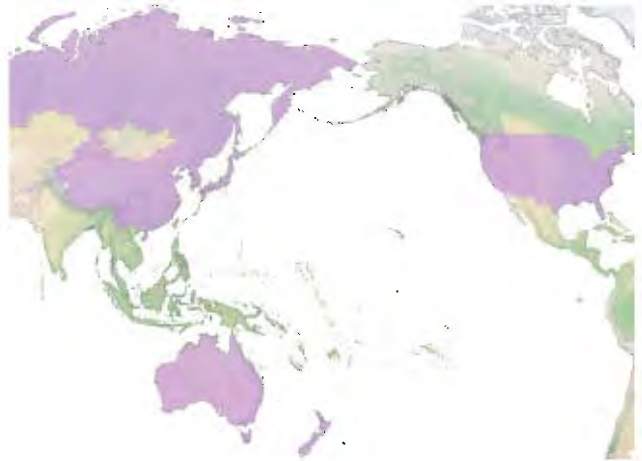
Polygonum cuspidatum is a perennial herb introduced as an ornamental in several countries. The Global Invasive Species Database ranks this species among the top 100 of the world's worst invaders. It is also used to stabilize soil, especially in coastal areas. The overwintering canes and leaves of the plant are slow to decompose.

Description : Perennial subshrubs, to 3 m tall. Mature stems hollow, purple speckled, surrounded by a membranous sheath, smooth, stout, swollen at joints, young shoots reddish to purple; rhizomes knotty, leathery brown, spread to 7 metres away from the parent plant, usually with a dark orange central core and an orange to yellow outer ring. Leaves simple, alternate, 15 x 8 - 10 cm, broadly ovate to triangular, apex acute. Inflorescence a terminal drooping panicle, dioecious. Flowers creamy white. Fruit an achene, brown, shiny, triangular. Seeds ca. 2.5 mm long, shiny.

Habitat : *Polygonum* is common near water sources, riparian zones, coastal shores and islands. The plant can tolerate a wide range of conditions like full shade, high temperatures, high salinity and drought. It can grow in a variety of soil types with pH ranging from 4.5 to 7.4.

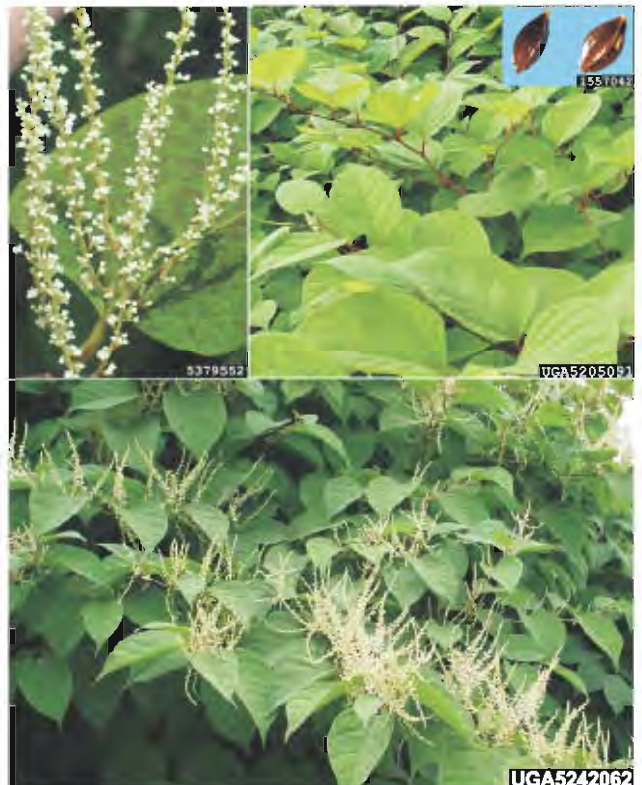
Threat and damage : The plant is a threat to riparian corridors, stream sides, natural forests and open areas where it spreads rapidly to form dense stands, smothering native vegetation and inhibiting regeneration. Once established, the plant is extremely persistent and difficult to control. Its extensive rhizome system can grow 15 to 20 metres in length and helps the plant to achieve early emergence and greater height much before the establishment of other vegetation.

Uses : A popular ornamental worldwide, and hence not generally recognized as a weed. In its native range, the plant is used extensively to beautify waste areas, garbage dumps and in coastal areas to stabilize soil.



