Asia-Pacific Forest Invasive Species Network

Invasive alien plants in the forests of Asia and the Pacific

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Invasive alien plants in the forests of Asia and the Pacific

K. V. Sankaran
T. A. Suresh

Kerala Forest Research Institute
Kerala, India

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For copies, write to :

Patrick B. Durst
Senior Forestry Officer
FAO Regional Office for Asia and the Pacific
39 Phra Atit Road
Bangkok 10200
Thailand

Tel: (66-2) 697 4000
Fax: (66-2) 697 4445
E-mail: patrick.durst@fao.org

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Cover photographs : Invasive alien plants in the forests of Asia and the Pacific. Right – *Hedychium gardnerianum;* left top - *Antigonon leptopus*, bottom - *Miconia calvescens*

Preface

The impacts of invasive species are mostly irreversible. This demands awareness of the threats they pose, preventive measures to thwart new invasions and control of those species that have already invaded our ecosystems. The impacts of invasive species can be social, economic and environmental. Indigenous species are highly vulnerable because their growth and survival are inhibited by invasives. This is especially true in the case of plants. The first step in managing invasive alien plants is to recognize them – those that have stealthily entered our ecosystems and those that have the potential to do so at an opportune time. This book serves to address these issues.

It is important to realize that invasions are a continuous process and not an isolated or single event. Such uninterrupted invasions help a species to expand its gene pool and build up viable populations. Hence, it is important to identify the pathways of invasions and develop strategies to contain them. The contents of this volume provide information on the current distribution of invasive alien plants in the Asia-Pacific region which can assist countries to investigate current and prospective pathways of invasions and plan ahead.

The Asia-Pacific region is characterized by countries with diverse climatic regimes, topography, forest types and governance structures. Awareness of biological invasions and preparedness to handle them vary greatly across these countries. While some countries have excellent quarantine regulations and tools for forest health surveillance, the ability to respond rapidly to a new invasion and techniques to manage established invasive species have yet to be developed properly in others. One of the main goals of the Asia-Pacific Forest Invasive Species Network (APFISN) is to open up communication channels across the Asia-Pacific region so that the problem of invasion, impending threats, impacts of invasions and options for management are shared to address these critical issues proactively.

This comprehensive compilation is not an end in itself but a significant step forward in the fight to protect vulnerable ecosystems from invasive alien plants. It will serve as a benchmark for researchers when new threats arise that must be documented and contained immediately.

Hiroyuki Konuma
Assistant Director-General and
Regional Representative for Asia and the Pacific
Food and Agriculture Organization of the United Nations

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Contents

Introduction

Biological invasions are dynamic and often fast enough to evade efforts at ongoing documentation. Species entry into databases on invasions depends on how fast an invasion is recognized, assessed and reported. This seldom occurs at the same pace across countries and continents. However, compilation of the available information, verification of its authenticity and publishing remain the first stage of documenting new invasions. This process needs to be strengthened and reiterated as frequently as possible to catch up with the plethora of invasions happening in this era of increased movement of people and goods across the globe.

This book drew its primary list of invasive alien plants in the forests of the Asia-Pacific region from the Global Invasive Species Database. Information on habit, habitat, threat and damage caused, uses and methods of management were either collected/generated by the authors or compiled from authentic web sites, research papers, books and proceedings of workshops. Geographic distribution was based on the GRIN taxonomy database and Web sites of the European and Mediterranean Plant Protection Organization and the Pacific Island Ecosystems at Risk (PIER). The accuracy of the nomenclature was checked with the web sites of the United States Department of Agriculture, the International Plant Name Index (IPNI) and the *Plant book* by D.J. Mabberley. Distribution maps were prepared at the Asia-Pacific Forest Invasive Species Network (APFISN) Secretariat at the Kerala Forest Research Institute (KFRI) using Arc GIS (9.0) software. The synonyms of the species names were adapted from www.plantlist.com. Author citations for insects and fungi follow www.ces.csiro.au and www.indexfungorum.org and/or www.mycobank.org, respectively. The synthesis of information on invasive plants from nearly 33 countries would not have been possible without the support of the APFISN. The National Coordinators of the Network in different countries were instrumental in preparing invasive species checklists which greatly helped this process.

In the complex procedure of ensuring authenticity of the information collected and limiting the literature search to early 2012, it is possible that a few of the new invasive plants in the forests of the region have not found a place in this book.

The contents of the book are arranged as follows: the botanical name of the invasive plant in question, its native range, most frequently used synonyms and common names, a general description of the plant, habitat, threat and damage, distribution in the Asia-Pacific region (also shown in a map in pink colour), uses as provided in the literature and options for management. Additional synonyms of each plant are provided in the index to synonyms. Although information on chemical control of individual plants is provided wherever available, it does not imply that the authors or the APFISN authenticate/support such practices. Hence, use of herbicides in any instance will be at the user's risk. The authors propose that the use of chemical methods of control should be avoided as far as possible. Likewise, invasive plants should not be used for medicinal or any other purpose unless authentic information on their non-toxicity is gathered.

This book has certain specific functions. The first is raising awareness among quarantine officials of potential invasions and strengthening vigilance to thwart new introductions. Secondly, it should help foresters to quickly detect invasive alien plants in forest habitats to facilitate eradication/management. Thirdly, it should assist researchers in identifying knowledge gaps on invasive plants in their countries and help to fill them. In these contexts, the primary goal is to kick-start the process of evolving invasive weed management protocols for the region and open communication channels across the Asia-Pacific region on the movement of invasive alien plants. It would be gratifying if the book meets all or at least some of these major objectives.

Habitat, description and distribution of invasive alien plants

Abelmoschus moschatus Medik.

Native : Southeast Asia

Family : Malvaceae

Synonyms : *Abelmoschus betulifolia* Wall.
Hibiscus abelmoschus L.

Common names : Musk-mallow, musk okra, tropical jewel hibiscus

Abelmoschus moschatus is cultivated throughout Asia for its beautiful flowers and high medicinal value. It has become invasive in certain countries in the Asia-Pacific region interfering with the growth of native plants. Propagation of the plant is through seeds, tubers and stem cuttings.

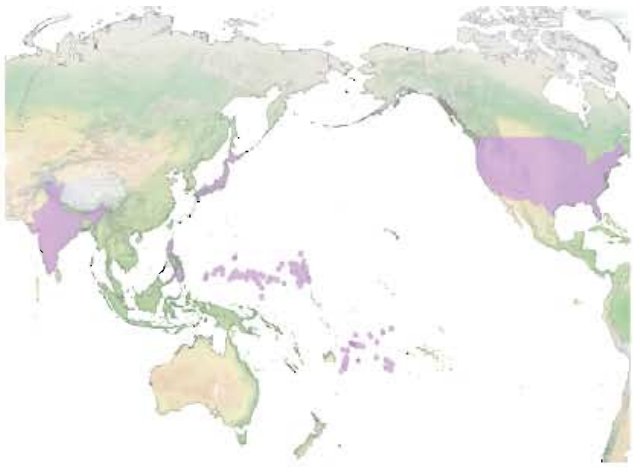
Description : Annual or biennial subshrubs, to 2 m tall, plants uniformly yellow hispid or setose. Stipules filiform, 0.7 - 0.8 cm. Leaves simple, palmately lobed, 6 - 15 cm across, variable in form, lobes lanceolate to triangular; lamina on distal part of stem narrower, both surfaces sparsely hirsute, base cordate, margin irregularly serrate; petiole 7-15 cm, sometimes densely pubescent along adaxial groove. Flowers solitary, axillary, yellow or water melon pink; pedicel 2 -3 cm, hirsute, epicalyx lobes 6-10, linear to narrowly oblong, 8-13 × 1.5-2 mm, incurved, appressed to capsule. Fruit a capsule, oblong, 5 - 6 cm, apex acute, uniformly yellow hirsute. Seeds black-brown, reniform, concentrically ribbed, glandular-reticulate, with a musk odour.

Habitat : *A. moschatus* is common in agricultural areas, natural and planted forests, open and disturbed areas, roadsides, urban areas and wetlands. In the tropics, it grows up to an altitude of 1 650 metres above sea level. It is frost-sensitive and cannot withstand temperature above 45°C. The plant can thrive in fertile loamy and sandy loamy soil.

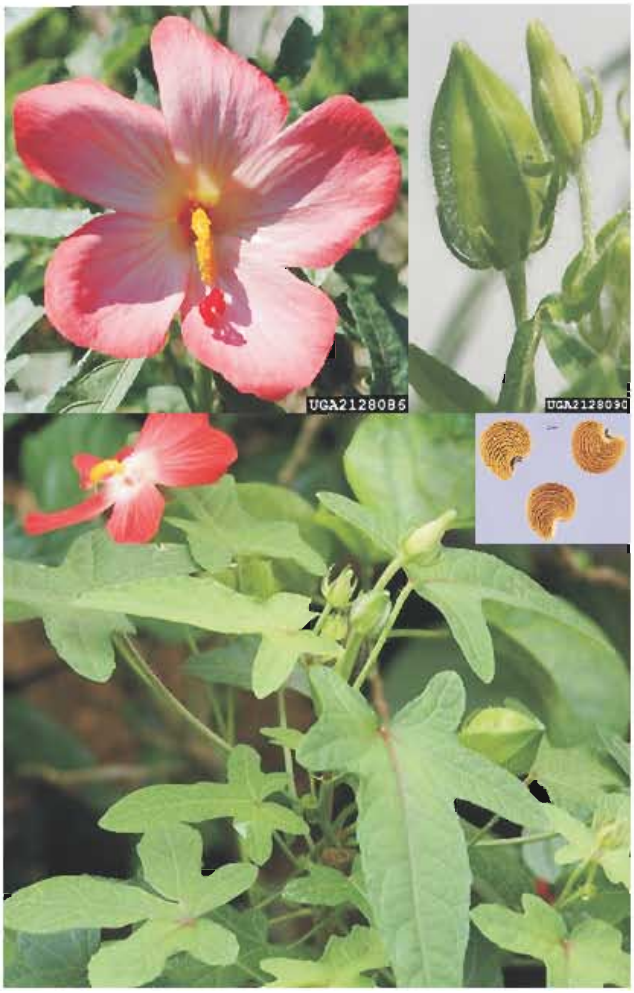
Threat and damage : *A. moschatus* threatens growth and survival of native flora and fauna. It also acts as a host for *Dysdercus cingulatus* Fabr., a pest of cotton.

Uses : The plant is usually used as an ornamental. Ambrette oil, extracted from the seeds, is used in the perfume industry and in aromatherapy. In India, the aromatic seeds are also used to treat various ailments such as stomatitis, urinary discharge, gonorrhea and pruritus. Extracts of fruits and upper parts of the plant show insecticidal activity.

Management : No methods are currently known.



Distribution : American Samoa, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, India, Japan, Marshall Islands, New Caledonia, Niue, Northern Mariana Islands, Palau, Philippines, Samoa, Tonga, United States, Wallis and Futuna Islands.



Acacia farnesiana (L.) Willd.

Native : Tropical and subtropical America

Family : Fabaceae

Synonyms : *Acacia smallii* Isley
Mimosa farnesiana L.

Common names : Needle bush, sweet acacia

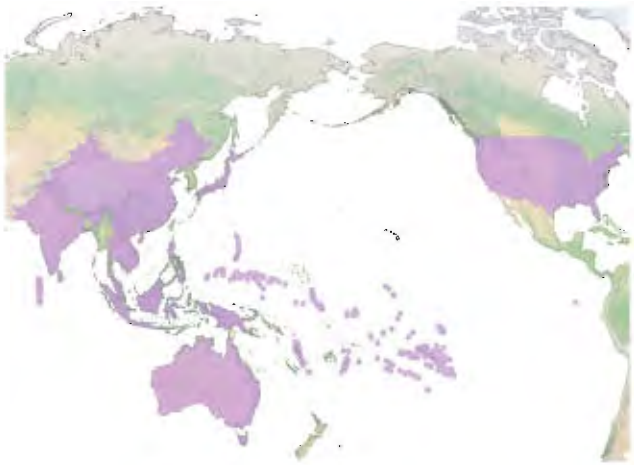
Acacia farnesiana has been introduced to several countries for its bark, gum, seed and wood. It is sometimes planted as an ornamental or to minimize soil erosion. The plant prefers dry habitats and can form thick impenetrable thickets. It has become invasive in most countries wherever introduced. Its life span is 10-50 years. The plant is a prolific seed producer and the seeds germinate when the soil is disturbed. Seeds are dispersed by ungulates.

Description : Shrubs or small trees, to 9 m tall, deciduous; branchlets slightly zigzag, marked with grey or pale brown dots, young parts glabrescent; spines stipular, in pairs, straight, 0. 7 - 1.8 cm long. Leaves compound, rachis 1.2 - 5.5 cm long, pilose; petiole usually with a small gland about the middle, pinnae, 2 - 8 pairs, 1.2 - 2.5 cm long, leaflets 10 - 20 pairs, sessile, to 0.5 x 0.15 cm wide, linear, oblong, acute, base oblique, glabrous to sub-glabrous. Flowers orange in color, very fragrant, grouped in 50 or more globose heads, 1.5-2.0 cm in diameter, grouped by 2-3, or isolated on an 8-35 mm long slender, hairy-downy peduncle. Fruit a green pod, turning black or dark brown at maturity, thick, indehiscent, cylindrical, 4 - 8 cm long and 0.8 - 1.5 cm in diameter, each contains 12-14 seeds. Seeds transversally set in pods, ovoid, compressed.

Habitat : The plant can thrive in dry areas and on loamy or sandy soils up to an elevation of 2, 000 metres. It can tolerate a wide variety of environmental conditions. It is fire-resistant but cannot tolerate frost.

Threat and damage : The plant can replace native vegetation by its fast growth and by forming dense thorny thickets.

Uses : The barks and pods are good sources of tannin and are used for dyeing leather. Fragrant essential oil from the flower is used in the perfume industry. Trees add nitrogen and organic material to the soil and are often used to reduce soil erosion. It is also used in folk medicine for styptic purposes or as an astringent.



Distribution : Australia, Bhutan, Cambodia, China, Cook Islands, Fiji, French Polynesia, Guam, India, Indonesia, Japan, Kiribati, Lao PDR, Malaysia, Maldives, Nauru, New Caledonia, Niue, Northern Mariana Islands, Pakistan, Palau, Papua New Guinea, Philippines, Solomon Islands, Sri Lanka, Thailand, United States, Vanuatu, Viet Nam.

Management : Grubbing controls spread of the species. The plant is susceptible to translocated herbicides like picloram, metasulfuron methyl, glyphosate and triclopyr and residual herbicides like tebuthiuron and hexazinon. Biological control is unknown.

Acacia mearnsii De Wild.

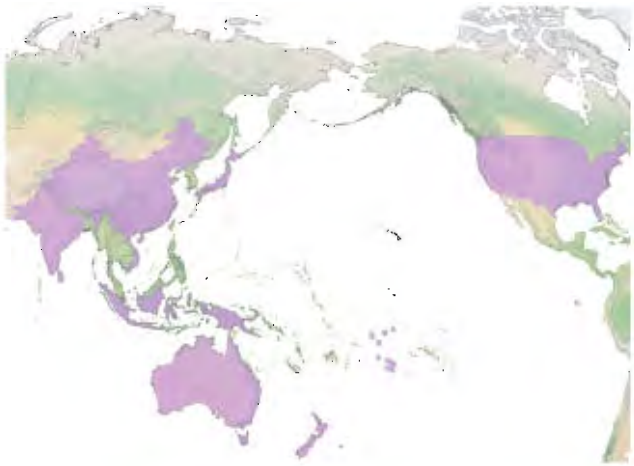
Native : South and East Australia

Family : Fabaceae

Synonyms : *Acacia decurrens* var. *mollis* Lindl.
Racosperma mearnsii (De Wild.) Pedley

Common names : Black wattle, tan wattle

Acacia mearnsii is a fast growing nitrogen-fixing tree of the highland tropics widely used for various purposes including soil erosion control and soil improvement. The species has been introduced to 25 countries in tropical and subtropical regions worldwide. Multipurpose use and the ability to grow in a broad spectrum of soils and sites may have prompted such wide introduction. Black wattle is in the top 100 of the world's worst invaders. It is reported to displace native species and affect biodiversity in introduced regions.

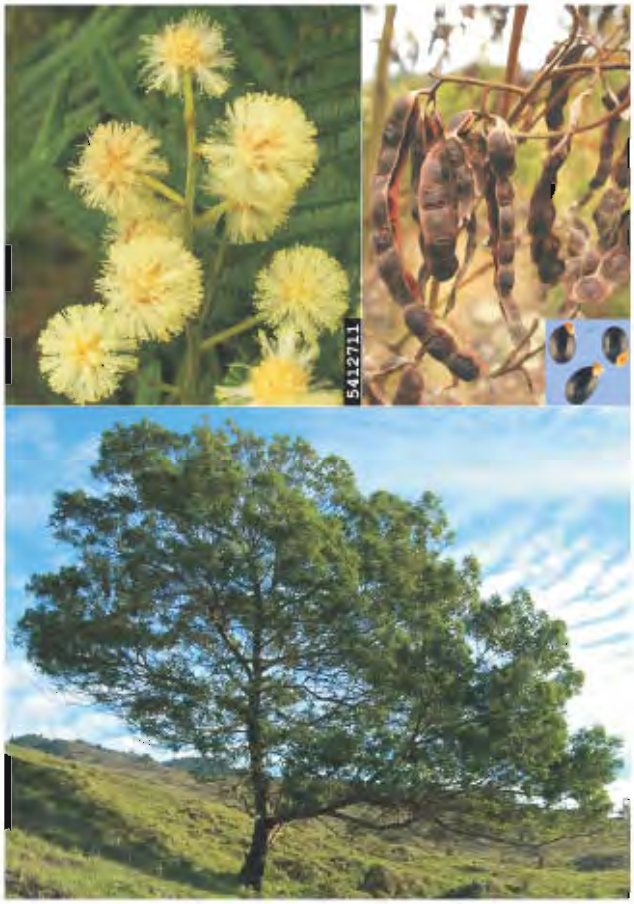


Distribution : Australia, China, Cook Islands, India, Indonesia, Japan, New Zealand, Pakistan, Papua New Guinea, Sri Lanka, United States, Viet Nam.

Description : Small trees, to 20 m tall, branchlets angular, greyish white tomentose. Leaves compound, pinnae 30 - 60 pairs, 0.5 - 5.5 cm, glands at rachis of pinna insertion and elsewhere. Leaflets, 10 - 68 pairs, dense, linear; young leaves golden tomentose. Flowers in globose heads, yellowish or white, 6 - 7 mm in diameter, arranged in axillary racemes or terminal panicles; peduncles 7-1 mm; rachis yellow, densely tomentose. Fruit black, oblong, flat, slightly constricted between seeds, pubescent. Seeds 1-14, longitudinal in the pod, bean like, elliptical, flattened, blackish, 4 mm long, caruncle conspicuous.

Habitat : The tree grows in disturbed, mesic habitats in a wide range of climates including warm temperate dry climates and moist tropical climates. Black wattle is an aggressive colonizer due to its hardy nature and high competitive ability.

Threat and damage : The invasiveness of the tree is partly due to its ability to produce many long-lived seeds (viable up to 50 years) that are distributed by birds, cattle and wild animals, especially rodents. The seeds are triggered to germinate *en masse* by wildfire. Black wattle competes and replaces indigenous vegetation including grass communities and reduces the carrying capacity of the land. It also increases rainfall interception and transpiration causing a decrease in stream flow. Commercial plantations and invasive stands of black wattle in South Africa resulted in loss of diversity, increased soil erosion and destabilization of riverbanks and reduced surface stream flow. In India, the species has virtually taken over the shola forests (southern montane wet temperate forests) and grasslands in the southwest region significantly reducing the diversity of indigenous flora.



Uses : Tannin extracted from the tree is used for making soft leather and other products like adhesives and resins. The wood is a good building material and the wood chips are used for making paper. It is also a good source of charcoal.

Management : Seedlings can be pulled out by hand but care must be taken to remove roots as the plant can re-sprout from roots. Treatment of the saplings with herbicides such as triclopyr, glyphosate, dicamba and picloram at the cut surface is effective. In large trees, herbicides may have to be applied through drilled holes. Basal bark and stump bark treatments with herbicides are also effective. The introduction of a seed-eating weevil, *Melanterius maculatus* Lea, which caused reduction in seed numbers has been effective in controlling the spread of the tree in South Africa. A Cecidomyiid gall midge, *Dasineura* sp., has also been identified as a promising biocontrol agent as it forms flower galls and prevents fruit production without affecting vegetative growth. In an innovative initiative, the South African wattle industry is supporting a breeding programme to produce sterile black wattle trees (triploid trees) through genetic manipulation using gamma rays.

Acacia melanoxylon R.Br.

Native : Australia

Family : Fabaceae

Synonyms : *Acacia arcuata* Spreng.
A. melanoxylon var. *arcuata* (Spreng.) Ser.

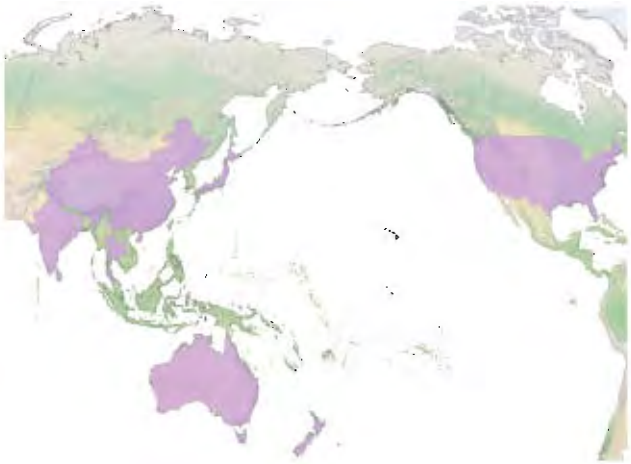
Common names : Australian blackwood, blackwood, blackwood acacia

Acacia melanoxylon is a rapidly growing nitrogen-fixing tree that can grow in a wide range of soils and climatic conditions. The seed has high longevity and germinability and the plant can regenerate from stem and root suckers. The species was introduced to many countries for forestry purposes, but turned out to be invasive in the long term. It is listed as a noxious weed in South Africa, where it invades and displaces natural vegetation. Control of its invasion in forest plantations and farmlands involves huge investment. The tree can survive for more than 200 years. Profuse vegetative growth can occur from cut and damaged plants and the tree can reproduce prolifically after wildfire. It produces many seeds but they remain dormant until a disturbance occurs. The seed has large red funicles that are attractive to birds.