Distribution : Australia, China, Democratic People's Republic of Korea, Japan, New Zealand, Republic of Korea, Russian Federation, United States.

Management : Cutting, mowing and hand-pulling can be effective. A cut stem treatment method using glyphosate or triclopyr can be used where plants are established within or around non-target plants. A subsequent foliar application of glyphosate may be required for better results. *Puccinia polygoni-weyrichii* Miyabe, a fungal pathogen that attacks the plant in Japan is a potential biocontrol agent.



Prosopis glandulosa Torr.

Native : Southern United States and Mexico

- Family** : Fabaceae
- Synonyms** : *Algarobia glandulosa* (Torr.) Torr. & A. Gray
Neltuma constricta (Sarg.) Britton & Rose
- Common names** : Honey mesquite, mesquite,
Texas mesquite

Mesquite is a perennial, woody tree that forms dense thickets which compete strongly with native species, suppressing their growth and reducing species diversity. This deciduous tree is tolerant to moderately salty and frost conditions. It thrives under high atmospheric temperature and survives well in dry areas. It is ranked in the Global Invasive Species Database among the top 100 of the world's worst invaders. As hybridization is common, the taxonomy of mesquite is often complex. Genetic variability among the population is high, with good potential for selection of individuals and ecotypes for breeding. Seeds mature 35 to 40 days after flowering and remain viable up to 50 years. They germinate under warm temperatures if moisture is available. Seed-spread is through grazing animals.

Description : Small trees; thorns stout, 0.7 - 5 cm long, axillary. Leaves alternate, bipinnate, rachis 2.5 - 12.5 cm long, prolonged beyond the last pinnae as a soft bristle, swollen, glandular at the base, pinnae 1 or 2 pairs, 7.5-12.5 cm long, sometimes glandular between the leaflets. Leaflets sessile, 8 -18 pairs, ca. 1.5 - 4.0 x 0.15 - 0.5 cm, rather distant, linear, oblong, falcate, usually acute. Inflorescence an axillary pedunculate spike to 7.5 cm long, solitary or in fascicles of 2 - 4; peduncle 0.5-1.8 cm long. Flowers creamy white, to 3 cm across. Fruit a pod, 7-8 x 1. 25-2 cm, linear, straight or falcate, compressed, turgid, pendulous, narrowed into a short stalk, exocarp coriaceous, mesocarp pulpy, endocarp cartilaginous surrounding each seed separately. Seeds oval, 5 x 7 mm, thick, 12 to 20 in a pod.



Distribution : Australia, India, Myanmar, Pakistan.

Habitat : Mesquite is found in open areas with good rainfall. It has a very deep root system that can extract moisture from the water table. It can grow in diverse climatic conditions and soil types and can withstand high atmospheric temperature.

Threat and damage : The plant outcompetes understorey plants resulting in loss of ground cover. Allelopathic effects of the tree litter promotes erosion.



Uses : The pods are used as a food and beverage. Gum from the bark is edible and also used for medicine and in the dye industry. Bees favour the flowers, and mesquite is highly valued for its flavour. Wood, chips and charcoal are excellent fuels, and the wood smoke lends a pleasant flavour to cooked food. The tree is a folk remedy for dyspepsia, eruptions, hernia and skin diseases.

Management : Includes tree bulldozing, cable chaining, roller chopping, root ploughing, tree grubbing and land imprinting. For mechanical

measures to be effective, the dormant buds that occur along the underground stem must be damaged or removed to prevent sprouting. Application of the herbicide clopyralid often results in more than 80 percent mortality of the plant. Taller plants may be less susceptible to herbicides than shorter ones. Chemical and mechanical methods such as grazing and fire can be used in an integrated control programme. Biological control agents including two seed feeders, a leaf-tying moth and a sap-sucking psyllid have been imported into Australia. Impact of the releases are not yet known.



Prosopis juliflora (Sw.) DC.