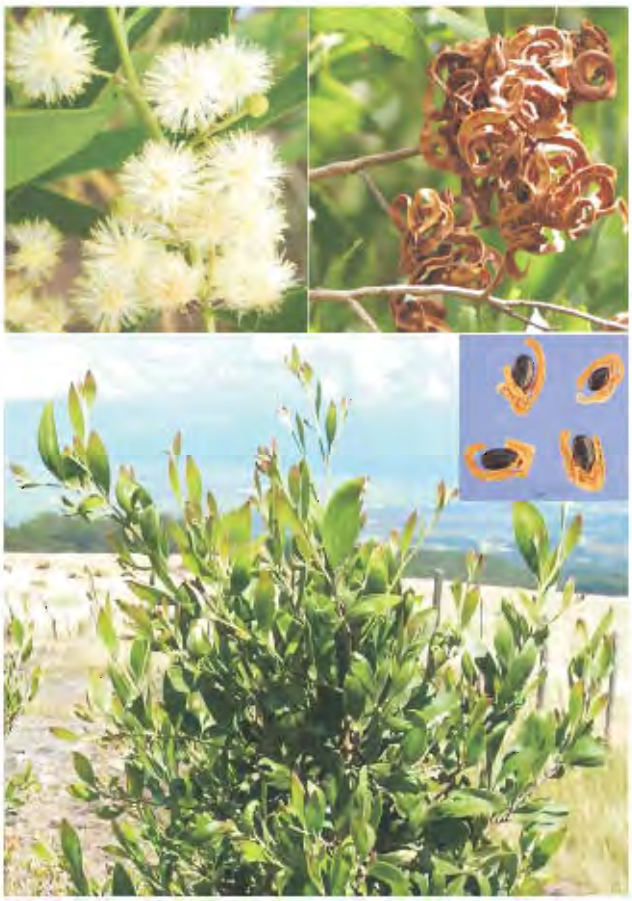
Description : Small to medium trees, to 30 m tall, bark greyish - black, deeply fissured and scaly. Phyllode oblanceolate to lanceolate, 6 -10 x 1.8 - 2.0 cm, one edge straight, the other curved, 3 - 6 parallel nerves, gland 4 mm in diameter at base. Inflorescence with 3 - 5 relatively large globular heads on short axillary racemes, 2.5 -5 cm long, each head with 30 - 50 flowers, whitish to very pale yellow. Fruit a legume, flat, thin, 6-10 x 0.4-0.6 cm, mid-brown when ripe, either irregularly twisted or openly coiled. Seeds black, oval, flat, 6 - 10, longitudinally in the pod, funicle pink or red, half-encircling the seed in a double fold on each side, aril small.

Habitat : Grows in agricultural areas, coastal land, disturbed areas, natural forests, planted forests and in *Melaleuca* swamps. The tree occurs mainly in cool and warm humid climatic zones. It can tolerate drought, poor drainage, salty soils and cold winds. In its native Australia, it grows at an elevation of up to 2, 700 metres. Best growth of the tree is observed in cooler, moist and slightly acidic fertile sites.

Threat and damage : *A. melanoxylon* replaces native vegetation, alters nutrient cycling, uses higher amounts of water than native species and cuts off light to the other plants. Windfalls obstruct water flow along invaded streams and rivers. It is reported to cause allergic contact dermatitis and bronchial asthma in wood workers.



Distribution : Australia, Bhutan, China, India, Japan, New Caledonia, New Zealand, Sri Lanka, Thailand, United States.



Uses : Used as an ornamental. The timber of the tree is extensively used for making cabinets and for other purposes such as panelling, inlays, boat building and making stringed instruments. Although most timber on the market is harvested from natural stands in Tasmania, the species is now grown as a plantation species in Southern Australia. It has good pulpwood potential and is especially good for making fine paper.

Management : The tree is difficult to control because of its fast growth and vigorous regrowth from root suckers and regeneration from seed. Mechanical control of the species involves pulling or digging out small seedlings along with the root system before flowering and fruiting. Biocontrol is being attempted in South Africa using *Melanterius acacia* Lea, a seed-feeding weevil.

Adenanthera pavonina L.

Native : Southeast China and India

Family : Fabaceae

Synonyms : *Adenanthera gersenii* Scheff.
A. polita Miq.

Common names : Coral bean tree, false wiliwili, red bead tree, red sandalwood tree

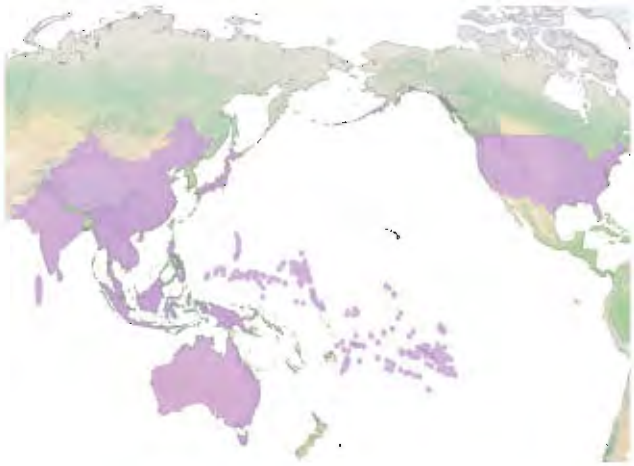
Adenanthera pavonina, a nitrogen-fixing tree, has long been considered an important tree in Southeast Asia and the Pacific islands. It is cultivated in home gardens and planted in forest clearings and village common lands as an ornamental tree and is now naturalized in many countries.

Description : Trees, to 15 m tall, deciduous, bark pale pinkish-grey. Leaves compound, bipinnate, to 24 cm long, rachis 10 - 40 cm long; petiole approximately 5-10 cm long, pinnae opposite, 2-6 pairs, 7-12 cm long; leaflets 7 - 15 pairs, sessile, alternate, obovate, 1.5 - 4.0 x 0.5 - 2.5 cm, margins slightly curved backwards, base unequal. Inflorescence of axillary and terminal raceme, flower pedicellate, pedicel 3.5 - 4 cm long. Flowers pale yellow, fragrant. Fruit a pod, 15 - 22 x 2 cm with slight constrictions between seeds, dark brown, turns black upon ripening, leathery, curve and twist upon dehiscence. Seeds 8 - 12, hard coated, 7.5 - 9 mm in diameter, lens shaped, vivid scarlet, adhere to pod.

Habitat : Common throughout the lowland tropics in coastland, natural forests and ruderal/disturbed lands up to 400 metres above sea level. Optimal plant growth occurs in areas with precipitation ranging from 3, 000 to 5, 000 mm. The tree prefers neutral to slightly acidic soils but will grow on a variety of soils in moist and seasonally moist tropical climates.

Threat and damage : The species invades intact, undisturbed hardwood forests as well as disturbed sites and can quickly establish large colonies. It is susceptible to breakage in high winds, with most damage occurring in the crown. However, rapid resprouting and growth can occur.

Uses : Cultivated as an ornamental. Also used for food, medicine, fodder, furniture, ornaments and fuelwood. A red dye from the wood is used by certain people to mark religious symbols on their foreheads. The young leaves can be cooked and eaten. Mature leaves are mulched to fertilize crops. The raw seeds are toxic and may cause intoxication. Cooked seed is



Distribution : American Samoa, Australia, Brunei, Cambodia, China, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, India, Indonesia, Japan, Kiribati, Lao PDR, Malaysia, Maldives, Marshall Islands, Myanmar, Nauru, New Caledonia, Niue, Northern Mariana Islands, Pakistan, Palau, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Thailand, Tonga, United States, Viet Nam, Wallis and Futuna Islands.

rich in oil and proteins and easily digested by both humans and livestock. It was used in ancient India for weighing gold. The ground seeds can produce oil, which can be used as an industrial lubricant.

Management : Hand-pulling or digging out seedlings and saplings. Stem injection with glyphosate or basal bark treatment with triclopyr gives good control. Biological control is unknown.

Ageratina adenophora (Spreng.) R.M. King & H. Rob.

Native : Mexico

Family : Asteraceae

Synonyms : *Eupatorium adenophora* Spreng.

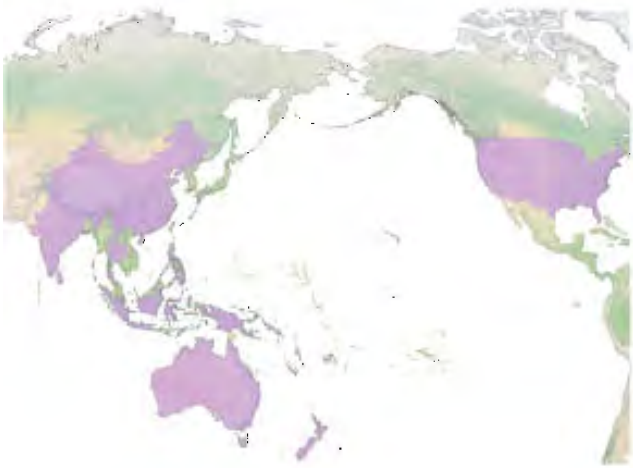
Common names : Cat weed, crofton weed, hemp agrimony

Ageratina adenophora is a troublesome weed in Australia and many countries have listed it under the noxious weed category. Seeds are a contaminant in many traded products. The enormous number of seeds produced and rampant vegetative growth defeat all control measures. The allelochemicals released by the plant affect native biodiversity. A mature plant produces around 100,000 seeds per year. The plant reproduces vegetatively from short, pale-yellow rootstocks. The seeds are dispersed through wind and machinery movement.

Description : Perennial herbs, 1 - 3 m tall, stem often purple, terete, erect, glandular puberulent. Leaves simple, opposite, ovate - deltoid, 7 - 10 x 4 - 7 cm, apex acuminate, base obtuse to very broadly cuneate or truncate, three-nerved, sparsely pilose on both surfaces, margins crenate, median ones larger, upper leaves gradually smaller towards inflorescence; petiole 4 - 5 cm long. Inflorescence of loose compound corymbs, heads 6.5 mm in diameter, peduncle 8 - 14 mm long, densely pubescent, involucre cylindric, 3 - 4 mm long, florets 70-80, white; receptacle glabrous, areolate. Fruit an achene, reddish-brown or blackish-brown, 1.5 mm long, five-angular, glabrous, pappus of 8 - 10 bristles, 3.5 mm long.

Habitat : *A. adenophora* is a weed found in high altitude areas along roadsides, abandoned areas and forest margins. The plant can grow on any type of soil and can tolerate some salinity and infertility.

Threat and damage : *A. adenophora* reduces crop yield and hampers movement of livestock and machinery. It is a noxious and poisonous weed and farmers are often forced to abandon their landholdings due to its invasion. The plant is unpalatable to livestock and



Distribution : Australia, Bhutan, China, Fiji, India, Indonesia, Nepal, New Zealand, Papua New Guinea, Philippines, Sri Lanka, Thailand, United States.

feeding leads to mortality. It displaces the native flora by competition and by forming monospecific stands.

Uses : An oil from the plant has antifungal and insecticidal qualities and it also used for the production of xylitol. Tribal communities use the plant as a smoking torch for honey harvesting.

Management : Slashing followed by ploughing and then sowing desirable pasture species is effective. Applications of glyphosate, dicamba + picloram + triclopyr at the time of active growth are also useful. Attempts at biocontrol have been unsuccessful.

Ageratum conyzoides L.

Native : Central and South America and the West Indies

Family : Asteraceae

Synonyms : *Ageratum ciliare* Lour., *A. conycoides* L. *A. obtusifolium* Lam.

Common names : Ageratum, billy goat-weed, blue top, goatweed, mother brinkly

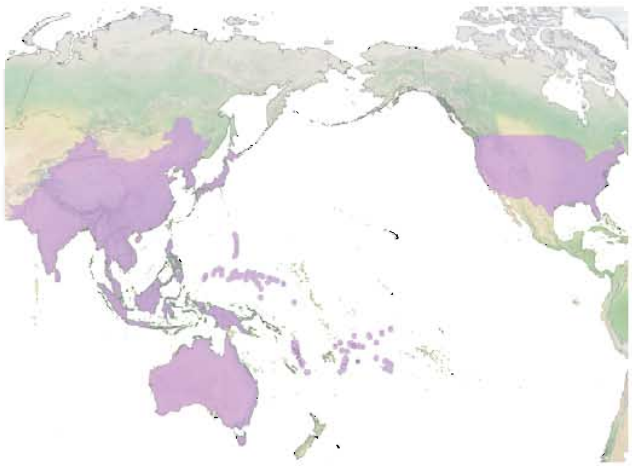
Ageratum conyzoides is a rampant weed that is widely distributed in the tropics and subtropics. It can significantly reduce total biomass, change community structure and reduce diversity of native plant species. A plant may produce about 40, 000 seeds and in some areas 50 percent of the seeds will germinate shortly after shedding. Seeds are positively photoblasitic and viability is often lost within 12 months. They are dispersed by wind and water.

Description : Annual erect subshrubs, 0.5 - 1 m tall, stem sparsely to densely villous. Leaves simple, blades ovate to elliptic-oblong, 2 - 8 × 1 - 5 cm, margins toothed, abaxial faces sparsely pilose and gland-dotted; peduncles minutely puberulent and sparsely to densely pilose, eglandular. Flowers usually blue to lavender, sometimes with a white head. Fruit is an achene, sparsely strigoso-hispidulous, pappi usually with scales, 0.5-3 mm, sometimes with tapering setae.

Habitat : The weed exhibits high morphological variation and easily adapts to different ecological conditions. It grows in a variety of soil types such as sandy, loamy and clayey, and tolerates a range of pH levels. However, it thrives best in rich and moist mineral soils. Ageratum normally occurs as a weed in frequently disturbed areas such as vegetable gardens, agricultural areas, pastures (especially when overgrazed), plantations and orchards and along roadsides. The plant is shade-tolerant but dry and less fertile conditions do not suit its growth.

Threat and damage : Ageratum is a weed in crop fields and hosts many diseases such as tomato leaf curl. It is allelopathic and can displace native vegetation such as grasses and medicinal herbs and create homogenous monospecific stands. The weed is allergic to humans and is a health hazard. It is also a threat to forest communities and the dynamics of natural ecosystem processes.

Uses : Ageratum contains many bioactive compounds



Distribution : American Samoa, Australia, Bangladesh, Bhutan, Brunei, Cambodia, China, Cook Islands, Democratic People's Republic of Korea, 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, Niue, Northern Mariana Islands, Pakistan, Palau, Papua New Guinea, Philippines, Republic of Korea, Samoa, Singapore, Solomon Islands, Sri Lanka, Thailand, Tonga, United States, Vanuatu, Viet Nam, Wallis and Futuna Islands.

including flavonoids, alkaloids, cumarins, essential oils, chromenes, benzofurans, terpenoids and tannins. It is widely used as medicine for pneumonia, diarrhoea, rheumatism, the common cold, ulcers and bleeding. The plant has also good insecticidal, nematocidal and bactericidal properties.

Management : Mulching, hand-weeding and chipping are successfully practiced. A variety of chemicals have been used to control ageratum, including diuron, atrazine, acifluorfen, ametryne, bromacil, 2,4-D, glyphosate, fluroxypyr, diquat and paraquat. Biological control is unknown.

Ageratum houstonianum Mill.

Native : Mexico, Central America and the West Indies

Family : Asteraceae

Synonyms : *Ageratum mexicanum* Sims
A. wendlandii Bailly

Common names : Ageratum, blue billy goat-weed, flossflower, Mexican ageratum

Ageratum houstonianum is a noxious weed in many countries and a threat to native biodiversity. The plant is also toxic to animals and humans. It is commonly grown as an ornamental plant.

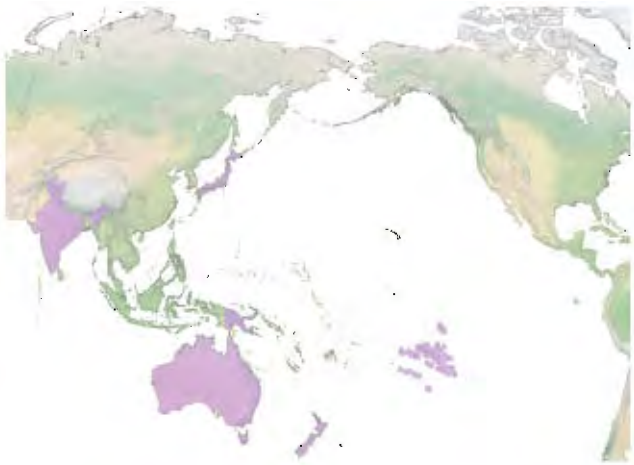
Description : Annual erect herbs, 0.5 - 1 m tall, branches purple-red, green or straw-coloured, white tomentose or thinly lanate. Leaves simple, opposite, broadly ovate or triangular-ovate, 2 - 6 x 1.5 - 3.5 cm, upper and axillary leaves smaller, tri-veined or inconspicuously 5 nerved, both surfaces sparsely or densely white pubescent, base cordate or truncate, margin crenate-serrate, apex acute; petiole 0.7 - 3 cm, petiole of upper leaves and axillary branches usually spreading, white, long tomentose. Inflorescence of corymbose, 2 - 4 cm in diameter, pale lavender to blue, purplish; peduncle densely pubescent or powdery pubescent, capitula 5 - many; involucre campanulate, 6 -7 mm in diameter, phyllaries 2 or 3 seriate, narrowly lanceolate, 4 - 5 mm, abaxially glandular pubescent. Fruit an achene, black, five-angled, 1.5 - 1.7 mm, pappus of five short free scales, scales oblong-lanceolate, 2-3 mm, apex aristate-acuminate, sometimes truncate, 0.1 - 1.5 mm.

Habitat: The plant can tolerate disturbed habitats and is commonly seen near roadsides, riversides, upland slopes and in open areas, gardens, forest fringes, wastelands and pastures. It is distributed at elevations of 40 - 1, 300 metres above sea level.

Threat and damage : The plant threatens flora and fauna of invaded ecosystems. It is considered as a widespread environmental weed out of its natural area. The plant contains an alkaloid, pyrrolizidine, which causes liver lesions and tumor if ingested by grazing animals.

Uses : Crushing or drying the plants or flowers in an oil or alcohol base work as a mosquito repellent. In Cameroon, an essential oil from the flowers is used against ticks that transmit diseases in humans.

Management : Hand-pulling, cutting down and covering with a thick layer of mulch are not very effective. However, application of glyphosate is effective in bringing down the population. Biological control is unknown.



Distribution : Australia, Fiji, French Polynesia, India, Japan, New Caledonia, New Zealand, Papua New Guinea.

Alliaria petiolata (M. Bieb.) Cavara & Grande

Native : Northwest Africa, West and Central Asia

Family : Brassicaceae

Synonyms : *Alliaria alliacea* (Salisb.) Britten & Rendle
A. fuchsii Rupr., *A. alliaria* Scop.

Common names : Garlic mustard plant, garlic root, garlic wort, hedge garlic

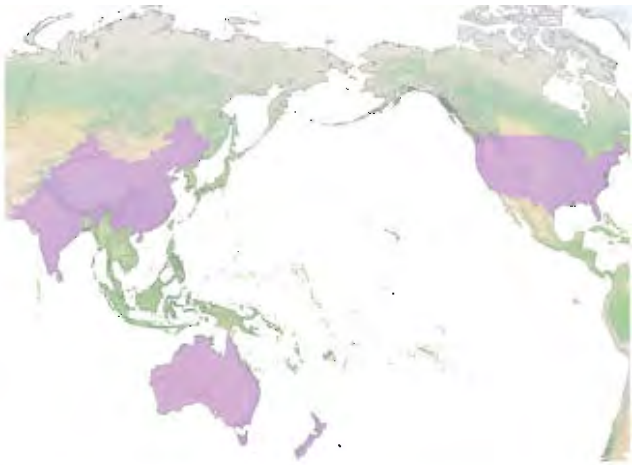
Alliaria petiolata, an invasive herb, can outcompete native herbaceous vegetation and cause serious impact to the invaded ecosystems. The plant acts as a population sink for certain butterflies. It is self- as well as insect-pollinated. The seed is dispersed through humans, animals and water.

Description : Biennial erect herbs, to 1 m tall, stem simple or branched distally, glabrous or pilose basally. Basal leaves of petiole 3 - 16 cm, blade reniform or cordate, surfaces glabrous or pilose, cauline leaves of petiole shorter than basal, blade ovate, cordate or deltate, base cordate or truncate, apex acute, margins acutely to obtusely toothed. Flowers white, in terminal racemes or short axillary racemes, petals four, 4 - 8 x 2 - 3 mm. Fruits divaricate, ascending, subtorulose, quadrangular or subterete. Pods, 4 - 5.5 cm long. Seeds many, dark brown or black, ca. 3 x 1 mm, narrowly oblong, 10 - 20 seeds in each fruit.

Habitat : The plant prefers shade but it can grow in unshaded areas as well. It grows well in moist, nutrient-rich, sandy and loamy soil. It is commonly found in natural and planted forests, riparian zones and urban areas.

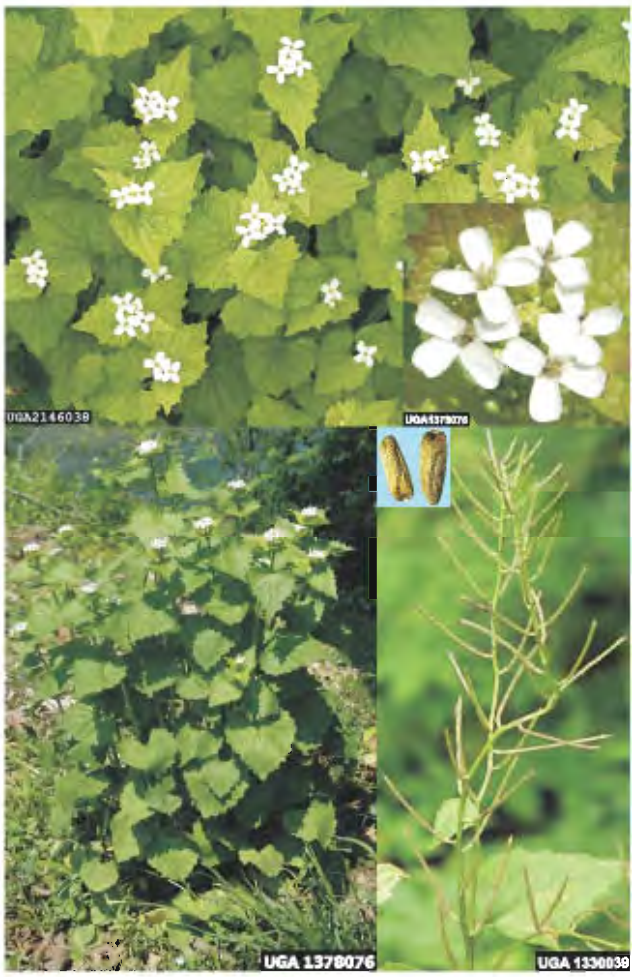
Threat and damage : *Alliaria* can accumulate a soil seed bank and populations of the plant establish rapidly after disturbance. It can invade and dominate the understorey of natural forests posing a threat to native flora and fauna. The plant is also known to interfere with the oviposition of certain butterflies. Once established, *Alliaria* competes successfully with native flora for light, moisture, nutrients and space.

Uses : The garlic-smelling young leaves are used as a flavouring agent while cooking. The leaves and stems are anti-asthmatic, antiscorbutic, antiseptic, deobstruent, diaphoretic, vermifuge and vulnerary. The leaves are taken internally to promote sweating and to treat bronchitis, asthma and eczema. The roots are chopped up into small pieces and heated in oil to make an ointment to rub on the chest to relieve bronchitis.



Distribution : Australia, China, India, Nepal, New Zealand, Pakistan, Sri Lanka, United States.

Management : Cutting the plants at the ground level is recommended. Application of glyphosate to dormant rosettes in late autumn or early spring is effective. Biological control is unknown.



Ambrosia artemisiifolia L.

Native : North America

Family : Asteraceae

Synonyms : *Ambrosia glandulosa* Scheele
A. monophylla (Walter) Rydb.

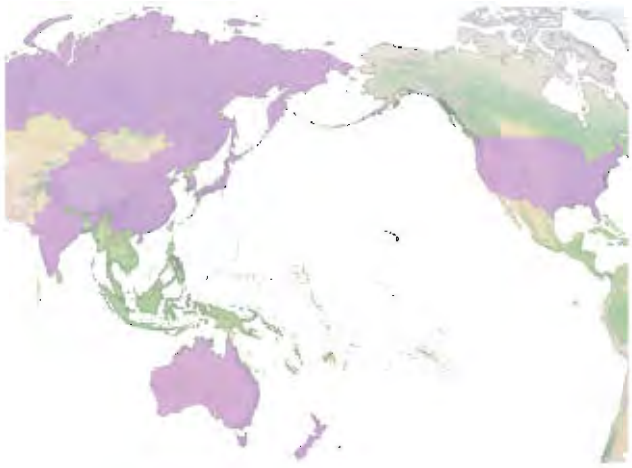
Common names : Annual ragweed, bastard wormwood, blackweed, carrot-weed

Ambrosia artemisiifolia establishes easily in human-impacted and disturbed areas in high abundance. Although not a competitively aggressive species, it has become an invasive species in Europe, parts of Asia and Australia, interfering with the growth of cultivated crops. The main impact of *Ambrosia* is the copious amount of pollen produced from male flowers to which people are allergic. Fruits are dispersed by birds, melting snow, waterways and strong winds. One plant may produce up to 100, 000 seeds which are viable for five to 14 years. Seeds are dispersed through exchanges of contaminated seedlots, forage and fodder. Germination occurs in the spring with only a portion of the seed bank germinating.

Description : Annual erect herbs, 1 - 2 m tall. Leaves opposite and alternate, blade deltate to lanceolate or elliptic, 1 or 2 pinnately-lobed, bases cuneate, ultimate margins entire or toothed, abaxial faces sparsely pilosulous to strigillose, adaxial faces strigillose, both gland-dotted. Flowers monoecious, male flowers green, small, 4 - 5 mm, with bractless flowers arranged in a terminal spike, often drooping, female flowers in the axils of the upper leaves, sessile, inconspicuous, in either small clusters or singly. Fruit, a woody achene resembling a crown, 3 - 4 x 1 - 2 mm, with 4-7 spine-like projections.

Habitat : Commonly found in ruderal or waste sites associated with frequent and extensive disturbance regimes resulting from human activities. The plant grows well on roadsides, along railway lines, gravel pits, construction sites, agricultural fields, waterways, urban areas and private gardens. It is a pioneer species that establishes after disturbance in early successional plant communities. *Ambrosia* prefers warm areas with nutrient-rich and slightly acidic soils.

Threat and damage : *Ambrosia* pollen is a seasonal aeroallergen in late summer to early autumn costing millions of dollars annually in health care costs and lost labour hours. In Europe and North America,



Distribution : Australia, China, India, Japan, New Zealand, Republic of Korea, Russian Federation, United States.

approximately 10-15 percent of the population is sensitive to the pollen that causes rhinitis,

oculorhinitis, asthma and dermatitis. The plant is a weed pest in agricultural crops like sunflower, sugar beet, maize and other cereal crops. It also displaces native vegetation in its introduced ranges especially after disturbance such as overgrazing, which put competitive pressures on the native flora. The plant competes strongly with crop plants for water and nutrients and can seriously reduce yields of cereals and other field crops. Its presence greatly reduces the fodder quality of meadows and taints dairy products if cattle feed on it.

Uses : An essential oil obtained from the tree has antibacterial and antifungal properties. Fruits are a food source for the bobwhite quail.

Management : Mowing, hand-pulling, tilling and burning are all physical options that can be employed to reduce the population. Among herbicides, dicamba and clopyralid and some triazines are effective. *Zygogramma suturalis* F., a chrysomelid beetle, has been released in the Russian Federation, China and Croatia as a biocontrol agent, but was only successful when *Ambrosia* populations were abundant and dense. A noctuid moth, *Tarachidia candefacta* Hübner and a stem-galling tortricid moth, *Epiblema strenuana* Walker, have both been released as biocontrol agents in the Russian Federation and China. Of these, *E. strenuana* has shown host-specificity to *Ambrosia* and experiences less predation compared to *Z. suturalis*.

Annona glabra L.

Native : Tropical America and West Africa

Family : Annonaceae

Synonyms : *Annona australis* A. St.-Hil.
A. chrysocarpa Lepr. ex Guill. & Perr.

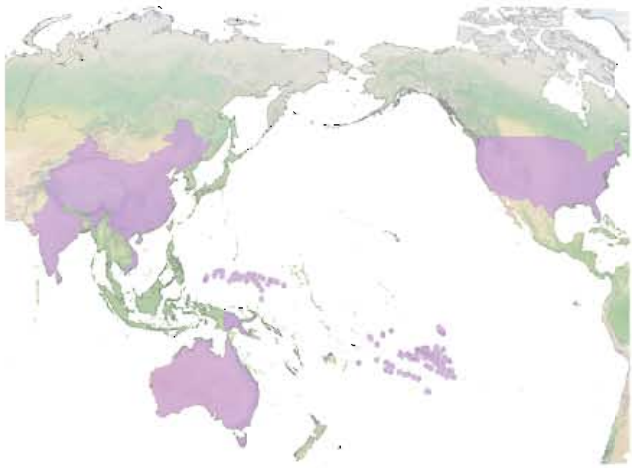
Common names : Alligator apple, cherimoyer, pond apple, swamp apple

Annona glabra is a highly invasive woody weed that threatens wetlands and riparian ecosystems of the moist tropics in particular. It can establish as a dense understorey that suppresses other plant growth leading to monocultures. The plant can tolerate heavy flooding and spend weeks at a time with its roots under water. It is very useful as a rootstock for other *Annona* species.

Description : Small trees, 10 - 12 m tall, branches horizontal. Leaves simple, blade ovate to elliptic, 5-15 × 6 cm, base broadly cuneate to rounded, apex acute to shortly acuminate, glabrous. Flowers axillary, solitary, thick and fleshy, peduncle stout, linear, club-shaped, to 2 cm, becoming enlarged; outer petals cream-white, ovate-cordate, adaxially concave, inner petals cream-white, inside base deep purple, oblong-ovate, base cupped, incurved-cuneate, 2 × 3 cm of outer petal corrugate. Fruit an aggregate of the berry, ovoid, round at apex, 7 - 8 cm in diameter, yellow to orange, smooth, pulp yellow. Seeds many, 12 - 15 x 8 - 10 mm, elliptic, black.

Habitat : *A. glabra* can behave as a freshwater or brackish water mangrove as it can survive root immersion at high tide and prolonged freshwater flooding. Seedlings require ample soil moisture and sunlight to survive. Such conditions can be expected only on riverbanks and in naturally open wetlands or disturbed wetlands and rain forests. It grows in swamps, tolerates salt water and cannot grow in dry soil. The hard seeds can remain viable for considerable periods in either fresh, brackish or sea water.

Threat and damage : The tree forms dense monotypic stands displacing native vegetation. Its tolerance of immersion in salt and freshwater enables the tree to invade melaleuca wetlands, where it forms a dense understorey preventing young melaleucas from developing. It grows in estuaries choking mangrove swamps, where the seedlings carpet the banks and prevent other species from germinating or thriving.



Distribution : Australia, China, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, India, New Caledonia, Niue, Palau, Papua New Guinea, Solomon Islands, Sri Lanka, United States, Viet Nam, Wallis and Futuna Islands.

Uses : Fruits are edible and can be made into jam, jellies and wine. The flesh of the fruit is sweetly scented but since it is strongly narcotic it is not very popular. The plant is a deterrent to the Giant African snail, *Achatina fulica* Bowdich and is usually used in nursery beds to prevent infestation.

Management : Trees and seeds are readily destroyed by fire and regular burning in areas that are tolerant to this practice is a successful management tool. Hand-pulling has been successful in ditches and drains. Cutting large trees and treating the stump with any of the common herbicides is effective. Stem injection with herbicides is recommended for aquatic areas Biological control is unknown.

Anredera cordifolia (Ten.) Steenis

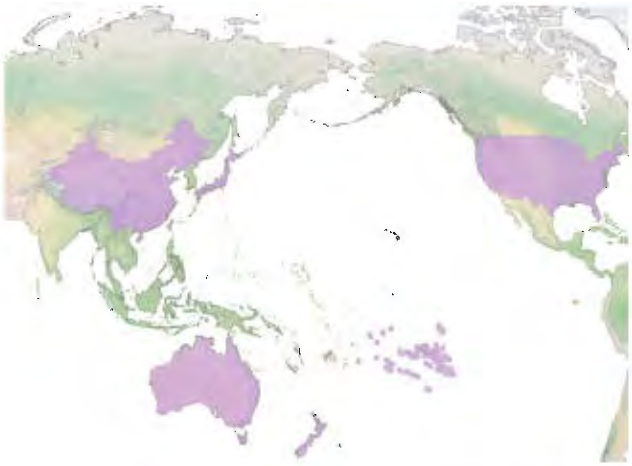
Native : South America

Family : Basellaceae

Synonyms : *Boussingaultia cordata* Spreng.
B. cordifolia Ten.

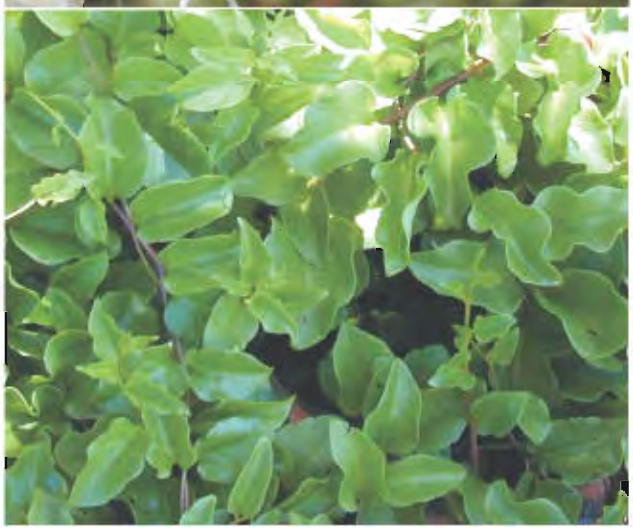
Common names : Bridal wreath, madeira vine, mignonette vine

Anredera cordifolia is a succulent climbing vine. The combination of fleshy leaves and thick aerial tubers makes it very heavy. It smothers trees and other vegetation and can easily break branches and bring down entire trees. The weed is notoriously difficult to control. Wart-like tubers are produced on aerial stems and are key to identifying the plant. It spreads through tubers, which detach very easily.



Distribution : Australia, China, Cook Islands, Fiji, French Polynesia, Japan, New Caledonia, New Zealand, Niue, United States.

Description : Climbers, stems often producing single or clustered axillary tubers. Leaves simple, petiole 6-12 mm, lamina ovate to orbicular, 2-10 × 1-7 cm, base of larger leaf blades proximal to inflorescences, cordate, base of small distal leaf blades tapering, apex obtuse to acute. Inflorescences racemes or in branched panicles of racemes, 10-35 cm long, fragrant; single bract subtending, pedicel triangular-lanceolate, 1-2 × 0.3-0.4 mm, paired bracts subtending, each flower persistent, triangular to obtuse, 0.6-1 × 0.5-0.6 mm, basally connate into cup. Flowers bisexual, usually functionally staminate, sepals basally adnate to petals, cream-white, ovate to elliptic, 1.2-2.3 × 1.1-2 mm, apex obtuse, petals basally connate, cream-white, ovate to elliptic, 2.1-3 × 1.4-2 mm, apex obtuse, spreading at anthesis. Utricles rarely producing viable seeds.



Habitat : In Australia, *A. cordifolia* invades riparian vegetation, edges of rain forests, tall open forests and damp sclerophyll forests. In New Zealand, it has become naturalized in wastelands, especially scrub-covered areas such as coastal gullies. The smothering habit of the weed makes it a nuisance especially for tropical Pacific Islands to the north where it commonly occurs in natural forests, planted forests and riparian zones. The plant prefers sandy, loamy and clayey well-drained soils. It can grow well in open and semi-shaded conditions.

Threat and damage : The plant proliferates readily from small vegetative parts and as a result is very hard to control. The aggressive vining nature of the plant helps it to smother desirable species. The growth rate

of the stem in warm and moist regions can exceed 1-6 metres per week in a growing season. Its sheer weight results in the breaking of branches of host trees, thereby reducing them to poles, and potentially causing collapse of the rain forest canopy. *Anredera* is not only a highly destructive species but also the most difficult to eradicate because it produces plenty of terrestrial, small to large aerial tubers (to 25 cm in diameter) on the stems, which grow into new plants.

Uses : It can be trained to twine up trellises, fences or rock walls for decoration or for screening. The raw root is crisp and pleasant when first put in the mouth, but soon degenerates into a mucilaginous mass. When well-baked, the root loses this quality and is quite pleasant to eat. The plant has anti-inflammatory, anti-ulcer and liver-protective effects. The flowers have a mignonette scent. Tubers are a source of food in South America.

Management : Physical control of *A. cordifolia* is not easy. Placing a plastic sheet below the plant before any manual control will help removal of all parts of the plant, especially aerial tubers. All parts of the vine must be removed, including underground tubers and vines to prevent resprouting. Spraying glyphosate or triclopyr on plants and tubers are reported as effective in controlling the plant. Scraping stems at staggered intervals and applying glyphosate is also an effective control method. Larger infestations can be controlled by cutting back top growth and spraying the remaining stems with metasulfuron methyl or picloram. An insect, *Plectonycha correntina* Lacordaire, is reported to be a promising biocontrol agent.

Antigonon leptopus Hook. & Arn.

Native : Mexico

Family : Polygonaceae

Synonyms : *Antigonon cordatum* M. Martens & Galeotti
A. platypus Hook. & Arn.

Common names : Chain-of-love, confederate vine, coral vine, Mexican creeper

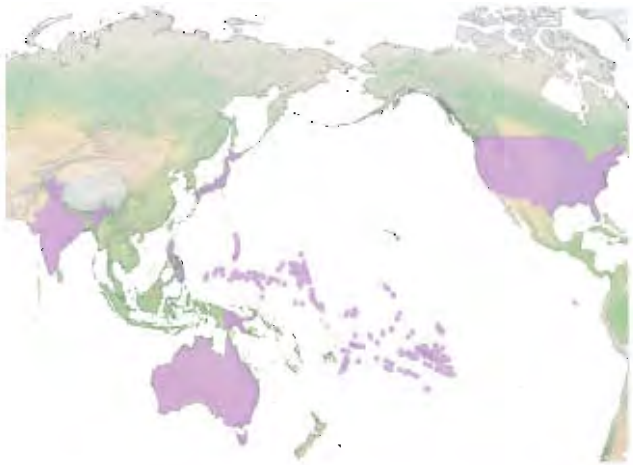
Antigonon leptopus is a smothering vine that invades disturbed areas and forest edges. It produces huge quantities of seeds, which are spread by water currents and animals that consume the fruits. The plant is invasive in several countries including India, the United States and some of the Pacific Islands. Vegetative reproduction is through root suckers, underground tubers and stem segments.

Description : Robust vine, perennial, spreading, stem angular. Leaves simple, 2.5 - 7.5 cm long, cordate - ovate, hastate -ovate or triangular, reticulately veined, acute to acuminate, lower ones much larger; petioles 0.6 - 1.5 cm long. Inflorescence paniculate, branches bearing flowers in clusters along the rachis, rachis tip tendrillate. Flowers bright pink or white, petals 4 - 10 x 2 - 6 mm. Fruit an achene, conical, sharply three-angled above, shining, 8 -12 x 4-7 mm, much exceeded by the veiny, persistent, enlarged perianth.

Habitat : Grows well on dry to moist soil in lowland areas with limestone soils. It tolerates drought by defoliation and regrows strongly after rain. The vine is common on roadsides, particularly on banks and cutting-faces, rain forest margins, banks of water courses and coastal sand dunes.

Threat and damage : Invades disturbed areas and forest edges, outcompeting native vines and understorey plants. Leaves dry out and drop during the dry season providing fuel for fires.

Uses : Ornamental. It is also used to cover fences or climb trellises with fresh green foliage and a splash of bright colour. The leaves are used in the Caribbean as poultices for boils and swellings. Tea from the leaves is used to treat hypertension, diabetes, flu and menstrual pains. The plant is preferred for urban planting because it tolerates air pollution, restricted space, inadequate sunshine and poor soil. This vigorous growing vine also does well in greenhouses where it adds an airy grace and periodic colour.



Distribution : American Samoa, Australia, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, India, Japan, Kiribati, Maldives, Marshall Islands, Nauru, New Caledonia, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Tonga, United States.

Management : Cutting alone is ineffective. Underground tubers must be removed or plants will resprout. Application of Garlon 4 can kill the foliage but the plant will regrow after a short span of time. Biological control is unknown.

Ardisia crenata Sims

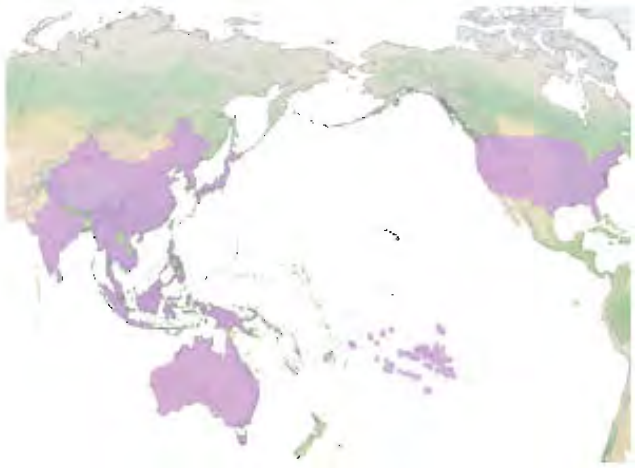
Native : Southeast Asia

Family : Myrsinaceae

Synonyms : *Ardisia crenulata* G. Lodd

Common names : Australian holly, Christmas berry, coral ardisia, coral berry tree

Ardisia crenata is an ornamental plant that has become highly invasive in mesic forests. The plant thrives well in productive, well-drained soils and the growth rate has been positively correlated with soil phosphorus levels. Eradication is effective before seed production. The fruits are mainly spread by birds. The plant is easily propagated by seeds or stem cuttings.



Distribution : Australia, Cambodia, China, Cook Islands, Democratic People's Republic of Korea, Fiji, French Polynesia, India, Indonesia, Japan, Malaysia, Myanmar, Papua New Guinea, Philippines, Republic of Korea, Samoa, Sri Lanka, Thailand, United States, Viet Nam.

Description : Shrubs, to 1.5 m tall, branchlets minutely reddish, glandular, papillate, terete. Leaves simple, petiole narrowly marginate, blade elliptic, narrowly lanceolate or oblanceolate, 7 - 21 × 2 - 4 cm, subcoriaceous, prominently punctate, base cuneate, margin subrevolute, crenate, or undulate, with large vascularized marginal nodules, apex acute or acuminate. Inflorescences terminal, umbellate or cymose on specialized, 2 or 3 leaved lateral branches, 4-16 cm. Flowers membranous, white or rarely pinkish, 7 - 12 mm in diameter; pedice l 7 - 12 mm long. Fruit a bright red, glabrous, one seeded drupe, up to 0.8 mm in diameter.

Habitat : Common in natural forests, planted forests and disturbed areas up to an elevation of 2, 400 metres. It prefers rich, well-drained moist soils for growth. Seeds can germinate in a range of soil pH from 4-10. It can resprout vigorously after cutting and fire.

Threat and damage : Invades the understorey of mesic forests and significantly reduces native species diversity. It can cut light to the understorey species and displace ground cover.

Uses : An ornamental that is cultivated in many countries. The root is anodyne, depurative and febrifuge. It is used to stimulate blood circulation.

Management : Hand-pulling of seedlings and saplings is effective. Spraying of glyphosate is effective on dense seedling populations. Larger trees are cut and the stumps are treated with herbicides. Basal bark application of triclopyr gives good results. Biological control is unknown.

Ardisia elliptica Thunb.

Native : South and East Asia

Family : Myrsinaceae

Synonyms : *Ardisia humilis* Vahl., *A. kotoensis* Hayata *A. littoralis* Andrews

Common names : Shoebutton ardisia

Ardisia elliptica is a shade-tolerant shrub. Its fast growth and attractive fruits made it a popular ornamental plant in the past. The species escaped from private and public gardens to invade natural forests. Due to high reproductive output and shade-tolerance, carpets of seedlings are usually formed underneath adult plants. High seed viability and seed consumption by both avian and mammalian frugivores lead to rapid spread of the species across landscapes. *Ardisia* is included in the top 100 of the world's worst invaders in the Global Invasive Species Database. Large adults can produce up to 400 fruits. Seedlings and juveniles can survive under very shady conditions for many years.

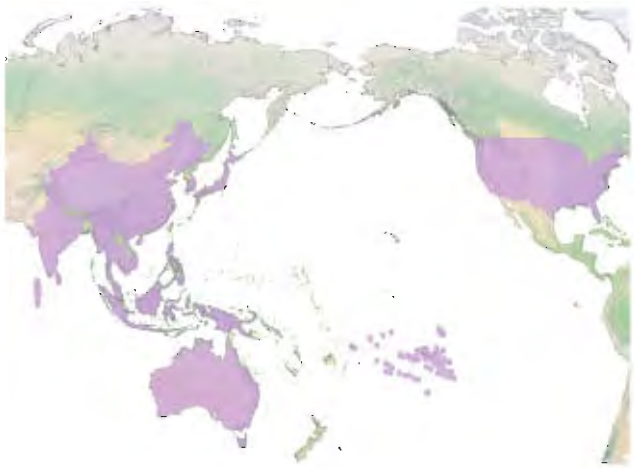
Description : Shrubs, to 6 m tall, branchlets angular, glabrous, conspicuously black punctate-lineate, longitudinally ridged. Leaves simple, petiole 5 - 10 mm, blade oblanceolate or obovate, 6 - 12 × 3 - 5 cm, subleathery, dull and densely punctate abaxially, especially along the margin; base cuneate, margin revolute, entire, apex obtuse or acute. Inflorescence axillary or subterminal on basally thickened lateral branches, subumbellate or umbellate. Flowers leathery, pink or white, 6 - 8 mm; pedicel 10 - 20 mm, densely white verruculose, punctate. Fruit a drupe, subglobose, red or purplish-black, ca. 8 mm in diameter, minutely punctate, fleshy, one seeded. Seeds spherical, about 5 mm in diameter.

Habitat : Usually found in wet forests and open areas. In Hawaii, the tree is naturalized in disturbed *hala* forest, mesic forest and lower portions of rain forests. In Australia, it is cultivated in gardens and has naturalized in the last five to ten years. Also, isolated specimens of the species exist in riparian vegetation within areas of dry rain forest associated with the monsoon belt of Northern Australia.

Threat and damage : The weed readily forms dense monotypic stands that exclude native species.

Uses : Ornamental.

Management : Hand-pulling of seedlings is effective.



Distribution : Australia, Cambodia, China, Cook Islands, French Polynesia, India, Indonesia, Japan, Malaysia, Maldives, Myanmar, Papua New Guinea, Philippines, Republic of Korea, Samoa, Sri Lanka, Thailand, United States, Viet Nam.

Basal application of a triclopyr mixed with oil diluents is necessary to control old growth. Tebuthiuron and glyphosate are also effective in controlling spread. Biological control is unknown.

Argemone mexicana L.

Native : Mexico and the West Indies

Family : Papaveraceae

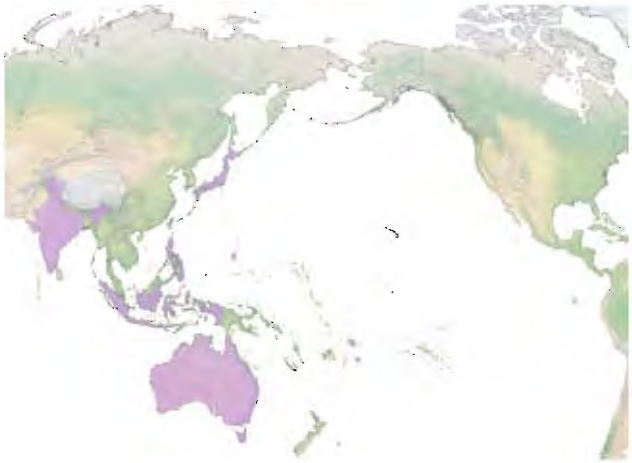
Synonyms : *Argemone mucronata* Dum. Cours. ex Steud.
A. spinosa Gaterau

Common names : Bermuda thistle, Mexican poppy, Mexican thistle, prickly poppy

Argemone mexicana is a major weed that poses a serious threat to agricultural and vegetable crops in the tropics and temperate regions. As a result of its infestation, several instances of seed and oil poisoning and death have been reported from India, Fiji, South Africa and other countries. Its prickliness is a nuisance to subsistence farmers. *A. mexicana* forma *leiocarpa* is a variety found in West Africa which has few or no prickles on the stem, leaves and capsules. In Southern India, the plant flowers and produces fruits throughout the year. The dispersal of seeds occurs through surface water, mud adhering to farm machinery and through humans and livestock. Each plant produces 60 - 90 capsules and 300 - 400 seeds are found in a single capsule.