Native : Central and South America and Mexico

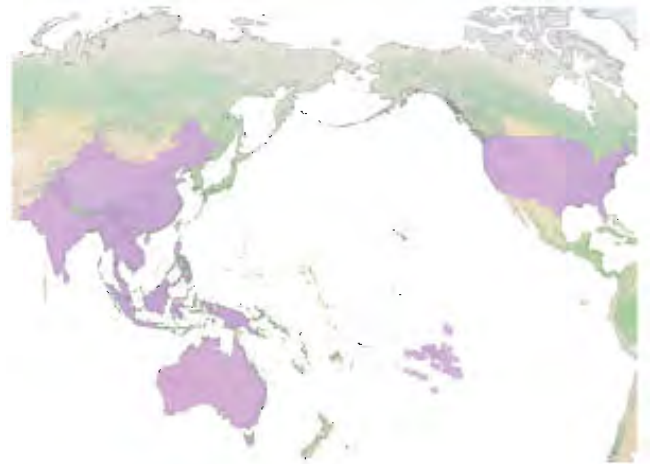
- Family** : Fabaceae
- Synonyms** : *Acacia cumanensis* Willd.
A. juliflora (Sw.) Willd.
Mimosa juliflora Sw.
- Common names** : Algarroba, ironwood
mesquite, vilayati babul

Prosopis juliflora is a multipurpose tree used for timber, fuelwood, charcoal, animal feed, human food, medicinal purposes and also for reclamation of wastelands and sand dunes. The species is tough, resilient and adaptable to all frost-free climatic regions. It has been introduced and cultivated in many countries but turned invasive eventually. Animals favor the pods and a large percentage of the seeds remain viable after passing through the animal's digestive tract. Dissemination of seeds through cattle dung is one of the major pathways for invasion.

Description : Small trees, to 12 m tall, armed with stipular spines. Bark thick, brown to black, shallowly fissured. Leaves compound, dark green, alternate, bipinnate, with 1-3 pairs of pinnae, rachis 1 - 8 cm long, prolonged beyond the last pinnae as a soft bristle; leaflets in 10 - 20 pairs, 0.7 - 1.7 x 0.2 - 0.3 cm, entire, oblong, obtuse, sometimes mucronate, stipules spiny, to 1 cm in length, in pairs. Inflorescence of pedunculate spikes, dense, axillary, 4 - 8.5 cm long; peduncle 0.6 - 1.2 cm long. Flowers greenish-yellow, sweet scented, spike-like, pedicel ca. 1 mm. Fruit a pod, pedicellate, 16-23 x 1-1.5 cm, straight to semi-circular, with one to several segments, light yellow, glabrous; pedicel ca. 5-7 mm long, constricted between the seeds. Seeds 10 - 30, dark brown, hard and ovoid with a mucilaginous endosperm surrounding the embryo.

Habitat : The habitats include abandoned agricultural lands, wastelands, degraded lands, deserts and grasslands. The tree is capable of growing on sandy and rocky areas, on medium- to fine-textured soils in semi-arid and arid regions, on saline soils, acid to alkaline soils and in seasonally waterlogged areas where other tree species have failed. The tree can grow well at 14 to 34° C in areas with annual rainfall of 50 to 1,200 mm and at altitudes up to 1,500 metres.

Threat and damage : The tree grows gregariously in its preferred habitats, forming dense, impenetrable



Distribution : Australia, Bangladesh, Brunei, Cambodia, China, French Polynesia, India, Indonesia, Lao PDR, Malaysia, Myanmar, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, United States, Viet Nam.

thickets. Thickets of *Prosopis* can be found in grazing lands, croplands and along river courses, which alarms pastoralists, farmers and conservationists. There is concern about the impact of the tree on the biodiversity of native plants and on the amount of water in dryland streams. The carrying capacity of



many habitats has been seriously reduced due to the spread of *Prosopis*. The tree can dry out the soil and compete with grasses for water, especially in dry areas. The pollen of the species may cause allergic reactions such as rhinitis, bronchial asthma and hypersensitivity to pneumonitis. *Prosopis* poisoning may induce a permanent impairment of the ability to digest cellulose.

Uses : In several parts of India, farmers find it more profitable to allow the growth and colonization of *Prosopis* on their drylands, compared to cultivating cereals and millets. Its wood is well known for its high calorific value, slow burning properties and for the capacity to hold heat well. The trees are allowed to grow for a few years and are then converted to

charcoal, thus contributing significantly to the socio-economic situation in the region. Apart from providing a means to contribute to farmers' livelihoods, *Prosopis* also meets their demands for fuelwood and fodder.

Management : Thinning and pruning of seedlings to less dense spacings. Winter burning has been used to control young trees. Basal bark application of the herbicide triclopyr ester at 5 percent solution in diesel oil is effective. Application of tebuthiuron is also reported to be effective. Seed-feeding bruchid beetles viz., *Neltumius arizonensis* Schaeffer, *Algarobius prosopis* Le Conte and *A. bottimeri* Kingsolver, have been introduced from North America and released in South Africa for biological control.