Description : Annual herbs or subshrubs, stem branched, with sparse explanate fulvous spines. Leaves simple, alternate, pinnately-lobed, basal leaves dense, glaucous with blue-green markings on veins, paler abaxially, broadly oblanceolate or obovate to elliptic, 5 - 25 x 2.5 - 8 cm, glabrous, sparsely with sharp spines on veins, base cuneate, margin pinnatipartite, apex acute; lobes with undulate teeth, apically spiny, cauline leaves alternate, similar to basal leaves, upper leaves smaller and sessile, often subamplexicaul; petiole 5 -10 mm. Flowers solitary, sometimes in a few flowered cyme, yellow or orange, 1.7 - 3 cm, subsessile. Fruit a capsule, oblong to broadly elliptic, 2.5 - 5 × 1.5 - 3 cm, sparsely fulvous and spiny, 4 - 6 valved, apically dehiscing, Seeds numerous, spherical, 1.5 - 2 mm in diameter, netted, brownish-black.

Habitat : *A. mexicana* can adapt to a wide range of habitats and soil types. It is common in agricultural areas, wastelands, pastures, gardens, along roadsides, on stony edges, vacant land and near forests. In Tanzania, the plant occurs from sea level to 2, 900 metres elevation. It grows well in nitrogen-deficient sites. It cannot survive in the shade but can tolerate drought.



Distribution : Australia, Fiji, Guam, India, Indonesia, Japan, New Caledonia, Niue, Philippines, Samoa.

Threat and damage : *A. mexicana* is a principal weed of many agricultural crops in Australia and India. The plant produces allelochemicals that affect the growth of vegetables. Grazing animals can be poisoned through hay or chaff. In poultry, ingestion of seeds affects egg production and often leads to death. The adulteration of edible oil with Mexican poppy plant oil has resulted in epidemic dropsy in humans. The plant is also considered as an allergen. Because of the similarity between seeds of the plant and seeds of *Brassica nigra* (mustard), the former is widely used for adulteration purposes. As a result, several instances of seed and oil poisoning and death have been reported. The plant contains several alkaloids, including berberine and protopine in the herb, and sanguinarine and dihydrosanguinarine in the seed oil, which display significant cytotoxic and antimicrobial properties.

Uses : The plant is used to expel torn placenta and help cleanse the body after parturition. Dried and powdered plants are recommended as green manure. The seed oil is used as an illuminant, lubricant, in soap making and for protection from termites. The narcotic effects of the herb and its juice and flowers are well known. In Mali, *Argemone* is used to treat malaria.

Management : Mechanical methods to control the plant include pulling, hoeing and cutting the flowering stalks while in early bloom. Cultivation of the ground destroys the weed if continued for a sufficient time to stir all dormant seeds into growth. Chemicals like glyphosate, triasulfuron and 2,4-D amine are used to control Mexican poppy. Biological control is unknown.

Arundo donax L.

Native : Asia and Africa

Family : Poaceae

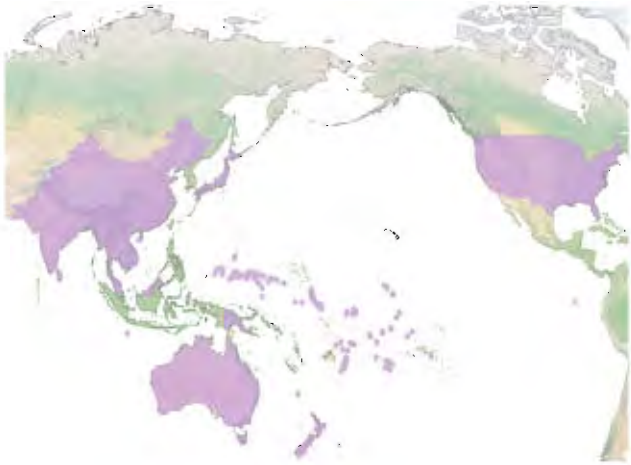
Synonyms : *Aira bengalensis* (Retz.) J.F. Gmel.
Amphidonax bengalensis (Retz.) Nees ex Steud.
Arundo versicolor Mill.

Common names : Arundo grass, bamboo reed, cow cane, donax cane, giant reed cane

Arundo donax is among the top 100 of the world's worst invaders. Once established, it forms dense, homogenous stands at the expense of native plant species, altering the habitat of the local wildlife. It is also a fire and flood hazard. Ancient Egyptians wrapped their dead in the leaves of *Arundo* grass. The canes which contain silica, perhaps the reason for their durability, have been used to make fishing rods, walking sticks and paper. The plant rarely produces seeds and sexual reproduction is unknown. Asexual reproduction is through lateral extension and flow dislodgement of rhizomes.

Description : Robust, perennial, shrubby grass with thick knotty rhizome; culms very stout, erect, 2 - 6 m tall, 2- 3 cm in diameter, unbranched or with bamboo-like clusters of slender branches from nodes. Leaf sheath longer than internodes, usually glabrous except long pilose at the mouth; blade 30 - 60 × 2 - 5 cm, margins scabrous, tapering to a slender filiform apex, ligule 0.7 - 1.5 mm. Inflorescence paniculate, 30 - 60 cm, dense, usually purplish; branches 10 - 25 cm, ascending; spikelets densely clustered, 10-15 mm, florets 2 - 5, rachilla glabrous; glumes hyaline and brownish or purplish, 11 - 13 mm long, palea pale-whitish, membranous, 5 - 10 mm long. Caryopsis elongate, 1- 1.5 mm long.

Habitat : The grass easily invades riparian zones of low-gradient rivers, wetlands, coastal marshlands and along ditches. Once established, it can form huge clones, sometimes covering hundreds of hectares. It is common in agricultural areas, coastlands, deserts, natural forests, planted forests, grasslands, riparian zones, ruderal/disturbed areas, scrub/shrublands, roadsides and urban areas and in moist areas such as along ditches and riverbanks. The plant is highly inflammable and resprouts quickly after burning. Fires help transform communities of native plants into solid stands of *A. donax*.



Distribution : Australia, Bangladesh, Bhutan, Cambodia, China, Christmas Island, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, India, Japan, Kiribati, Lao PDR, Malaysia, Myanmar, Nauru, Nepal, New Caledonia, New Zealand, Pakistan, Palau, Papua New Guinea, Norfolk Island, Samoa, Singapore, Sri Lanka, Thailand, Tonga, United States, Viet Nam, Wallis and Futuna Islands.

Threat and damage : *A. donax* displaces native riparian vegetation and provides poor habitat for terrestrial insects and wildlife. It traps sediments and narrows flood channels, leading to erosion and overflowing. It may reduce water availability through high evapotranspiration. The long, fibrous, interconnecting root mats of the plant form a framework for debris accumulation which blocks stream flow and causes damage to bridges, culverts and other structures. It ignites easily and can create intense fires. *A. donax* can float miles downstream where root and stem fragments may take root and initiate new infestations. Due to rapid growth rate and vegetative reproduction, it can quickly invade new areas and form pure stands outcompeting and suppressing native vegetation.

Uses : Grown as an ornamental due its attractive appearance. The rhizome can be dried and ground into a powder to make bread, usually in conjunction with cereal flours. It can also be roasted or boiled. The root is diaphoretic, diuretic and emollient. A paste of the root can be applied to the forehead to treat headaches. Alkaloids isolated from this plant have been experimentally shown to raise blood pressure and contract the intestine and uterus. The rhizome or rootstock is used in the treatment of dropsy. Boiled in wine with honey, the root or rhizome has been used for treating cancer. *Arundo* grass is an ideal bio-fuel that produces methanol as a by-product while manufacturing cellulose.

Management : Mowing may be somewhat effective, but if small fragments of the root are left in the soil, these may lead to re-establishment. Small populations can be controlled through physical removal of rhizomes. Good control of large populations usually requires foliar or cut-stump application of herbicides like glyphosate. Vertebrate grazers such as cattle and sheep may also be useful in managing the weed. Angora goats have been partially successful in reducing the population of the plant. Several insects and pathogens are under consideration as biocontrol agents.

Asparagus densiflorus (Kunth) Jessop

Native : South Africa

Family : Liliaceae

Synonyms : *Asparagopsis densiflora* Kunth
Asparagus aethiopicus L.
A. sprengeri Regel

Common names : Asparagus fern, foxtail fern, regal fern, smilax, sprengeri fern

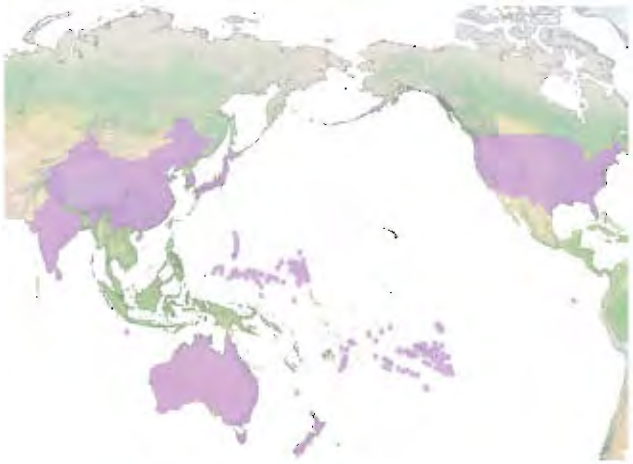
Asparagus is both drought and salt-tolerant and can invade a variety of habitats. It is used as a garden plant or for cut foliage. Though known as asparagus fern, the plant is not a true fern and reproduces by seed. It has an extensive root system with fairly large tubers, which are a source of food during long periods of drought. Seed dispersal is mainly through fruit-eating birds. Seeds may germinate through out the year provided moisture is available, but there is a major flush in spring and a smaller one in autumn. Growth rate is slow until the root system is well established and then it increases rapidly.

Description : Climbing subshrubs, perennial, branches distinctly striate-ridged. Cladodes in fascicles of 1 - 5, linear, 1 - 3 x 0.15 - 0.25 cm, flat. Leaf spur spinescent, spine slightly hooked, 3 -5 mm, sharp on main stems, short and blunt on branches. Inflorescences develop after cladodes, solitary or paired, axillary, each a many-flowered raceme or panicle, 2 - 2.5 cm. Flowers small, white or pinkish, fragrant. Fruit a berry, red, 8 - 10 mm in diameter, 1 or 2 -seeded. Tubers with white flesh, 25 - 40 x 8 - 20 mm. Rhizomes white when young, brown with age, 5 mm thick. Fibrous roots anchor rhizome and tubers.

Habitat : Invades roadsides, dry to moist forests, planted forests and coastlands. In Australia, it has invaded rain forests, frontal dunes, sclerophyll forests and coastal heathland. It is also a persistent weed of urban bushland. The plant is shade-tolerant and grows best in shaded areas where other vegetation has been removed.

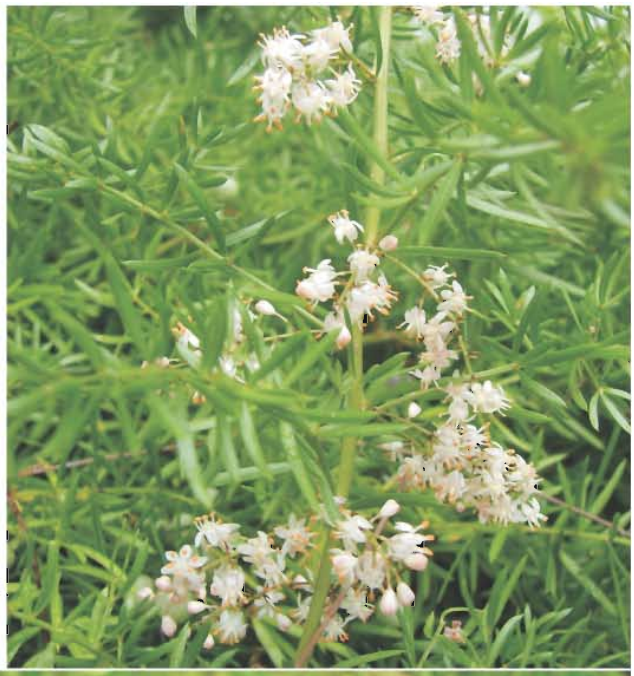
Threat and damage : Has the potential to smother the forest understorey to a height of 2.5-5 metres. It can also smother ground cover and prevent regeneration of canopy species.

Uses : Used as a ground cover ornamental. Tubers are used to cure stomach ache in children. The leaves when mashed have the property of healing wounds.



Distribution : Australia, China, Christmas Island, Cook Islands, Fiji, French Polynesia, Guam, India, Japan, Marshall Islands, Nauru, New Caledonia, New Zealand, Niue, Norfolk Island, Northern Mariana Islands, Palau, Republic of Korea, Samoa, Singapore, Tonga, United States.

Management : Control should aim at removing the crowns of plants and all fruits. Seedlings are hand-pulled. A follow-up programme is necessary to control regrowth. Regrowth and seedlings can be effectively controlled with the herbicide dicamba. The 'crowning' technique is often practised to control it where the aboveground part of the plant is cut off from the root system and hung up off the ground. Foliar sprays with glyphosate or metsulfuron methyl are effective. Tubers can be painted with glyphosate to avoid sprouting. *A. densiflorus* is attacked by several pests (a chalcid wasp, a moth larva, a thrip, a geometrid wasp and two other chalcid species) and a rust fungus. Each of these species may have the potential as a biocontrol agent, but further research is needed to prove this. *Crioceris* sp., a potential biological control agent for *Asparagus* spp., can be effective on *A. densiflorus*.



Bambusa vulgaris Schrad. ex J.C. Wendl.

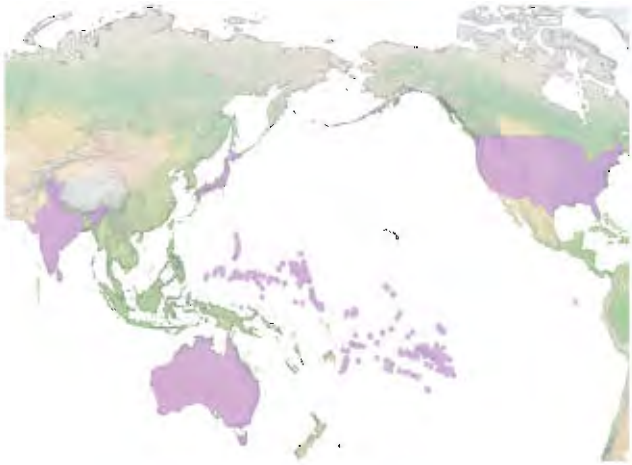
Native : Tropical Asia

Family : Poaceae

Synonyms : *Arundarbor blancoi* (Steud.) Kuntze
A. fera (Miquel) Kuntze

Common names : Feathery bamboo, golden bamboo, soft bamboo, yellow bamboo

Bambusa vulgaris is an ornamental bamboo widespread in the tropics and subtropics. It tolerates a wide range of climatic conditions and thrives under varied soil conditions. *B. vulgaris* grows as monospecific stands along riverbanks, roadsides and open ground. The tender shoots of the plant are edible. The plant reproduces mainly by vegetative means.



Distribution : American Samoa, Australia, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, India, Japan, Kiribati, Marshall Islands, Nauru, New Caledonia, Niue, Northern Mariana Islands, Palau, Samoa, Solomon Islands, Sri Lanka, Tonga, United States.

Description : Clump bamboo with short rhizomes, stem yellow with thin green stripes, to 20 m tall, 4 - 10 cm in diameter with leafy branches at nodes. Culm-sheaths 15 - 25 cm long, 25 - 35 cm broad, rounded and truncate at top, beautifully streaked in green and yellow; ligule 5 - 8 mm tall. Leaves narrowly or broadly lanceolate, to 25 x 6 cm, acuminate, rough beneath. Inflorescence a large leafy compound panicle, bearing spicate branches with heads of spikelets in bracteate clusters of 3 - 10, clusters larger at the nodes, rachis rounded or somewhat furrowed, scurfy, end segments hairy; spikelets 1.5-2 cm long, oblong, acute, compressed, bearing one to two empty glumes. Flowers 6-10, one imperfect, rachillae cuneate, glabrous.

Habitat : Grows mostly near riverbanks, roadsides, planted forests and in wastelands. It thrives best under humid conditions up to 1, 000 metres elevation and can tolerate dry conditions.

Threat and damage : It can exclude nearby plants by forming monospecific stands.

Uses : Used for construction of houses, huts, boats, furniture and as pulp and fodder. It is also used for ornamental purposes and for making baskets and musical instruments. The leaves are used as sudorific and febrifuge agents. The plant helps to reduce soil erosion.

Management : Digging the rhizomes out is the most common method used. Cutting at the top and spraying herbicides such as glyphosate and amitrole are effective. Biological control is unknown.

Berberis thunbergii DC.

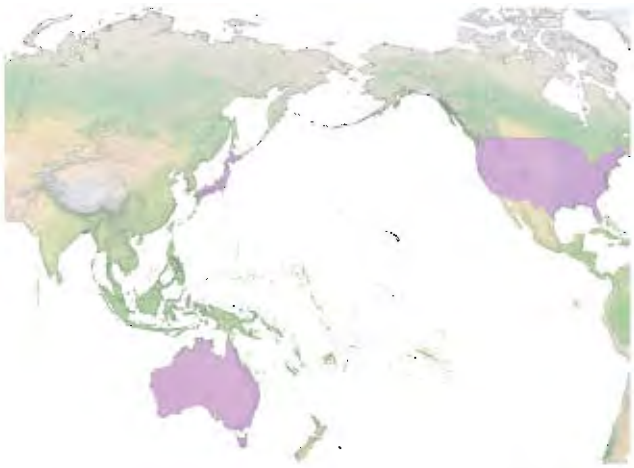
Native : Japan

Family : Berberidaceae

Synonyms : *Berberis thunbergii* var. *minor* Rehder
B. thunbergii var. *uniflora* Koehne

Common names : Crimson pygmy, Japanese barberry

Berberis thunbergii is an ornamental shrub that can invade a variety of habitats such as damp lowlands, dry roadsides and wasteland. The plant is highly shade-tolerant and displaces native plant species wherever it gets established. Roots are shallow but tough. Spread is through seeds and by sprouting from root crown and rhizomes.



Distribution : Australia, Japan, United States.

Description : Deciduous shrubs, to 3 m in height, branchlets angulate, dark red, shoot reddish-green, glabrous; spines simple, occasionally 3-fid, 5 - 15 mm, internodes 1-1.5 cm. Leaves simple, verticillate, subsessile, blade abaxially greyish-green, adaxially green, obovate, spatulate, or rhombic-ovate, 1 - 2 x 0.5 - 1.2 cm, thinly papery, abaxially with slightly raised mid-vein, both surfaces glabrous, with indistinct reticulate veins, base attenuate, cuneate, margin entire, apex mucronate or obtuse. Inflorescence an umbel with subfascicled flowers, yellow, 2-5 flowered, 1 - 2 cm; pedicels 5 - 10 mm, glabrous. Fruit a berry, shiny red, ellipsoid, approximately 8 × 4 mm. Seeds 1 or 2, brown.

Habitat : The plant is shade-tolerant and drought-resistant and adaptable to a range of habitats. It prefers to grow in direct sunlight to partly-shaded areas but will flower and fruit even in heavy shade. It commonly occurs in natural forests, planted forests, ruderal/disturbed/scrub/shrublands, wetlands, along roadsides, open fields and open woods.

Threat and damage : The highly shade-tolerant nature of the plant helps it to form dense stands in sunny as well as shady areas displacing native herb and shrub species.

Uses : Used as an ornamental and landscaping species. In Northern Japan, *Macaca fuscata* Blyth (the Japanese macaque) prefers the plant as a food source. The plant is known to stimulate earthworm populations. The root bark is anthelmintic, antiseptic and febrifuge. Berberine, present in the rhizomes, has marked antibacterial and antitumour effects. The plant can be grown as a hedge because it is very tolerant of trimming and has prickles which make it an effective barrier to larger creatures.

Management : Hand-pulling is an extremely effective method of reducing population and seed productivity of *Berberis*. Mowing or cutting will control spread but will not eradicate it. Use of glyphosate and triclopyr is effective. The cut stump method should be used when treating individual bushes or where the presence of desirable species precludes foliar application of herbicides. Biological control is unknown.

Bidens pilosa L.

Native : Temperate and tropical America

Family : Asteraceae

Synonyms : *Bidens africana* Klatt, *B. arenaria* Gand. *B. aurantiaca* Colenso

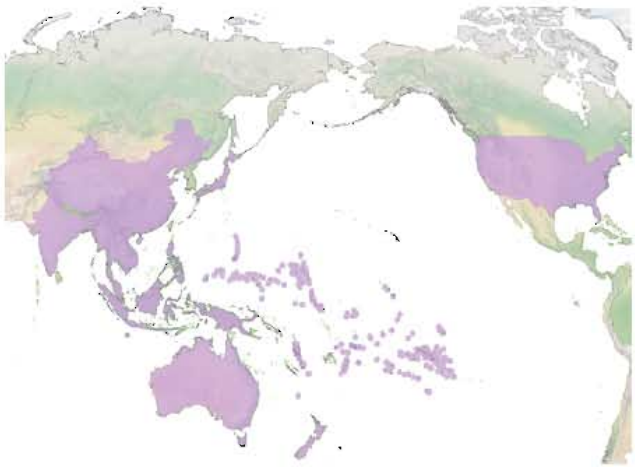
Common names : Beggar's tick, black fellows, black jack, broom stick, Spanish needle

Bidens pilosa is widely distributed in more than 40 countries. Its high reproductive potential and fast growth rate enabled such wide distribution. In its non-native ranges, the plant was introduced for agricultural and ornamental purposes and eventually became a major crop weed. A single plant can produce up to 6, 000 seeds per year and dispersal is mainly by attachment to animals, birds or by wind and water. Seeds are known to remain viable for 5 - 6 years.

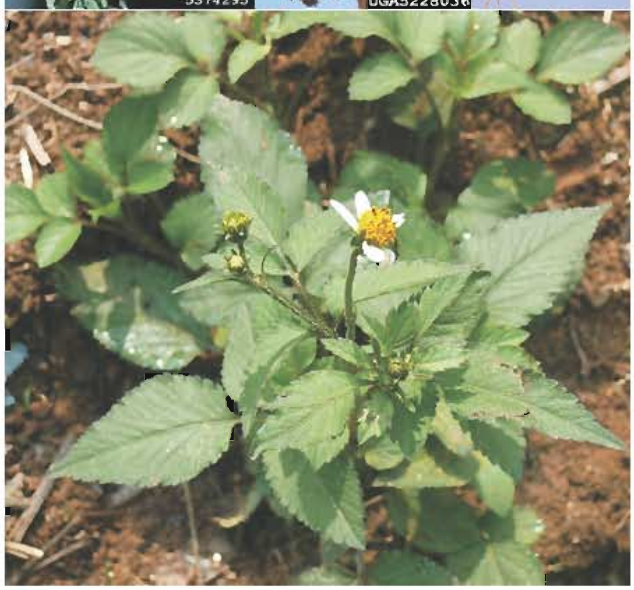
Description : Annual herbs or subshrubs, to 1 m tall, stems reddish-tinged, 4-angled. Leaves simple, blades either ovate to lanceolate, 3 - 7 × 1 - 2 cm, or one pinnately-lobed, primary lobes 3-7, ovate to lanceolate, 2.5 - 8 × 1-4 cm, base truncate to cuneate, ultimate margin serrate or entire, usually ciliate, apex acute to attenuate, faces pilosulous to sparsely hirtellous or glabrate; petiole 1 - 3 cm. Inflorescence of a head usually borne singly, sometimes in open, corymbiform arrays; peduncle 1-2 cm, calyculi appressed, spatulate to linear, bractlets 4 - 5 mm, margin ciliate, abaxial faces usually hispidulous to puberulent. Involucre turbinate to campanulate; ray florets to eight; laminae whitish to pinkish, 2 - 7 x 3 - 15 mm; disc florets 20 - 40, yellowish, 3 - 5 mm. Fruit cypselae, reddish-brown, flat, linear to narrowly cuneate, 4 - 5 mm, margins antrorsely hispidulous, apex truncate, face obscurely two-grooved, inner blackish, equally four-angled, linear-fusiform, apex truncate or attenuate, pappi to 3, erect to divergent, retrorsely barbed awns 2 - 4 mm long.

Habitat : Commonly seen in grasslands, agricultural areas, natural forests, planted forests and wetlands. It can grow from low to high elevations up to 3, 600 metres. The plant is tolerant to acidic and alkaline soils and prefers temperatures between 15 and 45°C.

Threat and damage : *Bidens* can form dense stands that can compete, outgrow and eliminate crops and native vegetation. It is a threat to at least 30 crops in different countries. The leaf and root extracts of *Bidens*



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



suppress germination and seedling growth of native plants. The thickets that affect road, rail and recreation areas are a nuisance to travellers and tourists. Its burrs irritate people, sheep and other livestock and they can also be a seed contaminant. The roots, leaves and flowers are strongly phytotoxic and poisonous. The plant also acts as a host and vector to harmful parasites such as root knot nematode and tomato spotted wilt virus.

Uses : The leaves, roots and seeds are antidysentric and antimicrobial. In Africa, it is used to treat headaches, ear infections, diarrhoea, kidney problems, malaria and dysentery. Fresh and dried shoots and young leaves are used as vegetables.

Management : Hand-weeding is effective. The weed is susceptible to herbicides such as diuron, bromacil, atrazine, oryzalin, 2,4-D, glyphosate, diquat and paraquat. Biological control is unknown.

Brassica tournefortii Gouan

Native : South Europe, North Africa and West Asia

Family : Brassicaceae

Synonyms : *Brassica amblyorhyncha* Coustur. & Gand.
B. mesopotamica (Spreng.) Bernh.

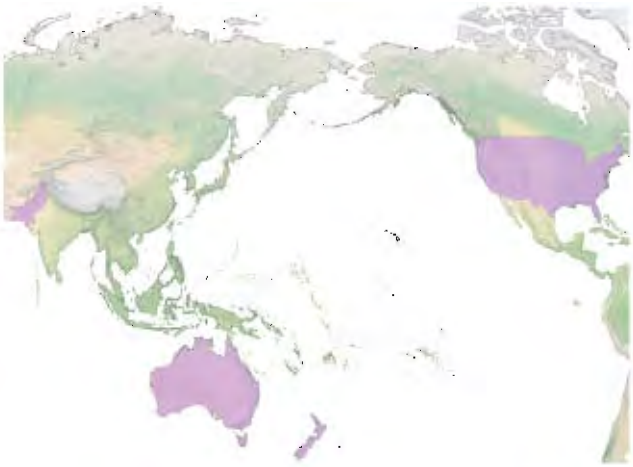
Common names : African mustard, Asian mustard, Mediterranean turnip, Sahara mustard

Brassica tournefortii is common in disturbed sites such as roadsides, abandoned fields and in areas with wind-blown sediments. It is rare on alluvial deposits and rocky hill slopes. It suppresses native species by monopolizing available soil moisture, building canopy and producing mature seeds long before many native species have begun to flower. The plant also increases fuel load and is a fire hazard in desert scrub and coastal sage scrub. It shows variability in size depending on the availability of soil moisture. During rainfall, a sticky gel forms over the seed case that permits seeds to disperse long distances by adhering to animals. A mature mustard plant produces 750 - 9, 000 seeds.

Description : Annual herbs, stem erect, hairy below with long ciliate white hairs, branches almost aphyllous. Basal leaves rosulate, runcinate-pinnatifid, 4 - 12 jugate, shortly petioled, hispid, terminal lobe often small, obliquely cordate, trilobate, sinuate-dentate, 7 - 30 cm long, lateral lobes narrow, oblong, often subrecurved; upper leaves much smaller, few, oblong or linear, 1-3 cm long, 4-8 mm broad, dentate or entire, acute, hairy. Inflorescence of 10 - 20 flowered raceme, enlarging to 30 cm in fruit, flowers 4 - 7 mm across, pale yellow; pedicel 2 - 6 mm long, enlarging to 20 mm and slightly thickened in fruit, spreading. Fruit a capsule, linear, edges rounded, tip beaked, slightly constricted between seeds, 3 - 7 x 2 - 3 mm. Seeds uniseriate, many, ca. 1 mm in diameter, globose, dark brown, finely tuberculate, mucilaginous when wet.

Habitat : Invades annual grasslands, coastal sage scrub, rocky slopes and abandoned sandy fields where it forms pure stands within a short period. It prefers sandy, loamy or heavy clay soils and can thrive on acid, neutral and alkaline soils. It cannot grow in the shade.

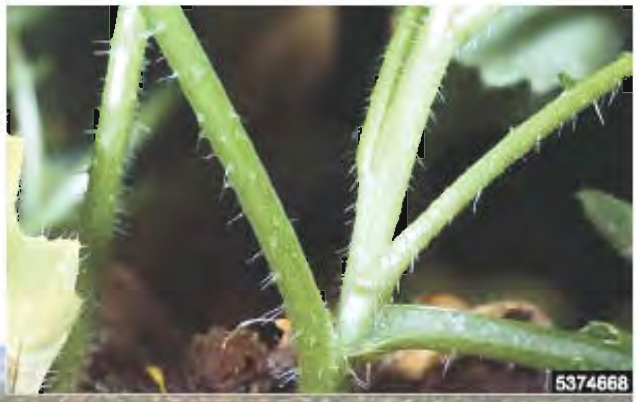
Threat and damage : Suppresses native vegetation by forming dense stands. It dominates grasslands in dry, open sites, especially disturbed areas. The plant can re-establish easily from a soil seed bank after fire.



Distribution : Australia, New Zealand, Pakistan, United States.

Uses : Leaves are a source of various oils; an edible oil can be obtained from the seed. The leaves and young shoots can be cooked and the plant is widely used as a source of food in Libya. The plant contains 3-methylsulfinylpropyl glucosinolate, which reduces the risk of cancer.

Management: The spread of the weed can be reduced by controlling it along roads, which provide corridors for rapid invasion into new habitats. Hand-pulling might be effective if done before seed setting. Early herbicidal treatment may reduce weed abundance and allow later-germinating natives to establish. Biological control is unknown.



Bromus inermis Leyss.

Native : France to Siberia

Family : Poaceae

Synonyms : *Bromopsis inermis* (Leyss.) Holub
B. inermis var. *aristata* (Schur) Tzvelev

Common names : Awnless brome, Hungarian brome, smooth brome, smooth bromegrass

Bromus inermis is an invasive cool season grass which has negatively impacted grasslands of North America. It has also affected population dynamics and movement behaviour of several native arthropod species in North American prairies. Seeds of the grass remain viable for two to ten years.

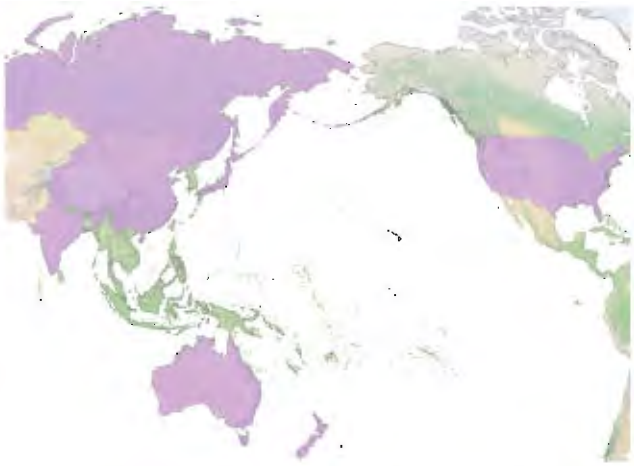
Description : Rhizomatous perennial grass, culms solitary or loosely tufted, to 1.2 m tall. Leaf blade to 35 x 0.8 cm, glabrous or sparsely ciliate on the margins, greyish-blue ventrally and green dorsally. Sheaths glabrous or thinly pubescent. Panicle 10 - 20 cm long, usually rather dense, occasionally loose and open. Spikelets narrowly oblong, 8 - 13 flowered, 15 - 30 mm long, pallid or slightly purple-tinged; glumes narrowly lanceolate, glabrous, the lower 3.5 - 8 mm long, 1 - nerved, the upper 6 - 11 mm long, 3 - nerved. Seeds elliptic, pale yellow to dark brown.

Habitat : Occurs in a wide range of soils but prefers deep, fertile, well-drained silt loam or clay loam soils with a pH from 5.5 - 8. *Bromus* grows widely in natural forests, grasslands, roadsides, riverbanks and disturbed sites. It is drought-resistant, can tolerate spring flood conditions and temperatures as low as -38°C but cannot tolerate shade and anaerobic, calcareous or salty conditions.

Threat and damage : An aggressive, competitive species that can smother other species and exclude native vegetation. It is widely grown as a forage or cover crop and has become invasive inhibiting natural succession processes. The grass alters the population dynamics of the cord grass, *Spartina pectinata* Bosc ex Link.

Uses : Usually planted to increase forage or for erosion control.

Management : Cutting at the boot stage (while the flower head is still enclosed with in the sheath) may be effective. Application of herbicides such as picloram, dicamba and glyphosate has been successful. Biological control is unknown.



Distribution : Australia, China, India, Japan, Mongolia, New Zealand, Russian Federation, United States.

Bromus rubens L.

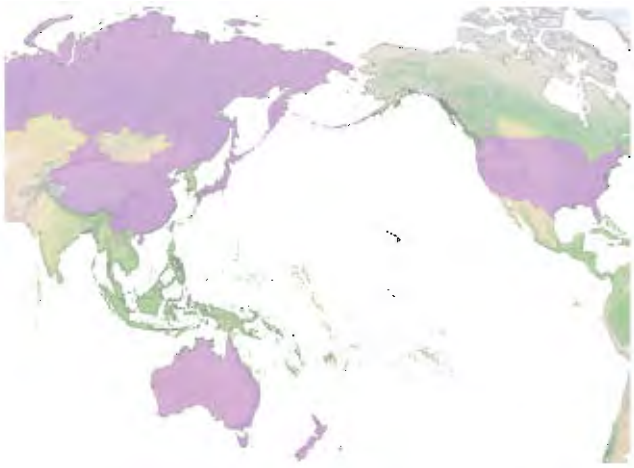
Native : Africa, Asia and Europe

Family : Poaceae

Synonyms : *Anisantha rubens* (L.) Nevski
Bromus madritensis ssp. *rubens* (L.) Hus.

Common names : Foxtail brome, foxtail chess, red brome

Bromus rubens is a cool season tufted bunch grass that grows profusely on shallow dry soil or poor textured clayey soil. It is highly competitive, produces huge biomass and displaces native species. The plant is drought resistant with high water use efficiency.



Distribution : Australia, China, Japan, New Zealand, Russian Federation, United States.

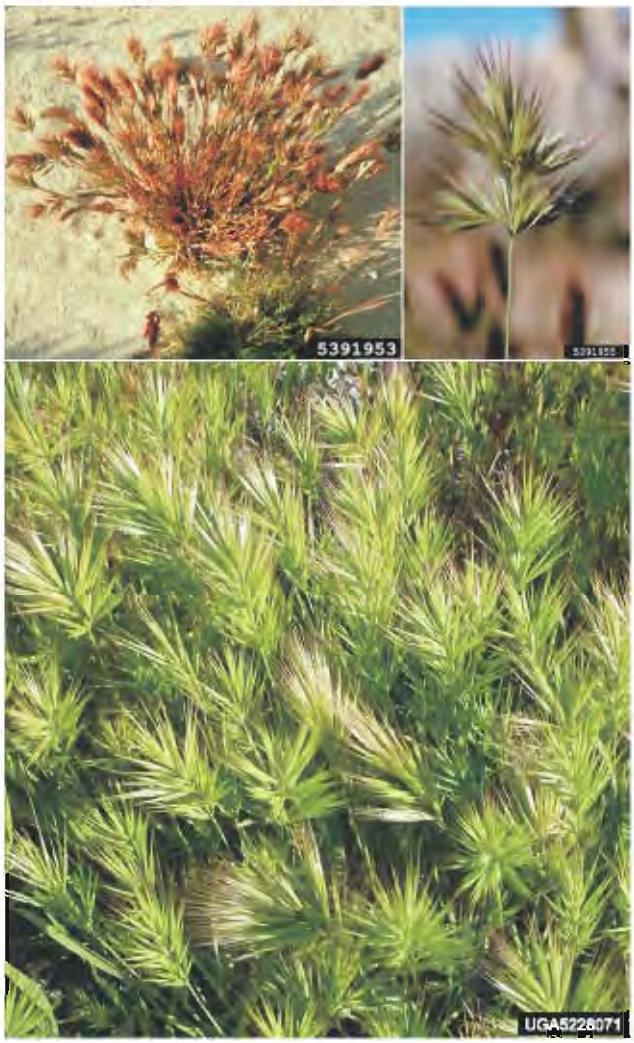
Description : Annuals, culms tufted, erect or ascending, 15-35 cm tall. Leaf sheath pubescent, blade 5-10 × 0.3-0.5 cm, both surfaces pubescent. Panicle densely contracted, narrowly elliptic in outline, stiffly erect, 4-7 x 2 cm, often tinged with purple; branches 2-5 mm, much shorter than spikelets, branches and pedicels pubescent. Spikelets 15 - 25 mm, 4 - 9 florets, upper florets sterile, reduced. Fruit a caryopsis.

Habitat : Common along roadsides, wasteland, agricultural areas, deserts, disturbed areas, rangelands, cultivated fields and steppe regions. It prefers low to medium elevations below 1, 500 metres whenever competition from established herbaceous plants is minimal.

Threat and damage : In the North American region, the plant grows as an invasive since competition from herbaceous plants is low. Once established, it has the potential to compete with other grasses. The accumulation of litter and necromass from the plant increases fire hazards, which cause loss of native perennial species in invaded areas. Nitrogen additions increase plant yield and lead to competitive suppression of native bunchgrass *Pseudoroegneria spicata* (Pursh) A. Love. The awns and florets are a direct threat to livestock and native fauna. The vegetation change from perennial grasses to this and other introduced species influences the density of rabbits, grasshoppers and kangaroo rats.

Uses : A source of forage for livestock though not a preferred one. Desert cottontail rabbits feed on this weed with the heaviest use occurring in winter.

Management : Hoeing and uprooting of the plants are practised during spring. Application of pre-emergence or soil-active herbicides is effective in controlling the grass. Biological control is unknown.



Bromus tectorum L.

Native : South Europe and Southwest Asia

Family : Poaceae

Synonyms : *Anisantha pontica* K. Koch
A. tectorum (L.) Nevski

Common names : Bronco grass, cheat grass brome, cheat grass, downy brome

Bromus tectorum usually thrives in disturbed areas preventing growth of native species. Disturbances such as overgrazing, cultivation and frequent fires encourage invasion. Once established, it forms pure stands out-competing native plants. The seedlings are bright green but the foliage and seed heads often become purplish before drying. It is a prolific seed producer and produces an average of 70.8 million seeds per acre. Long-distance dispersal is facilitated by humans and wild and domestic animals. The plant has a finely divided fibrous root system with an average of seven main roots that grow rapidly, spreading laterally and vertically.

Description : Annuals, culms erect, to 70 cm tall. Leaf blade to 18 x 0.4 cm, sheath pubescent. Inflorescence a panicle, to 18 cm long, loose or dense, erect or nodding; branches filiform, flexuous, bearing parallel clusters of spikelets, usually turned to one side; spikelets narrowly wedge-shaped, very fragile, 4 - 8 flowered, the upper 1-3 florets much reduced or aborted, 25 - 40 mm long including awns. Fruit is a caryopsis with a tuft of hair at apex.

Habitat : Common in agricultural areas, grasslands, ruderal/disturbed, scrub/shrublands, urban areas and intermountain ranges from sea level to 1, 500 metres. It prefers areas that receive good sunlight and 15-56 cm of precipitation and does not grow well under the forest canopy. The plant will grow in almost all types of soil and is most often found on coarse-textured soils. It does not grow well on heavy, dry or saline soils.

Threat and damage : Increases the frequency, extent and timing of fires. The early-maturing, fine-textured herbage of the weed increases the chance of combustion. Such frequent fires lead to loss of topsoil and nutrients, which alters the makeup of the soil and therefore the ecosystem. The plant can rapidly and completely dominate disturbed sites by competing with native shrubs and perennial grasses.

Distribution : Australia, China, India, Japan, New Zealand, Pakistan, Russian Federation, United States.

Uses : Used as fodder for many kinds of livestock in the early spring. Mule deer, pronghorn, elk, small mammals and certain birds also feed on this grass. It provides habitat for several small mammals and birds and is planted to decrease erosion in some countries. The small seeds of the plant can be cooked into gruel in times of food shortage. A coffee is made from the roasted seed. A paste made from seeds can be applied as a poultice to relieve chest pain.

Management : Hand-pulling before seed setting is an effective control method. While pulling, the root should also be removed or the plant will grow back. Tillage is effective after the plant is established. Application of glyphosate controls the weed, but its effectiveness is limited by the environmental conditions prevailing at the time of the application. Several new herbicides are being tested for selective control. In North America, planting of grasses, such as crested wheatgrass, have been attempted to compete with *B. tectorum*. Pink snow mould (*Microdochium nivale* [Fr.] Samuels & I.C. Hallett) has been attempted as a biological control agent, but information on its efficacy is unknown. Grazing is an excellent tool for suppressing the weed.

Buddleja davidii Franch.

Native : Western and Central China

Family : Buddlejaceae

Synonyms : *Buddleja davidii* var. *alba* Rehder & E.H. Wilson
B. variabilis Hemsley

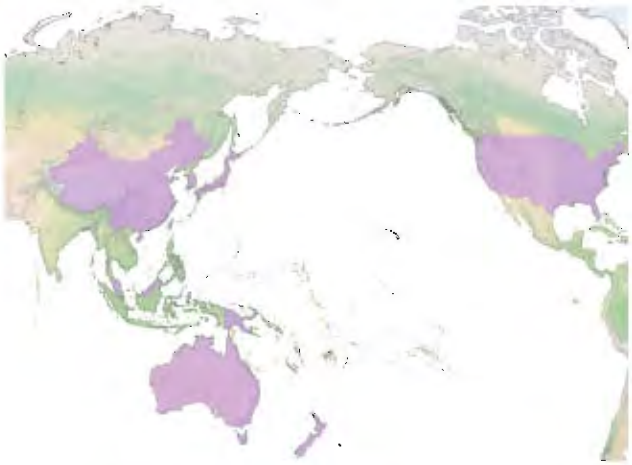
Common names : Butterfly bush, orange eye, summer lilac

Buddleja davidii, a shade intolerant shrub, is often cultivated for its beautiful flowers and ability to attract butterflies. It takes hold as an invasive plant in disturbed areas, riparian zones or open woodlands and is considered as one of the worst weeds in New Zealand, where it out-competes *Pinus radiata* seedlings. The small, wind dispersed seeds can remain dormant in the ground for many years. The plant can colonize a new area in 1 - 2 years from seeding.

Description : Shrubs, 1 - 5 m tall, young parts white tomentose or pubescent with stellate hairs, branchlets 4-angled, stipules often present, suborbicular to ovate. Leaves simple, opposite, subsessile, blade narrowly ovate-elliptic, 4 - 20 x 0.3 - 7.5 cm, adaxially dark green, glabrous or subglabrous, base cuneate, margin serrate, apex acuminate, lateral veins 9 - 14 pairs. Inflorescence of terminal, racemose or thyrsoid cymes, 4 - 30 x 2 - 5 cm, pubescent. Flowers violet to dark purple, sometimes white, with an orange-yellow throat, 0.8 - 1.4 cm, outside glabrous or stellately pubescent or with glandular hairs, tube narrowly cylindrical or subcylindrical, 6 - 11.5 x 1 - 1.5 mm. Fruit a capsule, brown, narrowly ellipsoid to narrowly ovoid, 5 - 9 x 1.5 - 2 mm, glabrous or sparsely stellate pubescent. Seeds ellipsoid, 2-4 x 0.5 mm, long-winged at both ends.

Habitat : Usually occurs in open and disturbed sites like riverbanks, edges of roads, along railway lines, walls, cliffs, building sites, wastelands and ruins. Its occurrence in natural forests is also reported.

Threat and damage : Dense infestations of the weed compete with indigenous vegetation of rivers and impede the growth and reproduction of other species of trees and shrubs. Monospecific stands of *Buddleja* impede access to rivers. Seedlings, which have superficial rooting, are easily carried away in floods and may form blockages, causing erosion of banks.



Distribution : Australia, China, Fiji, Japan, Malaysia, New Caledonia, New Zealand, Papua New Guinea, Republic of Korea, Singapore, United States.

Uses : Widely planted as an ornamental in hedges and other borders. It is the perfect foundation plant for a butterfly garden.

Management : Plants that are merely cut, buried by river sediment or knocked down by wind storms will continue to grow or will resprout. Hand-picking of seedlings may be successful when followed by establishing ground cover of a desired species which will inhibit resprouting of *B. davidii*. It may be possible to dig plants up, but again, disturbance encourages seedling growth and should be avoided. Uprooted plants should be removed from sites to avoid resprouting. Cutting the plant down and treating the stump with herbicides such as triclopyr or glyphosate is reported to be effective. A weevil, *Cleopus japonicus* Wingelmuller, and a stem boring beetle, *Mecyslobus erro* Pascoe, were tested as potential biological control agents for *B. davidii* in New Zealand.

Caesalpinia decapetala (Roth) Alston

Native : Tropical Asia

Family : Fabaceae

Synonyms : *Biancaea decapetela* (Roth) O. Deg.
B. scandens Tod.
Reichardia decapetala Roth

Common names : Cat's claw, Mauritius thorn, Mysore thorn, shoofly

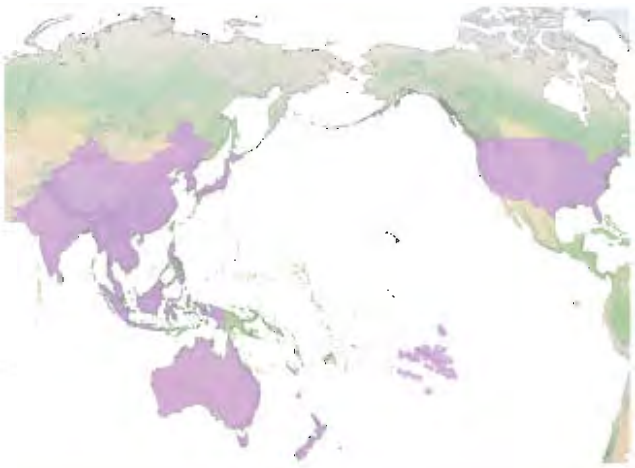
Caesalpinia decapetala has been introduced to many different tropical locations as a hedge or ornamental plant. It is a major invasive plant in South Africa and Hawaii, where it covers large areas of land forming dense thickets prohibiting animal movement. Trailing branches root where they touch the ground. Seeds are dispersed mainly by rodents and birds.