Psidium cattleianum Afzel. ex Sabine

Native : Brazil and Uruguay

- Family** : Myrtaceae
Synonyms : *Eugenia ferruginea* Sieber ex C. Presl
E. oxygona Koidz., *E. urceolata* Cordem.
Common names : Cattle guava, cherry guava,
Chinese guava, strawberry guava

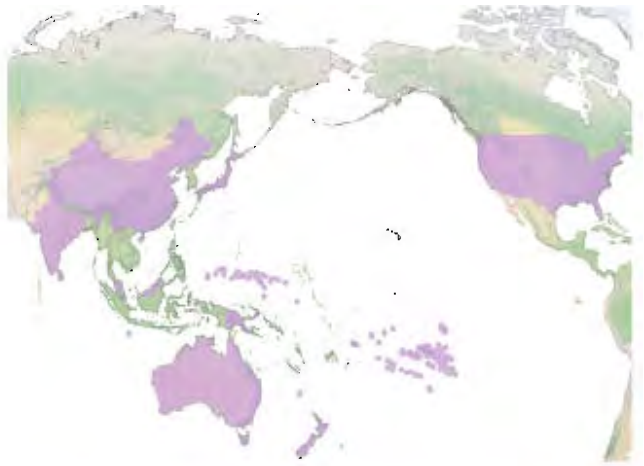
Psidium cattleianum is cultivated in many parts of the world for its delicious fruits. But, it can invade a variety of habitats, form dense thickets and suppress growth of native flora. It has caused devastating effects on native plants in Mauritius and Hawaii, where it invaded natural forests. The feral pigs, which feed on the fruits, act as dispersal agents of seeds. The plant is ranked among the top 100 of the world's worst invaders in the Global Invasive Species Database.

Description : Trees, to 8 m tall, bark grey to reddish-brown, peeling off; young branches terete, pubescent. Leaves opposite, simple, aromatic, glabrous, elliptic to oblong, to 8 x 4 cm. Flowers to 2.5 cm across, solitary, axillary, white. Fruit a berry, globose, 3 - 6 cm across, red to purplish, glossy, smooth, flesh whitish, sweet. Seeds numerous.

Habitat : Common in submontane rain forests, planted forests, coastlands, grasslands, riparian zones, disturbed areas and wetlands. It prefers full sun but is also shade-tolerant. The plant can grow up to 1,500 metres altitude but it grows most abundantly below 800 m. Fruit development depends on availability of adequate water.

Threat and damage : *Psidium* can alter the structure and quality of the understorey of native forest habitats by invading and outcompeting native plants and establishing monotypic thickets. Mats of feeder roots on the soil surface, large amounts of litter and the allelopathic properties of the litter suppress the growth of native seedlings. The plant acts as a major host of the Caribbean fruit fly, *Anastrepha suspense* Loew, which occasionally infests commercial citrus crops. The production of copious amounts of fruits helps to sustain high populations of vertebrates such as pigs and monkeys, which often damage native plants outside the *Psidium cattleianum* fruiting season.

Uses : The wood is used for making poles. Fruits, which have an agreeable sweet flavour, are used for making jellies, jams, custards and drinks.



Distribution : Australia, China, Christmas Island, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, India, Japan, Kiribati, Malaysia, Nauru, New Caledonia, New Zealand, Norfolk Island, Palau, Papua New Guinea, Samoa, Sri Lanka, United States.

Management : Pull or dig out small plants. Foliar, frill and cut surface applications of triclopyr, dicamba and 2,4-D are effective. Undiluted picloram is highly effective for cut stump treatment. Cutting and painting stumps with metasulferon-methyl are also effective. Four insect species were reported to cause heavy damage to *P. cattleianum*. Of these, a leaf gall insect viz., *Tectococcus ovatus* Hempel is reported to be a promising biocontrol agent.



Psidium guajava L.