Description : Woody climbers, bark dull red; branches, rachis and inflorescence with recurved prickles. Leaves 20-30 cm, pinnae 3-10 pairs, opposite, with prickles in pairs at the base. Stipules obliquely ovate, apex acuminate, caducous. Leaflets 8 - 12 pairs, oblong, 1-2.5 x 0.6-1.2 cm, membranous, both surfaces puberulent, glabrescent when old, apex and base obtuse-rounded. Inflorescence of terminal raceme, 15 - 30 cm, flowers dark yellow; rachis densely prickly, pedicels 3 - 4 cm, hairy, jointed at apex. Fruit a pod, 6 - 12 x 2.5 - 3 cm, oblong ligular, beaked at both ends, splitting along the ventral suture at maturity, smooth, brown, leathery. Seeds 6 - 9, black, ellipsoid, laterally flattened, 8 - 12 x 6 - 8 mm.

Habitat : In the Pacific, the plant is confined to dry to mesic lowland habitats. However, in South Africa it is found throughout the eastern seaboard in areas that experience high summer rainfall. Altitudinal range varies from sea level to 1, 500 metres. It is common in agricultural areas, natural forests, planted forests, range/grasslands, ruderal/disturbed lands and watercourses.

Threat and damage : Invades forest margins and gaps, plantations, roadsides and watercourses. It scrambles over and smothers other species, including tall forest trees and hinders access to plantations and riverbanks. It can retard growth of saplings in newly established plantations. Furthermore, infestations along riverbanks are likely to affect stream flow.

Uses : Used as a security hedge or a barrier plant. Sometimes used as an ornamental. The plant is anthelmintic, antiperiodic, astringent and febrifuge.



Distribution : Australia, Bangladesh, Bhutan, Cambodia, China, Democratic People's Republic of Korea, Fiji, French Polynesia, Hong Kong S.A.R., India, Indonesia, Japan, Lao PDR, Malaysia, Myanmar, Nepal, New Caledonia, New Zealand, Norfolk Island, Pakistan, Philippines, Republic of Korea, Sri Lanka, Thailand, United States, Viet Nam.

The leaves are emmenagogues and laxative. They are applied externally to burns. The root is a purgative and the bark is a rich source of tannin.

Management : Foliar applications of glyphosate and triclopyr, and soil applications of tebuthiuron are effective. Adequate coverage of the foliage in dense infestations is difficult. Timely and repeated applications (three to nine months) of triclopyr ester allow gradual reductions and opening of the canopy and eventual control. The treatment also controls seedlings. Basal bark of accessible stems may be treated with triclopyr ester in diesel or crop oil in very low volume applications. Two species of insects have been evaluated for its biological control. Of these, the leaf-mining moth, *Acrocercops hyphantica* Meyrick, is host-specific and the impact of the seed-feeding weevil, *Sulcobruchus subsuturalis* Pic is unknown.

Canna indica L.

Native : Tropical America

Family : Cannaceae

Synonyms : *Canna achiras* Gill., *C. aurantica* Roscoe

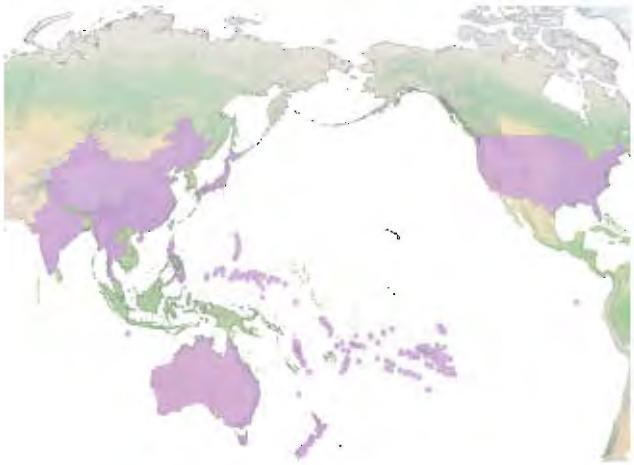
Common names : African arrowroot, canna, canna lily, gwangwa, Indian shot

Canna indica is a very popular ornamental plant commonly distributed in the tropics. It is invasive in several countries in the Asia-Pacific region where it grows in thickets displacing other plants. Physical control is difficult since the main mode of spread is through rhizomes.

Description : Rhizomatous subshrubs, many branched, stem stout, to 2.5 m tall. Leaf sheath green or purple, petiole short, blade adaxially green, abaxially and at margin green or purple, ovate-oblong to oblong, 30 - 60 × 10 - 20 cm. Inflorescence a raceme of cincinni, bracts light purple, ovate, approximately 8 mm, flowers pinkish-red, yellow, yellow with red spots or vice-versa, 3-4 cm across, 1 or 2 per cincinnus. Fruit a broadly ovoid capsule, 1.2-1.8 cm. Seeds globose, black, 5 - 8 x 4 - 7 mm.

Habitat : Often found as secondary growth in open wastelands. It also occurs in wetland habitats, disturbed sites, waste areas and old gardens. *Canna* is shade-intolerant and prefers moist and well-drained sandy, loamy or clayey soil. The plant is naturalized in Fiji, frequently around villages, along roadsides, in coconut plantations, in clearings and in forests near streams, at elevations from sea level to 450 metres.

Threat and damage : *Canna* can grow in thickets and suppress growth of other plants. Its dense clumps in water ways results in flooding and limits access to these areas. In Hawaii, *Canna* is naturalized in disturbed mesic and rain forest.



Distribution : American Samoa, Australia, China, Christmas Island, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, India, Japan, Kiribati, Marshall Islands, Myanmar, Nauru, New Zealand, Niue, Norfolk Island, Northern Mariana Islands, Palau, Philippines, Samoa, Singapore, Solomon Islands, Thailand, Tonga, Tuvalu, United States, Vanuatu, Wallis and Futuna Islands.

Uses : Grown widely as an ornamental. The rhizome is used in traditional medicine and food.

Management : Dig out rhizomes and roots and dispose. Application of a combination of metsulfuron methyl and glyphosate on cut stems is effective. Biological control is unknown.

Cardiospermum grandiflorum Sw.

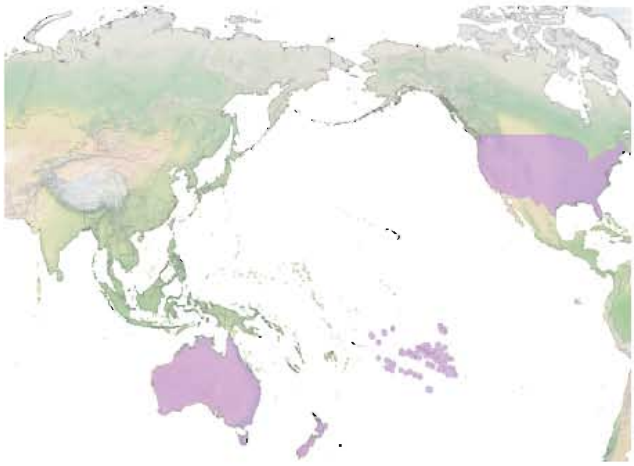
Native : North and South America and Africa

Family : Sapindaceae

Synonyms : *Cardiospermum barbicaule* Baker
C. coluteoides Kunth

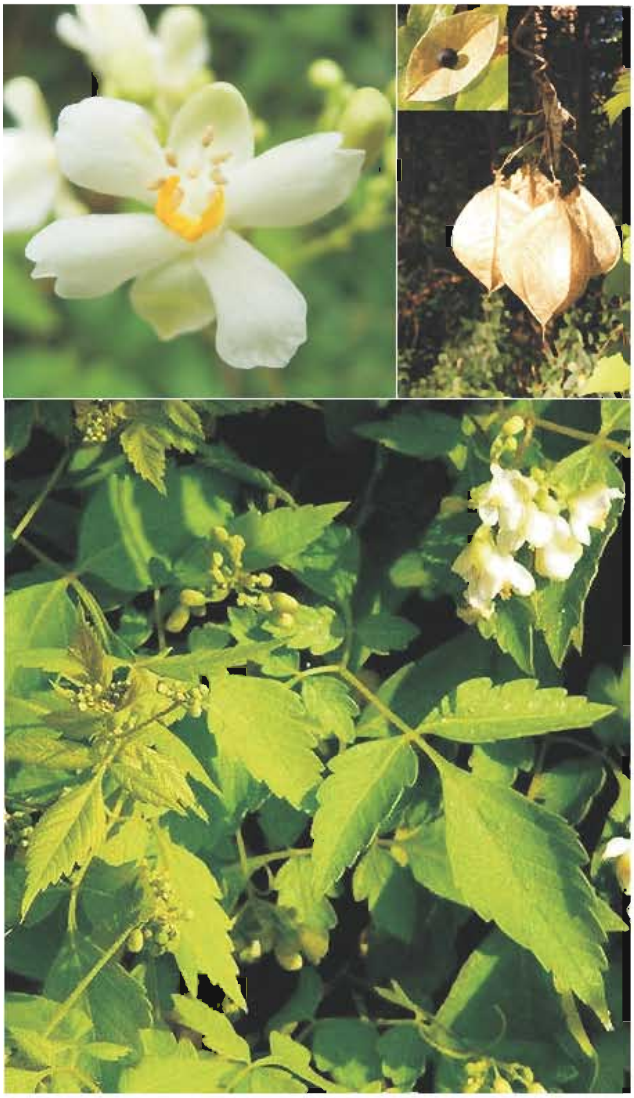
Common names : Balloon vine, heart seed

Cardiospermum grandiflorum is a rapidly growing invasive climber which forms large and dense smothering curtains of tangled stems that hamper the growth of supporting vegetation. It grows well in damp situations, especially near riverbanks. The light papery capsules float in water, which helps dispersal. They are also transported by wind. Seed longevity is around two years.



Distribution : Australia, Cook Islands, French Polynesia, New Caledonia, New Zealand, United States.

Description : Perennial vines, stem ribbed, branched, shortly villous. Leaves biternate, leaflets rhombic-ovate or lanceolate, 2.5-10 x 2.5 cm, terminal one larger, lateral pair small, sparsely to moderately yellowish pilose, densely along veins on the lower surface, margin irregularly lobed. Flowers in many flowered axillary heads, greenish-white, fragrant; peduncles 7-14.5 cm long, tendrillate at base of each flower cluster. Fruit a capsule, ellipsoid to ellipsoid-ovoid, membranous, strongly inflated, three-angled, 4.5-6.5 cm long, glabrous or nearly so. Seeds subglobose, 6-7 mm in diameter, aril suborbicular.



Habitat : Common in natural forests, riparian zones and urban areas; the vine prefers moist soils and can tolerate occasional flooding. It can withstand some shade but growth is vigorous in full sunlight.

Threat and damage : Forms dense but localized infestation. However, it can grow to enormous lengths and is capable of smothering even a 10-metre-tall tree. Seedlings of native shrubs and trees are unable to establish under the stands of the plant. In Australia, the plant tolerates periodic inundation and its vigorous growth destroys riparian forests. It smothers indigenous plant species by preventing their ability to effectively photosynthesize.

Uses : Grown as an ornamental. The derivatives of the root have laxative, emetic and diuretic effects. The leaves can cure swellings, oedema and pulmonary complications.

Management : Hand-pull or dig out smaller plants. Glyphosate is effective if sprayed on the resprouting foliage. Biological control is unknown.

Carduus nutans L.

Native : Asia and Europe

Family : Asteraceae

Synonyms : *Carduus armenus* Boiss.
C. attenuatus Klokov

Common names : Musk thistle, nodding plumeless thistle, nodding thistle, plumeless thistle

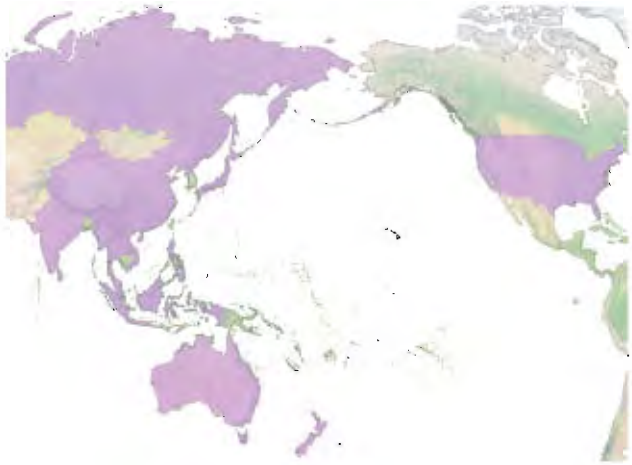
The stem and leaf margins of *Carduus nutans* are densely covered by sharp spines. The plant readily invades disturbed areas outcompeting native plants. Keeping the pastures competitive is the best way to prevent establishment of seedlings. Flower heads of the plant will drop to a 90-degree angle from the stem when mature and hence it is called nodding thistle. A single flower head may produce 1, 200 seeds and a single plant up to 120, 000 seeds, which are wind-dispersed. The seeds may remain viable in the soil for over ten years.

Description : Annual or biennial subshrubs, stem glabrous to tomentose, winged, wing spines 2-10 mm. Basal leaves tapering to winged petioles, blade 10-40 cm, pinnately lobed; cauline sessile, shorter, margin less divided. Inflorescence a head, borne singly or in corymbiform arrays, sometimes a few, axillary, at least terminal head conspicuously pedunculate, often nodding, red to purple, 2 - 4 cm; peduncle 2 - 30 cm, unwinged distally or throughout, finely tomentose, involucres hemispheric, 2-6 × 2-7 cm, phyllaries lanceolate to ovate, outer and middle with appressed bases, 2 - 4 mm, appendages 2 - 7 mm, purple, 15 - 28 mm. Fruit a cypselae, golden to brown, 4 - 5 mm, pappus bristles 13 - 25 mm.

Habitat : Grows in open disturbed soil, heavily grazed land, agricultural areas, grasslands, shrub lands, urban areas and near roadsides up to an elevation of about 2, 500 metres. It does not grow well in excessively wet, dry or shady conditions but spreads rapidly in areas subjected to disturbance.

Threat and damage : A perpetual problem on farmland because it out-competes native forage plants, crops and hinders the movement of livestock. It also reduces the amount of pasture available to livestock. The spiny vegetation catches in the wool of sheep, which reduces the value of the wool.

Uses : Used in traditional medicine for stimulating liver function. The flowers are a febrifuge and are used to purify the blood.



Distribution : Australia, Bhutan, China, Democratic People's Republic of Korea, India, Indonesia, Japan, Lao PDR, Malaysia, Myanmar, Nepal, New Zealand, Philippines, Russian Federation, Sri Lanka, Thailand, United States, Viet Nam.

Management : Hand-pulling is very effective. Minimizing disturbance to the soil during removal activities will help reduce the chance of germination of seeds stored in the soil. Foliar sprays with glyphosate or triclopyr is effective. Treatments should be made during the rosette stage or prior to flowering. Two weevils have been introduced from Europe and released in the United States as biological control agents, the thistle head-feeding weevil (*Rhinocyllus conicus* Frolich) and the rosette weevil, *Trichosirocalus horridus* (Panzer). Reports indicate that the releases were successful in managing musk thistle.

Casuarina equisetifolia L.

Native : Australia and Southeast Asia

Family : Casuarinaceae

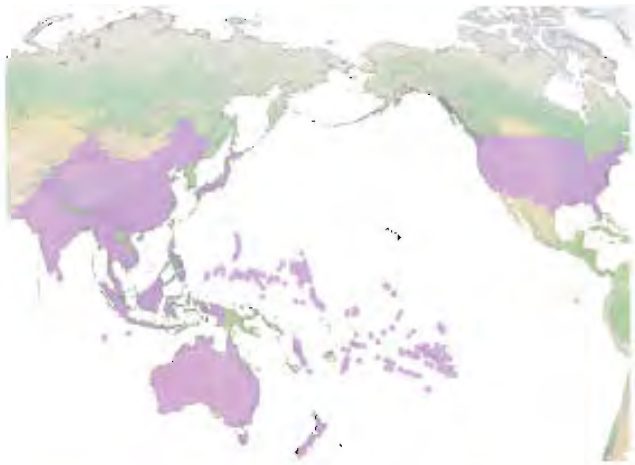
Synonyms : *Casuarina africana* Lour.
C. brunoniana Miq.

Common names : Australian beefwood, Australian-pine, beach she-oak, beef wood-tree

Casuarina equisetifolia is a deciduous tree with a soft, wispy, pine-like appearance. It resembles *Pinus* because of its small, round, cone-like fruits and scale-like leaves. This tree has been introduced worldwide for coastal landscaping. A single four- or five-year-old tree can produce thousands of winged seeds that are carried by wind to new colonization sites. Seeds remain fertile for a few months to a year and germinate under conditions of adequate moisture in four to eight days. Maximum growth is reached in 20 years with a maximum life span of 40 to 50 years. The tree is supported by a dense, spreading, fibrous root system.

Description : Tall trees, monoecious, trunk straight, crown conical, bark scaly, adaxially reddish brown on old trees, ultimate branchlets usually pendulous, greyish-green, 10 - 27 x 0.08 - 0.09 cm; articles 0.4 - 0.9 cm. Leaves scaly, appressed to branchlets, 6 - 8 per whorl, lanceolate or triangular, 1-3 mm. Male inflorescence 1-4 cm, cones ellipsoid, 1.2-2.5 cm, greyish-green or yellowish-brown, tomentose when young, glabrous at maturity, base and apex truncate to obtuse, apex of bracteoles slightly obtuse or acute. Female inflorescence 1-3 x 1-1.5 cm, short, cylindrical, conical or globose. Fruit a samara, grey or yellow, winged, 5 - 8 mm.

Habitat : Occurs in coastland, estuarine habitats, riparian zones, disturbed lands, rocky coasts, sand dunes and sandbars in tropical and subtropical climates. The tree frequently colonizes disturbed sites and its roots are capable of fixing nitrogen through microbial association. It is particularly common on alkaline, limestone-derived soils and nutrient-poor soils. The tree is tolerant of very saline conditions but grows best in slightly acidic sandy soils. It reaches maximum development in slightly depressional topography where adequate moisture is nearly always available. The tree can tolerate annual rain fall of 640 to 4 300 mm, temperatures of 22.1 to 26.9°C, and pH of 5.0 to 7.7.



Distribution : American Samoa, Australia, Bangladesh, 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, Malaysia, Marshall Islands, Myanmar, Nauru, New Caledonia, New Zealand, Niue, Northern Mariana Islands, Pakistan, Palau, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Thailand, Tonga, United States, Vanuatu, Viet Nam.

Threat and damage : *Casuarina* produces dense shade and a thick blanket of leaves and hard, pointed fruits that completely cover the ground beneath it. Dense thickets displace native dune and beach vegetation, including mangroves and others. Once established, it radically alters the light, temperature and soil chemistry regimes of beach habitats as it outcompetes and displaces native plant species and destroys the habitat of native insects and other wildlife. The ground below the tree becomes ecologically sterile, reducing the food value for native wildlife. *Casuarina* is a source of respiratory irritation in men. Also, its pollen can cause allergic reactions symptomized by eye irritation, runny nose and hoarseness or sore throat.

Uses : Widely planted for coastal reclamation, erosion control, tannin, pulp, timber and fuel. The wood is used for beams, boat building, electric poles, fences, furniture, tool handles and oars. The astringent bark extract is used as a remedy for diarrohoea and sore throat.

Management : Seedlings, saplings and young trees are best removed manually. Fire is effective only in dense stands with sufficient dry fuel on the ground. Prescribed fire has been used for large infestations in fire-tolerant communities. Raking and removal of leaf litter, cones and seeds should be done whenever possible. For heavier infestations, application of a systemic herbicide to bark, cut stumps or foliage is probably the most effective management tool. Triclopyr in diesel oil applied using the basal bark method or the hack-and-squirt method is most commonly used. Several pests such as *Lymantria xylina* Swinhoe and a root rot fungus, *Clitocybe tabescens* (Scop.) Bres. have potential for biocontrol but their efficacy is not clearly known.

Cedrela odorata L.

Native : West Indies South to the Amazon Basin

Family : Meliaceae

Synonyms : *Cedrela brachystachya* (C.DC.) C.DC.
C. brownii Loefl. ex Kuntze

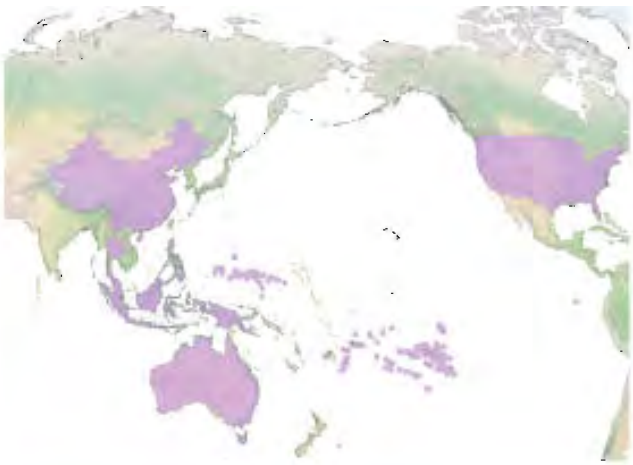
Common names : Barbados cedar, cigar box cedar, Mexican cedar, Spanish cedar

Cedrela is a plantation tree species widely cultivated in the tropics. It has been introduced into Indonesia, Peninsular Malaysia, Philippines, Singapore, Thailand, Pacific Islands and South Africa for the last several years. The tree has become invasive in some areas, especially where they are disturbed by cutting. Seed germination is vigorous and viability is up to 90 percent.

Description : Large trees, to 40 m tall, deciduous, monoecious, bole straight, cylindrical, bark fissured, reddish-brown especially near the base, greyish higher up, blaze purplish-red, branchlets finely to conspicuously lenticellate. Leaves alternate, paripinnate, leaflets 6-12 pairs, opposite to alternate, entire, ovate to oblong-lanceolate, 5 - 16 cm long, glabrous, base oblique, apex acute to shortly acuminate. Inflorescence a terminal panicle, flowers unisexual, white or cream tinged, red near the margin with well-developed vestiges of the opposite sex, subsessile, 6-9 mm long, garlic scented. Fruit a pendulous, reddish-brown capsule with five thin, woody valves, oblong-ellipsoid to obovoid, 2 - 3.5 cm long. Seed sharply angled or winged columella, 2 - 2.5 cm long.

Habitat : The tree tolerates a mean annual temperature of 22 - 26° C and rainfall of 1, 000 - 3, 700 mm. It can grow profusely from sea level to 1, 900 metres. It prefers fertile, free-draining, weakly acidic soil but tolerates heavy soil and soils with high calcium. *Cedrela* is common along roadsides and disturbed areas; it cannot grow in waterlogged or flooded areas. It is also found in primary and secondary evergreen to semi-deciduous lowland forests and lower montane rain forests.

Uses : Grown as a timber species for making furniture, doors and windows. The bark is used for medicinal purposes. The tree is resistant to insect attack due to the presence of a volatile oil in the wood. It makes excellent plywood and veneer and can be more widely used as a shade tree.



Distribution : American Samoa, Australia, China, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Indonesia, Malaysia, New Caledonia, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Thailand, Tonga, United States.

Management : In the Galapagos Islands, application of 50 percent picloram has been successful. Biological control is unknown.