Native : Tropical and subtropical America

Family : Myrtaceae

Synonyms : *Guaiaava pyrigormis* Gaertn.
G. pumila (Vahl) Kuntze

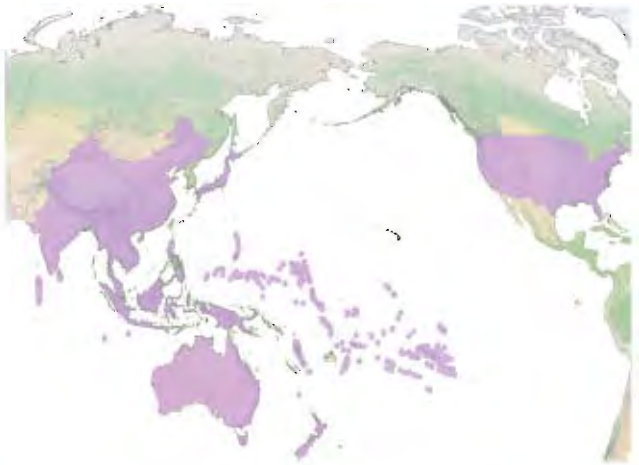
Common names : Guava, lemon guava, common guava

Psidium guajava was introduced to most tropical and subtropical regions worldwide for its edible fruit. It often escaped from cultivated areas and became invasive, affecting diverse habitats. Pastures and fields are over-run and the native plants displaced by guava by forming monospecific stands. Honey bees (*Apis mellifera* L.) are the chief pollinators. The seeds are dispersed by fruit-eating birds, monkeys, rats and feral pigs. Flowers and fruits are produced year round and seeds remain viable up to a year. A healthy tree will have a life span of 30 to 40 years.

Description : Trees, to 10 m tall, bark grey, smooth, peeling in strips, branchlets angular, pubescent. Leaves simple, opposite, lamina oblong to elliptic, 6-12 x 3.5-6 cm, leathery, abaxially pubescent, adaxially slightly rough, secondary veins 12 - 15 pairs, usually impressed, reticulate veins obvious, base rounded, apex acute to obtuse; petiole to 0.5 cm. Flowers solitary or to 3 in cymes, white, 1-1.4 cm across, hypanthium campanulate, ca. 5 mm, pubescent. Fruit a berry, globose, ovoid or pyriform, 3 - 8 cm, with persistent calyx lobes at the apex, flesh white or yellow; placenta reddish, well developed, fleshy. Seeds many.

Habitat : The plant is common in abandoned fields, disturbed areas, agricultural fields and natural forests. It can grow on a wide range of soil conditions (pH range of 4.5-9.4), withstand drought but is sensitive to frost. The plant is moderately intolerant to shade and can survive the competition of weeds and grass. It can grow up to 2,300 metres above sea level.

Threat and damage : The adaptability of guava to various habitats and soil conditions makes it a serious weedy tree in many tropical areas, competing successfully with crop plants.



Distribution : American Samoa, Australia, Bangladesh, Bhutan, Brunei, Cambodia, China, Christmas Island, Coco (Keeling) Islands, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Hong Kong S.A.R., India, Indonesia, Japan, Kiribati, Lao PDR, Malaysia, Maldives, Marshall Islands, Myanmar, Nauru, Nepal, New Caledonia, New Zealand, Niue, Norfolk Island, Northern Mariana Islands, Palau, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Thailand, Tonga, Tuvalu, United States, Vanuatu, Viet Nam, Wallis and Futuna Islands.



Uses : Guava fruit contains large amounts of vitamins A and C. Uncooked guavas are usually sliced and used in salads or desserts. The fruit can be stewed, canned or made into guava paste and cheese. The wood is used in carpentry and turnery, also as fuelwood and as a source of charcoal. The leaves and bark contains high amount of tannin. They are used to treat diarrhoea and common colds. The tree serves as shade or shelter for livestock and is also used for erosion control.

Management : Burning, manual cutting and bulldozing. Foliar applications of triclopyr, dicamba and 2,4-D and cut surface application of concentrates of these herbicides are useful. Basal bark treatment using triclopyr ester and 2,4-D ester are also effective. In Hawaii, goats and sheep graze on guava, which controls its growth.



Pteridium aquilinum (L.) Kuhn

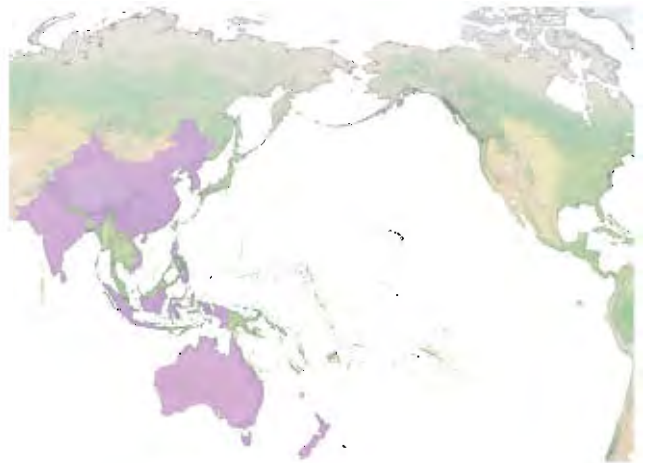
Native : Africa, Asia, Europe and North America

- Family** : Dennstaedtiaceae
- Synonyms** : *Pteridium esculentum* (Forst.) Nakai
P. revolutum (Bl.) Nakai
- Common names** : Bracken, bracken fern, brake,
northern bracken fern

Bracken is a cosmopolitan weed that is a major threat to biodiversity and livestock and human health. The rhizomes are the main carbohydrate storage organs and their ability to sprout from small sections of the rhizome impacts ecosystems. It is one of the few ferns that can germinate in the dark. The plant produces bitter-tasting sesquiterpenes, tannins and hydrogen cyanide when crushed. The water near a bracken-covered area contains carcinogens that are toxic to human health. The plant is used in folk medicine in different countries. The dispersal of the rhizome occurs through movement of soil and spores are dispersed by wind. The spores may be viable for up to ten years. The main mode of reproduction is vegetative.

Description : Perennial gregarious fern with well-branched, creeping, underground rhizomes. Young fronds produce extrafloral nectaries. Fronds large, triangular, 3-pinnate, 60-170 x 30-100 cm, with long, thick stipes. The ultimate segments numerous, woolly to smooth on the lower surface. Sporangium aggregated into sori on the underside of the frond. Clusters of spore cases densely line the in-rolled edges of sporophyll leaves. A single frond can produce up to 30 million spores and this will be greater in plants growing in open habitats.

Habitat : The plant is abundant at elevations below 3200 metres. It can tolerate different types of soil except heavily waterlogged soils. It can also tolerate pH between 3 and 8. The young shoots are sensitive to frost and trampling by large mammals. The growth of the plant is favoured by fire and soil acidity. It grows in shaded and unshaded habitats but grows best in more open areas. In North America, it occurs in dry to wet forest margins and openings. The plant is usually common near wastelands, riverbanks, woodlands and cliffs. In Central Cameroon, it is found near forest-savannah boundaries in association with *Chromolaena odorata*. In Western Europe, the shoots of the fern turn copper brown during the dormant season and the fronds gradually break up during late winter.



Distribution : Australia, Bhutan, China, Democratic People's Republic of Korea, Fiji, India, Indonesia, New Zealand, Norfolk Island, Pakistan, Philippines, Republic of Korea, Sri Lanka, Viet Nam.

Threat and damage : The plant can replace native vegetation and affect land productivity and biodiversity. It is difficult to control because of its ability to sprout from the extensive network of rhizomes. In the United Kingdom, it is a grassland and forestry weed where it expands its range to uplands. The plant is poisonous to livestock and humans. It can produce simple phenolic acids that diminish grazing areas and have fungicidal properties. It is also a fire-adapted species and promotes fire by producing a highly flammable layer of dried fronds every autumn.

Uses : The young shoots are diuretic and vermifuge. A tea made from the roots is used in the treatment of stomach cramps, chest pain, internal bleeding and



diarrhoea. In New Zealand, the carbohydrate-rich rhizome and belowground parts are considered delicious food by the Maori people who also use fire as an aid for hunting, which promotes regrowth of the plant. In early spring, the young leaves and tender leaf stalks are cooked as a vegetable, even though they contain carcinogens. It is also used as fuel and for thatching, bedding and compost and the ashes after burning are used as potash. It is a good indicator of seral forest communities in Oregon, United States.

Management : Frequent liming and fertilizer application are useful for controlling *Pteridium* in upland regions. Cutting it once or twice a year is also an effective measure for control. In Bulgaria, the use of glyphosate has been effective and the herbicide reduces carbohydrate reserves of the rhizome. In Tasmania, metasulfuron methyl and glyphosate are used to manage *Pteridium*. Two defoliating moths, *Panotina angularis* Hampson and *Conservula cinisigna* de Joannis and an unidentified eriophyid mite are host specific and merit testing as biocontrol agents.