Cenchrus clandestinus (Hochst. ex Chiov.) Morrone

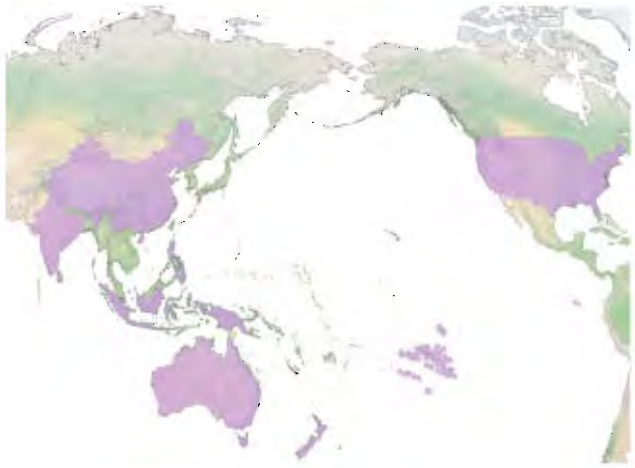
Native : Tropical East Africa

Family : Poaceae

Synonyms : *Pennisetum clandestinum* Hoechst. ex Chiov.
P. inclusum Pilg.

Common names : Kikuyo grass, kikuyu grass, West African pennisetum

Cenchrus clandestinus is a creeping grass which can be distinguished from other grasses by its extensively creeping rhizomes and stolons that form a dense mat. It is known as Kikuyu grass because the Kikuyu tribes live in its native area. It has no clearly visible inflorescence, only the white filaments and feathery stigmas are visible.



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

Description : Low, mat-forming, perennial grass, creeping by stout rhizomes, culms 30 - 120 cm tall, prostrate and rooting from nodes; internode short, profuse vertical leafy branches arise from stolon and rhizome. Leaf sheath overlapping, membranous to papery, pale brown, ligule a hairy rim, blades narrow, spreading, blunt to pointed, 1.25 - 5 x 0.3 - 0.4 cm, folded at first, later flat, margins rough. Panicle small, white or tawny, enclosed within short leaf sheaths resembling regular vegetative shoots. Spikelets in clusters of 2- 4, enclosed in the uppermost leaf sheath, terminal spikelet shortly stalked, others stalkless, spikelet surrounded by delicate bristles, unequal in length, inner bristles plumose, spikelets with two florets, slender, narrow, 1-2 cm long, whitish below, greenish above. Grain oblong, brown, 1.5-2.5 mm long. Seeds enclosed by leaf sheath.

Habitat : Grows well in moist, humid conditions and can withstand dry weather, frost and floods. It is common in open scrub land and on forest margins especially were the forest is disturbed. The plant grows up to 2, 700 m elevation in Eastern Africa.

Threat and damage : *Cenchrus* forms a dense mat through the thick network of rhizomatous roots and stolons. It thus prevents germination and growth of other species. The basal layer of dead leaves may support fires in fire-prone regions. The plant can kill small trees by smothering them and can choke ponds and waterways. Allelopathic toxins contained in the plant also affect the growth of native flora. The grass spreads vegetatively from pieces of rhizome. It also spreads through seeds.

Uses : Kikuyu grass is widely used for dairying in high altitude areas. It is also used as a lawn grass and for erosion control.

Management : Digging out may be effective but all rhizomes need to be removed. Glyphosate in water applied to wet the green foliage will give short-term control. The efficacy of the biocontrol agent viz., *Phakospora aroda* (Har. and Pat.) Mains, a rust fungus, released and established in Hawaii, is not yet known.

Cestrum parqui (Lam.) L'Hér.

Native : Central and South America

Family : Solanaceae

Synonyms : *Cestrum campestre* Griseb.
C. foetidissimum Jacq.

Common names : Green cestrum, green poison berry, willow-leafed jessamine

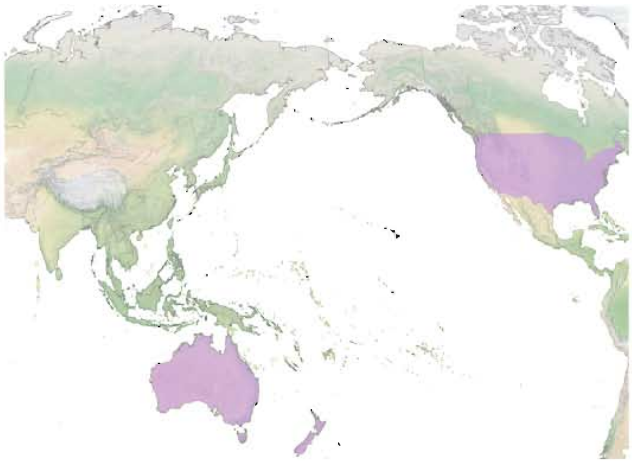
Cestrum parqui prefers moist habitats but is commonly found along roadsides and neglected, disturbed and abandoned sites. All parts of the plant are toxic and is responsible for the death of cattle, other animals and poultry around the world. It is also toxic to humans. The plant is long-lived and usually produces new growth in the spring. Seeds, which are generally dispersed by birds, will remain dormant in the soil for many years. The plant can regrow from cut root pieces. Its leaves emit a strong unpleasant smell when crushed.

Description : Perennial shrubs, to 2 - 3 m tall. Stem light green, brittle. Leaves simple, alternate, lamina 2 - 12 x 0.5 - 3 cm, lanceolate to narrow-ovate, minutely puberulent when young, glabrous at maturity, base attenuate or cuneate, apex acute to short-acuminate; petiole to 1 cm long. Inflorescence paniculate, dense, branches more or less puberulent. Flowers greenish-yellow or pale brownish-yellow, funnel-shaped, subsessile or shortly pedicellate, to 25 mm long, fragrant nocturnally. Fruit 7 - 10 x 6 - 8 mm, broad-ovoid to broad-ellipsoid (egg-shaped), glossy, black or purplish-black. Seeds, 1 - 2 per fruit, irregular in shape with sharp angles, 3 - 4 mm.

Habitat : Common in alluvial river flats, riverbanks and remnant bushland on both shale and sandstone soils and anywhere with warm atmospheric temperature and high rainfall. In its introduced range, the plant invades moist habitats along drainage lines and bushland pockets where thickets dominate preventing growth and regeneration of native species.

Threat and damage : It competes strongly with bush and pasture for living space. Because of its extensive shallow root system, vigorous regrowth and long life span of seeds, the plant is extremely difficult to control. On alluvial flats it is known to outcompete most native vegetation. The plant may cause contact dermatitis in some people.

Uses : Grown as an ornamental hedge plant.



Distribution : Australia, New Zealand, United States.

Management : Repeated cutting or digging up and removing all plant parts including roots are useful. Use of mulch to cover and suppress seedlings has also been successfully tried. Spot spray and basal bark application using picloram and triclopyr during late spring to early autumn is effective. Biological control is unknown.

Chromolaena odorata (L.) King & H. Rob.

Native : Tropical America

Family : Asteraceae

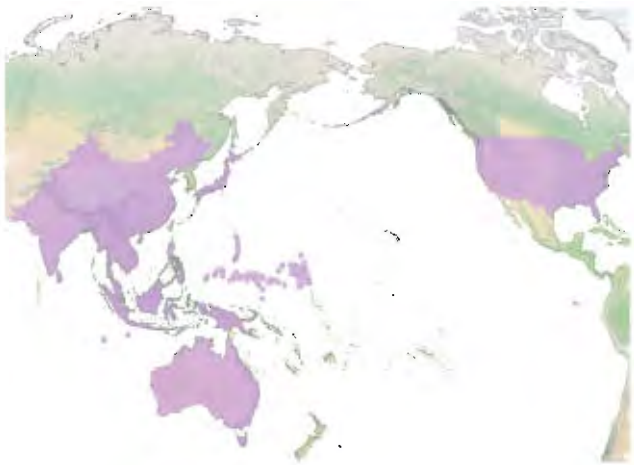
Synonyms : *Eupatorium clematitis* DC.
E. conyzoides Vahl., *E. odoratum* L.

Common names : Bitter bush, chromolaena, jack in the bush, Siam weed, triffid weed

Chromolaena odorata, a fast growing invasive shrub, was introduced inadvertently into the tropical regions of Asia, Africa and the Pacific. It can form dense stands that prevent the establishment of native plants. *Chromolaena* is one among the top 100 of the world's worst invaders. The plants can set seed within a year of growth. Seed production is prolific but the viability is only 20 - 46 percent. Seeds can survive up to five years, whether on the surface of the soil or buried. The root system is fibrous and does not penetrate beyond 20 - 30 cm in most soils.

Description : Perennial shrubs, 1.5 - 6 m tall, branches and branchlets glandular hairy. Leaves opposite, to 12 x 8 cm, ovate, acute at apex, cuneate at base, crenate, hispid, basally 2 or 3 nerved; petiole 2-3 cm long. Inflorescence heads to 1 cm in length, in terminal corymbose cymes; bracts 3 - 5, seriate, up to 8 mm long, ovate, obtuse, outer smaller, inner linear, acute, three-ribbed. Flowers few to many, similar, bisexual, ca. 5 mm long, white, tubular, five-lobed, pubescent at apex. Fruit an achene, ca. 4 mm long, linear, five-angled, scabrous, black; pappus many, 4 - 7 mm long, setaceous, yellowish. Seeds small, dark coloured, narrow, oblong, 3 - 5 x 1 mm.

Habitat : Grows on a wide range of soils and vegetation types. It is of common occurrence around peripheries of natural forests, in cultivated lands, abandoned or neglected fields, wastelands, grasslands, arid lands (with annual rainfall less than 500 mm), pastures, plantations, clearings, shrub jungles, nurseries, roadsides, riverbanks, thatched roofs, rocky areas, and slash and burnt areas. It has a negative relationship with tree canopy cover and appears to be most abundant on the edge of forested areas. In Northeastern India, the weed is regarded as a nutrient-demanding early successional species. It takes advantage of the flush of soil nitrogen that becomes available after a disturbance like fire or land clearing for agriculture and exhibits relatively high foliar nitrogen, phosphorus and potassium content.



Distribution : Australia, Bangladesh, Bhutan, Brunei, Cambodia, China, Christmas Island, Coco (Keeling) Islands, Federated States of Micronesia, Fiji, Guam, India, Indonesia, Japan, Lao PDR, Malaysia, Marshall Islands, Myanmar, Nepal, Northern Mariana Islands, Pakistan, Palau, Papua New Guinea, Philippines, Singapore, Sri Lanka, Thailand, Timor-Leste, United States, Viet Nam.

Threat and damage : As a major weed in fallow lands, plantations and croplands, chromolaena prevents establishment of native species due to competition and allelopathic effects. It is also a fire hazard in summer when the plants dry up. The plant can cause

asthma in allergy-prone people. Chromolaena shades and overtakes nesting sites creating fibrous root mats unsuitable for egg chamber and nest construction.

Uses : The plant is sometimes used in slash-and-burn agriculture to compete with *Imperata cylindrica* (L.) P. Beauv., which is harder to control. It is used in traditional medicine in countries like Indonesia. In India, young leaves of the plant are crushed, and the resulting liquid is used to treat skin wounds.

Management : Manual slashing and use of bush-cutter are common methods of physical control. Chemical control using herbicides applied at the seedling stage or on regrowth has given encouraging results. Triclopyr has proven to be the most effective among the herbicides. *Pareuchaetes pseudoinsulata* Rego Barros, a leaf-feeding insect, introduced into Guam and elsewhere, has been effective in controlling the weed. The stem gall fly *Cecidochares connexa* Macquart is also a suitable biological control agent and is released widely.

Cinnamomum camphora (L.) T. Nees & C. H. Eberm.

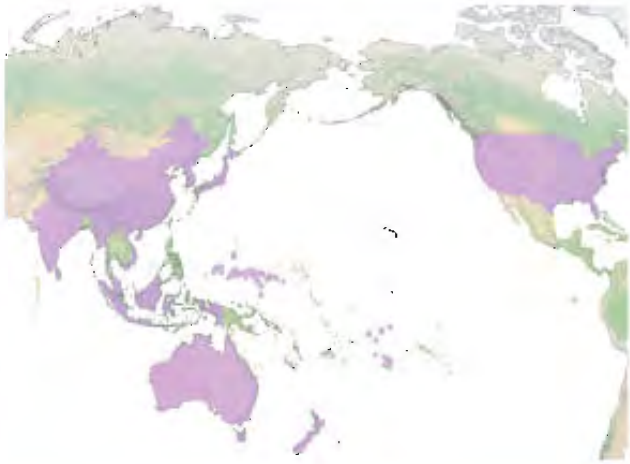
Native : East Asia

Family : Lauraceae

Synonyms : *Camphora camphora* (L.) H. Karst.
C. hahnemannii Lukman.
Laurus camphora L.

Common names : Camphor laurel, camphor tree

Cinnamomum camphora is a sturdy tree that can be used as a good windbreak. As it is hard to burn, it is valuable as a shade tree in areas that are prone to wildfires. The tree can be readily identified by the distinctive odour of the crushed leaves. The fruits, leaves and roots are toxic to humans in large doses. Major chemical compounds in wood and leaves of this tree are camphor, safrole, linalool, 1,8-cineole, a-pinene and a-terpineol. Seeds are easily spread by birds from cultivated areas to open forests. Spread to new locations is also aided by plant nursery sales.



Distribution : Australia, Bhutan, China, Cook Islands, Democratic People's Republic of Korea, Federated States of Micronesia, Fiji, Guam, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, New Caledonia, New Zealand, Republic of Korea, Singapore, Sri Lanka, United States, Viet Nam.

Description : Large trees, to 30 m tall, evergreen, whole plant strongly camphor-scented, bark yellow-brown, irregularly and longitudinally fissured; branchlets brownish, terete, glabrous, terminal buds broadly ovoid, bud scales broadly ovate or suborbicular, sparsely sericeous outside. Leaves simple, alternate, blade yellow-green or pale-green, glaucous abaxially, shiny adaxially, ovate-elliptic, 6-12x2.5-5.5cm, subleathery, three-nerved or inconspicuously five-nerved, mid-rib conspicuous on both surfaces, base broadly cuneate or subrounded, apex acute, margin cartilaginous, entire or sometimes undulate; petiole slender, 2-3 cm, glabrous. Inflorescence an axillary panicle, 3.5 - 7 cm; peduncle 2.5-4.5 cm, peduncle and rachis glabrous or grey-yellow-brown puberulent especially on the node, pedicels 1 - 2 mm, glabrous. Flowers greenish-white or yellowish, approximately 3 mm long. Fruit a drupe, purple-black, ovoid or subglobose, 8 - 10 mm across.

Habitat : The tree prefers fertile, sandy soil. It will tolerate a pH anywhere in the range of 4.3 to 8, and will grow in full sun or partial shade. Established trees are tolerant of drought but growth is poor in wet soil. It is common in open wood lands, rain forest margins, riparian zones, near roadsides and fence rows. The tree has an excellent adaptation to disturbed sites and easily becomes naturalized where planted.

Threat and damage : Camphor in large doses is toxic to humans. It stimulates the central nervous system

and may affect respiration or cause convulsions. In Chinese medicine, camphor is forbidden for pregnant women and those with a deficiency of vital energy. The tree is a prolific seed producer that apparently does not have serious predators or diseases outside its native range. Seedlings and root sprouts are abundant near mature trees, but individual trees occur far from seed sources. The tree grows like a weed, infesting forests and displacing native trees. It can form single-dominant stands that delay or preclude native rain forest regeneration.

Uses : Grown as a shade tree, screen or windbreak. Old leaves are dried and used as a spice. The wood and leaves are analgesic, antispasmodic, odontalgic, rubefacient and stimulant. An infusion is used as an inhalant in the treatment of colds and diseases of the lungs. An oil extracted from the tree is anthelmintic and cardiotonic. The sweetly-scented wood contains camphor.

Management: Small seedlings of the tree can be hand-pulled or grubbed out. It is important that the roots are removed otherwise the tree could regrow. Foliar spray with herbicides on young trees up to 3 metres tall is effective. Basal bark or cut stump herbicide treatments are effective for small trees with no multiple stems. Biological control is unknown.

Cirsium arvense (L.) Scop.

Native : Europe and West Asia

Family : Asteraceae

Synonyms : *Breea arvensis* (L.) Less.
B. dioica (Cass.) Less.
Cardus arvensis (L.) Robson

Common names : Californian thistle, Canadian thistle, creeping thistle

Cirsium arvense is one of the most noxious and economically-destructive agricultural weeds in the world. It is distinguished from other thistles by creeping horizontal lateral roots, dense clonal growth and small dioecious flowers. It spreads primarily by vegetative means, and also by seed which is produced in huge numbers. The seeds spread as a contaminant in agricultural seeds, cattle and horse droppings and on farm machinery. They are also dispersed through wind and water. Vegetative spread is through horizontal growth of root system.

Distribution : Australia, China, Democratic People's Republic of Korea, Hong Kong S.A.R., India, Japan, Mongolia, New Zealand, Pakistan, Republic of Korea, Russian Federation, United States.

Description : Perennial subshrubs with deep-seated creeping roots, to 1 m tall, dioecious, stems one to many, erect, glabrous to appressed, grey-tomentose. Leaves oblong to elliptic, 3-30 × 1-6 cm, margins revolute, entire, spinulose, dentate, or shallowly pinnatifid, lobes well separated, main spines 1 - 7 mm, abaxial faces glabrous or densely grey-tomentose, adaxial green; petioles narrowly winged, bases tapered, principal larger cauline proximally winged-petiolate, distally sessile, well distributed, gradually reduced, not decurrent, distal cauline, bract-like, entire, toothed or lobed, spinulose. Inflorescence head, one to many, borne singly or in corymbiform or paniculiform arrays at tips of main stem and branches; peduncles 0.2 - 7 cm. Flowers white or pink, flask shaped, 1-1.5 cm in diameter, 1-2 cm long. Female flowers fragrant, male flowers smaller then female, not fragrant. Fruit an achene, 3 - 5 mm long, feathery basally.

Habitat : Common on roadsides, open fields, disturbed habitats, croplands and pastures, in deep, well-aerated, mesic soils. It occasionally occurs in relatively dry habitats, as well as on the edges of wet habitats. The plant can tolerate salty soils but cannot tolerate waterlogged and poorly aerated soils.

Threat and damage : *C. arvense* threatens natural communities by directly competing and displacing

them; it also decreases species diversity, and changes the structure and composition of some habitats. Infestation by the weed reduces crop yield through competition for water, nutrients and minerals, and through interference with harvests. The plant hosts various pests and pathogens.

Uses : The nectar of the flower is a good source of honey. The root is a tonic, diuretic, astringent, antiphlogistic and hepatic. American Indians use the roots of the plant for treating mouth diseases and the flowers for making honey. It is also used for treatment of tuberculosis and as a tonic for gastrointestinal ailments.

Management : Repeated mowing at three-week intervals will weaken the plant and prevent flowering and seed production. Repeated burning has shown some reduction in old, established stands of the weed. Spot application of the amine formulation of 2,4-D using a wick applicator or hand sprayer can control individual stems. Foliar application of glyphosate in spring is effective. Currently, there are no effective biological control organisms available. Sheep and cattle graze on this weed when young and tender, helping to deplete the root reserves.

Citharexylum spinosum L.

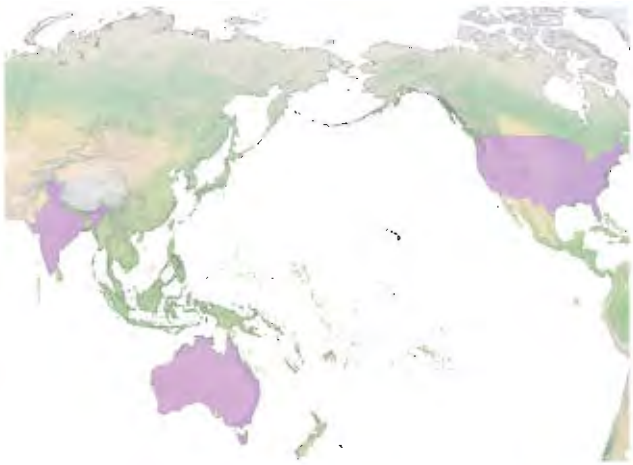
Native : The Carribbean

Family : Verbenaceae

Synonyms : *Citharexylum bahamense* Millsp. ex Britton
C. broadwayi O.E. Schulz ex. Urb.

Common names : Fiddlewood, Florida fiddlewood, spiny fiddlewood

Citharexylum spinosum is widely grown for its attractive foliage, which turns orange in colour prior to dropping, and fragrant flowers. It can form dense thickets that choke out other vegetation. The roots are very aggressive in growth and cause damage to pipes and underground services. The plant is propagated by seeds or stem cuttings.



Distribution : Australia, Fiji, French Polynesia, India, New Caledonia, Singapore, United States.

Description : Large shrub or small trees, deciduous, to 12 m tall. Leaves simple, opposite, decussate, estipulate, petiole 12 - 25 cm long, slender, grooved above, glabrous, orange-yellow in colour, lamina 10 - 18 x 4.5 - 7 cm, elliptic, elliptic-oblanceolate, elliptic-lanceolate or ovate, base acute or attenuate, apex acute or acuminate, margin entire, glabrous, coriaceous, six to nine pairs of lateral nerves, pinnate, prominent, intercostae reticulate. Flowers bisexual, white, in pendulous racemes, up to 20 cm long, bracts linear, 1.5 mm, cauducous; pedicel up to 3 mm. Fruit a drupe, to 8x6 mm, oblong, fleshy, reddish-black, often apiculate.

Habitat : The plant is common in coastland, disturbed sites and agricultural areas but prefers wet habitats for good growth. It also grows in dry habitats where it adapts by dropping its leaves during the dry season. The plant exhibits good growth in full sun but also tolerates some shade.

Threat and damage : It can form a dense canopy cutting sunlight to plants below, thus affecting their growth.

Uses : Cultivated as an ornamental in many tropical and subtropical regions. The wood is used to make stringed instruments such as fiddles and for making cabinets.

Management : If cut and left untreated, it will grow back. Herbicides are effective if applied on the cut end. A tree hopper viz., *Aconophora compressa* Walker, released in Australia in 1995, is effective as a biocontrol agent.

Clematis vitalba L.

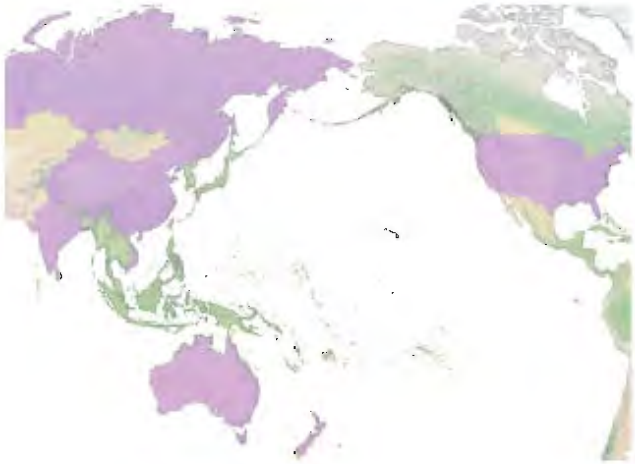
Native : Africa and West Asia

Family : Ranunculaceae

Synonyms : *Anemone vitalba* (L.) K. Krause
Clematis bannatica Schur

Common names : Old man's beard, travelers joy

Clematis vitalba is a perennial deciduous vine with climbing, woody stems. A variety of understorey trees and shrubs are reported to be severely diminished by infestation of this weedy vine. The flowers produce nectar which attracts insects. Seed dispersal is by wind, water, people and animals. Vegetative propagation is common.



Distribution : Australia, China, India, New Zealand, Russian Federation, Sri Lanka, United States, Viet Nam.

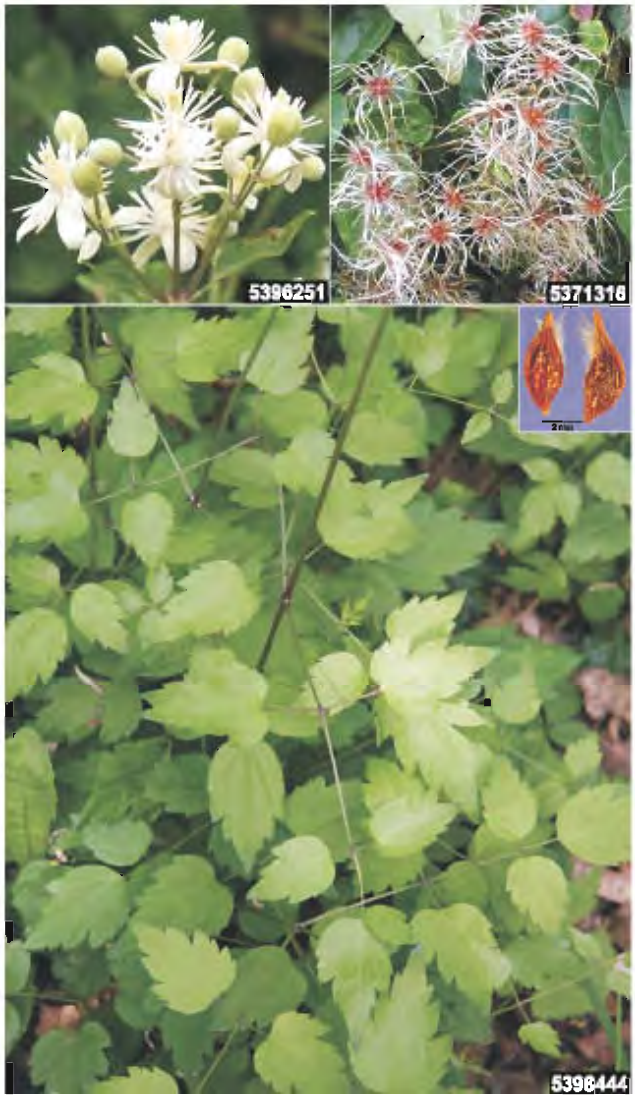
Description : Climbing shrubs, petiole and leaf-rachis tendrillate. Leaves pinnately 5-foliolate, leaflets cordiform, 4 - 8 × 3 - 5 cm, margins entire to regularly crenate or dentate, abaxially minutely pubescent on veins, adaxially glabrous. Inflorescences axillary and terminal cymes, 5-22 flowered. Flowers bisexual, creamy white; pedicel 1-1.5 cm, slender. Fruit an achene, nearly terete, densely pubescent, beak approximately 3.5 cm.

Habitat : *Clematis* is generally found in wastelands, coastal and lowland areas, disturbed lands, grass lands, urban areas and margins and openings of forested land. It requires highly fertile soils with good drainage for robust growth.

Threat and damage : The vine can climb up forest trees and smother them, forming a dense, light-absorbing canopy that suppresses all vegetation beneath it. The growth of the vine is so vigorous that the weight of foliage and stems can break the supporting trees, reducing once healthy forest to a low, long-lived thicket of vines scrambling over stumps and logs.

Uses : Usually grown as an ornamental plant. The leaves are analgesic, diuretic and rubefacient. The boiled roots and stems are used as a cure for pruritus.

Management : Mechanical control is effective if stem bases and roots are dug out in winter and seedlings are manually removed. Application of glyphosate is recommended for control of new growth. *Phytomyza vitalbae* Kaltenbach, an insect, was released in New Zealand for biocontrol of the weed but further information on its efficacy is not known.



Clidemia hirta (L.) D. Don

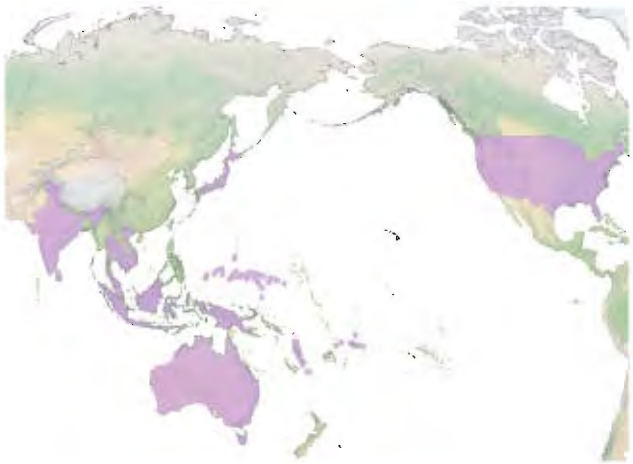
Native : Central and South America

Family : Melastomataceae

Synonyms : *Clidemia crenata* DC., *Melastoma hirtum* L.

Common names : Koster's curse, soap bush

Clidemia hirta, a densely branching shrub, is an aggressive invader of forest gaps in disturbed and un-disturbed forests in the tropics impeding regeneration of native plants. The Global Invasive Species Database has ranked this species among the top 100 of the world's worst invaders. A single plant can produce more than 500 berries per year and each fruit contains over 100 seeds. Seeds remain dormant for up to four years in the soil.



Distribution : American Samoa, Australia, Bhutan, Brunei, Cambodia, Federated States of Micronesia, Fiji, Guam, India, Indonesia, Japan, Malaysia, Palau, Papua New Guinea, Samoa, Singapore, Solomon Islands, Sri Lanka, Thailand, United States, Vanuatu, Viet Nam, Wallis and Futuna Islands.

Description : Perennial shrubs, branchlets rounded, covered with large reddish hairs. Leaves opposite, 5 - 16 x 3 - 8 cm, ovate to oblong-ovate, apex acute to short-acuminate, base rounded to subcordate, subentire to crenulate-denticulate basally, 5 - nerved, upper surface sparsely strigose, lower surface finely bristly, margins ciliate; petioles 0.5-3 cm long. Flowers white, arranged in axillary or terminal clusters, 8 - 11 x 4 - 5 mm, glabrous, hypanthium 3 - 3.5 mm long, sparsely or finely bristled, usually with a mixture of gland-tipped and stellulate hairs, receptacle with a conspicuous ring of fimbriate scales surrounding style. Pedicels 0.5 - 1 mm long in fruit. Fruit a berry, 6 - 9 mm across, dark blue, purplish or blackish in colour. Seeds light brown, 0.5 - 0.75 mm long, covered in stiff spreading hairs when young.

Habitat : The plant colonizes open areas disturbed by humans such as pastures, riversides, roadsides and forest margins. It prefers humid tropical climates and is capable of invading rain forests.

Threat and damage : The plant grows and spreads very quickly by producing many seeds, displacing native plants that grow in shaded habitats. It rapidly invades disturbed habitats, often foraged by feral pigs, altering natural regeneration by forming impenetrable thickets and developing monotypic stands. The plant also has the ability to invade undisturbed habitats, although population levels usually remain low in this case. It disrupts grazing land and the speedy growth of its thickets creates physical barrier to humans and animals.

Uses : Widely used as an ornamental.

Management : Manual weeding is effective to control small populations. Cutting at the base and treating the cut end using water-based triclopyr immediately after cutting is effective. A thrip, *Liothrips urichi* Karny, works well as a biocontrol agent in open areas, but not in the shade of forests. A beetle, *Lius poseidon* Napp and the moths *Antiblemma acclinalis* Hübner, *Carposina bullata* Meyrick and *Mompha trithalama* Meyrick are being tested for efficacy as biocontrol agents. *Colletotrichum gloeosporioides* (Penz.) Penz. & Sacc. isolated from diseased leaves of *C. hirta* in Panama was shown to be a highly aggressive pathogen.

Coccinia grandis (L.) Voigt

Native : Tropical Africa and South and Southeast Asia

Family : Cucurbitaceae

Synonyms : *Bryonia acerifolia* D. Dietr.
B. alceifolia Willd., *B. grandis* L.

Common names : Ivy gourd, scarlet-fruited gourd

Coccinia grandis is an aggressive vine that smothers native vegetation in the invaded areas forming a dense canopy. It acts as a host for melon fly and is a reservoir for other crop pests. Spread of the plant is through cuttings or bird-dispersed seeds.

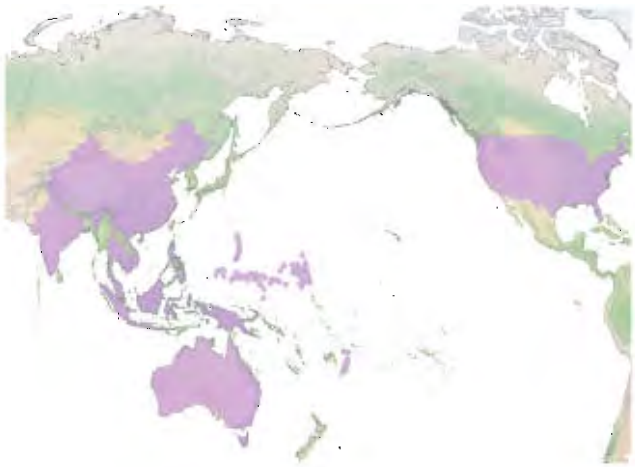
Description : Robust vines, stem many branched, cylindrical, glabrous or white scaly. Leaves simple, alternate, 5 - 10 x 3 - 7 cm, cordate, usually entire with a few glistering glands on both sides of the midrib towards the base; petiole slender, striate, 2 - 5 cm long. Flowers white, to 4 cm across, pedicellate, solitary, male and female on different plants. Fruit cylindrical or fusiform, 2.5 - 5 x 1.2 - 2.5 cm, bright scarlet when ripe, slightly beaked, many seeded. Seeds asymmetrically pyriform in outline, approximately 6 x 4 mm, compressed.

Habitat : Commonly seen in wastelands, cane fields and roadsides. It can invade dry rain forests of the monsoon zone, agricultural areas, natural forests, planted forests, ruderal/disturbed and riparian vegetation.

Threat and damage : An aggressive invader that can overgrow and prevent growth of indigenous vegetation. As it has an extensive tuberous root system, mechanical control is often difficult.

Uses : Young leaves and long slender stem tops are cooked and eaten or added to soups. The tender fruits are used raw in salads or cooked and added to curries. The juice of roots and leaves is considered effective in treating diabetes. The plant is a laxative. It is also used in a preparation for treating gonorrhea.

Management : Cutting has little effect in controlling the weed. Glyphosate is only effective against young plants. Because of its climbing habit, use of foliar herbicides is difficult without causing damage to the underlying vegetation. The knockdown of foliage using herbicides followed by basal stem treatments when the plants begin to resprout may be successful. Three natural insect enemies of the weed, viz., a clearwing moth, *Melittia oedipus* Oberthur and two



Distribution : Australia, Cambodia, China, Federated States of Micronesia, Fiji, Guam, India, Indonesia, Malaysia, Marshall Islands, Northern Mariana Islands, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Thailand, Tonga, United States, Vanuatu, Viet Nam.

weevils, *Acythopeus coccinae* O'Brien & Pakaluk and *A. burkhartorum* O'Brien & Pakaluk, were introduced in to the Hawaiian Islands from East Africa to control *Coccinia*.

Cortaderia jubata (Lem.) Stapf

Native : South America

Family : Poaceae

Synonyms : *Cortaderia atacamensis* (Phil.) Pilg.
Gynerium jubatum Lemoine ex Carrière

Common names : Andean pampas grass, cutty grass, jubata grass, pampas grass

Distinctive features of *C. jubata* are huge, nodding, pinkish or purplish flower plumes, and dark green, 1-cm-wide drooping leaves with razor-like margins. The plant's breeding system is termed agamospermous apomixis, which allows it to asexually produce seeds. Much of the invasive potential of the grass arises from its ability to produce thousands of wind-borne seeds annually. The normal life span of the plant is 10 to 15 years.

Distribution : Australia, New Zealand, United States.

Description : Tussock grass, culms 2 - 7 m tall. Leaves bright green, sheath hairy, sometimes densely, ligules 1 - 2 mm, blade 150 - 200 x 2 - 10 cm, mostly flat, often horizontal, dark green, abaxial surfaces hairy near the base. Inflorescence of panicles, 30 - 100 cm, elevated well above the basal foliage, deep violet when young, spikelets 14-16 mm, pistillate; florets readily disarticulating, calluses about 0.6 mm, lemmas about 10 mm, long-attenuate. Fruit caryopsis, up to 2.5 mm.

Habitat : Prefers disturbed areas, clearings, sand dunes, roadsides, grasslands, pastures and alpine shrublands. However, its habitat requirements are broad and it will grow vigorously in nearly any soil, under low or high moisture regimes, and in full sun or dense shade. It flourishes in coastal areas and needs at least some summer moisture from fog and freedom from freezing temperatures.

Threat and damage : Being a highly competitive grass it is a major threat to the ecological quality of preserves, particularly in coastal and grassland sites. Its rapid growth and accumulation of above- and belowground biomass affect growth of other vegetation. The plant can be damaging to threatened habitats such as coastal sand dunes and inland sand hills that contain a number of rare and endangered plant species. It hampers visibility due to the dense growth of the thickets and its sharp leaves cause serious injury to humans. The plant is also a fire hazard because of the large amount of dry matter it produces. The thickets of the grass harbours pests such as rats, mice and rabbits. Additionally, the seeds

stick to edible fruits, seriously degrading fruit quality.

Uses : A popular landscaping plant for its attractive plumes. It provides green forage during dry months.

Management : Physical removal of the plants is effective at the seedling stage but this type of control is time consuming and labour-intensive. Prescribed burning has also been suggested as a method to control *Cortaderia*. The plant is sensitive to glyphosate when aerially applied to wet all plant surfaces. Cattle grazing is used in pine plantations in New Zealand to control the grass.

Cryptostegia grandiflora Roxb. ex R. Br.

Native : Madagascar

Family : Apocynaceae

Synonyms : *Cryptostegia grandiflora* var. *tulearensis* Costantin & Gallaud

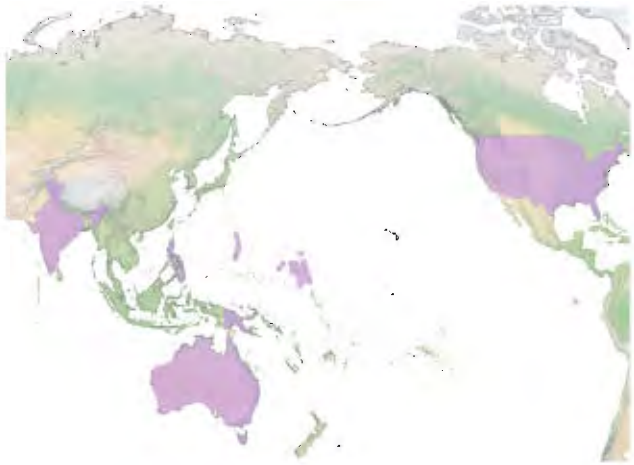
Common names : Indian rubber vine, palay rubber vine, purple allamanda, rubber vine

Cryptostegia grandiflora is a self-supporting, woody, perennial vine that is capable of growing over trees, smothering and pulling them down. It was introduced in several countries either for ornamental purposes or for its latex. A milky sap oozes from stems, leaves and seedpods of the plant when cut or broken. The plant can decrease water catchments due to increased transpiration resulting in lack of water for trees and native vines, which in turn leads to loss of biodiversity and habitat. It is grown as an ornamental plant in several parts of India but so far has not been found to invade and grow outside gardens. Seed dispersal is through wind and water.

Description : Evergreen suberect or climbing shrubs, branches terete, nodes sarmentose, lenticelled, warty. Leaves simple, opposite, 4 - 8 x 3 - 5 cm, exstipulate, subcoriaceous, elliptic, apex obtuse, base subacute, glabrous on both surfaces, dark green, glaucous above, pale beneath, ten to 12 pairs of lateral nerves; petioles 1-1.5 cm long, compressed, glabrous. Flowers 6 -7 cm long, 50 mm in dimeter, funnel-shaped, purple or whitish tinged with light purple, in few-flowered, terminal, dichotomous cymes; pedicels 1 - 1.5 cm long, stout, minutely pubescent, terete. Fruit a pod, 300 - 850 seeded, rigid, in pairs at the end of a short stalk, 10 - 12 x 3 - 4 cm. Seeds brown, 5.2 - 9.7 x 1.6 - 2.8 mm, ovate, glabrous, with silky-white crown of hairs.

Habitat : The plant can invade dry forests, agricultural areas, planted forests, grasslands, roadsides and openings of moist rain forests at low elevations. It is common in disturbed situations where there is temporary or permanent water, such as along gullies, rivers, creeks, waterholes and salt marsh areas.

Threat and damage : Indian rubber vine is poisonous to cattle, sheep, goats and horses if consumed and its rampant growth may restrict their access to water points. The plant is capable of smothering and pulling down riverside vegetation and choke waterways.



Distribution : Australia, Fiji, Guam, India, Marshall Islands, New Caledonia, Northern Mariana Islands, Papua New Guinea, Philippines, Singapore, United States.

Also, its impenetrable thickets reduce productivity of crops and pastures.

Uses : Grown as an ornamental and for its latex.

Management : Hand-pulling is practical only on a small scale. Burning is useful for short-term control. Herbicides like triclopyr, picloram and 2,4-D amine or mixtures of these herbicides are recommended either as foliar and stem sprays or basal bark treatments. Stem injections with picloram or hexazinone also give good results. Biological control of the vine using the rust fungus *Maravalia cryptostegiae* (Cummins) Y. Ono has been successful in Australia. Larvae of the moth *Euclasta whalleyi* Popescu-Gorj & Constantinescu, which feeds on leaves of the vine, is also a potential biocontrol agent.

Cuscuta reflexa Roxb.

Native : Asia

Family : Convolvulaceae

Synonyms : *Cuscuta elatior* Choisy
C. grandiflora Wall.

Common names : Giant dodder, Indian dodder

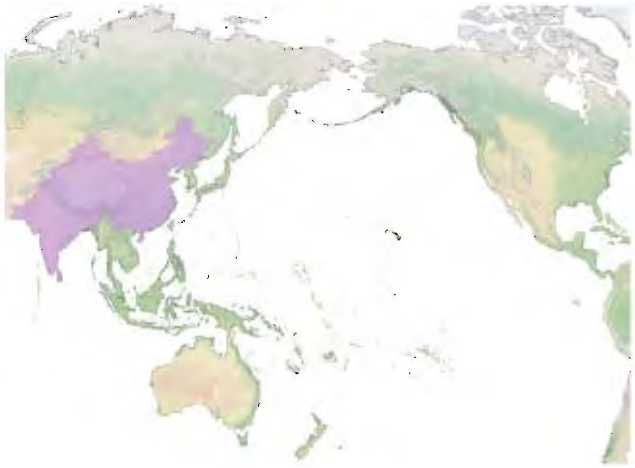
Cuscuta reflexa is a perennial, parasitic climber capable of persisting on its woody hosts for years. The leaves are reduced to scales and contain low levels of chlorophyll. It is considered a troublesome weed in many countries. The plant uses airborne chemical cues to locate its host plants. The seeds can survive in the soil for 5-10 years or more. Germination occurs without a host and the climber grows quickly towards a green plant.

Description : Leafless stem parasites, stem yellow or yellowish-green, stout, 0.2 - 0.3 cm in diameter, with brown spots. Leaves reduced to scales. Inflorescence lateral, few to many flowered, in racemes or panicles, 1.5 - 3 cm, branched. Flower white or creamy, fragrant, tubular, 5 - 9 mm, bracts and bracteoles scale-like; pedicel 2 - 4 mm, together with peduncle, brown-spotted. Fruit a capsule, conical-globose, subquadrate when mature, 5 - 10 mm in diameter, circumscissile. Seeds, 1 - 4, dark brown, oblong, ca. 4 mm.

Habitat : Common in open areas in a variety of soil types. However, it prefers moist soil for proliferation.

Threat and damage : The plant is an obligate holoparasite which utilizes the food reserve of the host plant and smothers it. It is a serious weed of many crops in several countries in the Asia-Pacific region. It smothers another invasive weed viz., *Sphagneticola trilobata*. *Cuscuta* wraps itself around the host species as soon as it reaches close proximity and produces a haustorium that is inserted into the vascular system of the host. It can grow continuously and may reach to the top of the canopy. It weakens the host plant by decreasing the resistance of the host against viral diseases. *Cuscuta* also spreads plant disease from one host to another if attached to more than one plant.

Uses : The stem of *Cuscuta* is used to treat bilious disorders. The whole plant is a purgative. It is also used in treating protracted fevers, body pain and itchy skin. The plant is utilized in traditional medicine like Ayurveda and Unani.



Distribution : Bangladesh, Bhutan, China, India, Nepal, Pakistan, Sri Lanka.

Management : Many countries have prohibited import of *Cuscuta* seeds. Use of pre-emergent herbicide like dacthal is effective in controlling the weed. Biological control is unknown.

Cyathea cooperi (Hook. ex F. Muell.) Domin

Native : Australia

Family : Cyatheaceae

Synonyms : *Alsophila australis* R. Br. var. *cervicalis* F.M. Bailey
A. australis R. Br. var. *excelsa* F.M. Bailey

Common names : Australian tree fern, lacy tree fern, scaly tree fern, straw tree fern

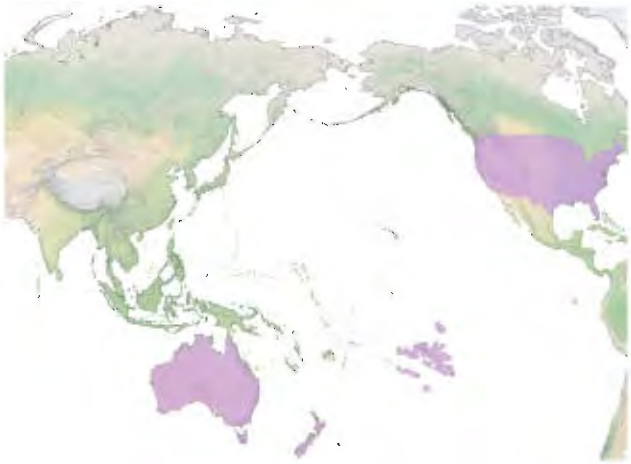
Cyathea cooperi is one of the most commonly grown tree ferns in gardens and commercial landscaping. It is quite distinctive from *C. australis* (R. Br.) Domin in that it has a more slender trunk with distinctive 'coin spots' where old fronds have broken off the trunk. The apex of the trunk and unfurling crosiers are very attractive as they are covered with conspicuous, long, silky, straw-coloured scales. This plant is a problem in Hawaii because it displaces native ferns. The spores are dispersed by wind.

Description : Tree fern, densely scaly, caudices slender, erect, to 6 m tall, 7 - 12 cm in diameter. Fronds to 4 m long, leaving oval scars on caudices after falling; stipes with scattered tubercles, scales at base, deciduous, older stipes naked, of two types: larger, to 40x2 mm, white, papery, with small dark red marginal spines, and smaller, ca. 10 x 0.1 mm, dark red or brown, margin minutely spiny with interrupted white line of aerophores along both sides of the stipes. Blades 2 or 3, pinnate at base, green or light green above, paler below; rachises with dark brown, obtuse tubercles; pinnae to 65 x 26 cm; pinnules stalked, tips acuminate, ultimate segments deeply pinnatifid to one-pinnate, segment lobes falcate, margins irregularly-toothed or, rarely, deeply-lobed, veins one-forked. Sori medial, round, 2-10 per segment, paraphyses abundant, hairs long , lacking indusia.

Habitat : Grows in tropical and subtropical rain forests to montane forests, in open areas, near streams, and in mountain gullies from sea level to 1 400 metres or above. It cannot withstand heavy frost, which may kill the fronds. The plant prefers protected, shady moist conditions but can grow in sunny areas as well.

Threat and damage : Being a fast-growing tree fern, *Cyathea* displaces native vegetation by forming dense stands.

Uses : Grown as an ornamental and for commercial landscaping.



Distribution : Australia, French Polynesia, New Zealand, Singapore, United States.

Management : Spraying of the herbicides dicamba and 2,4-D directly on the stem terminals is effective. Physical and bio-control methods are unknown.

Dalbergia sissoo Roxb. ex DC.

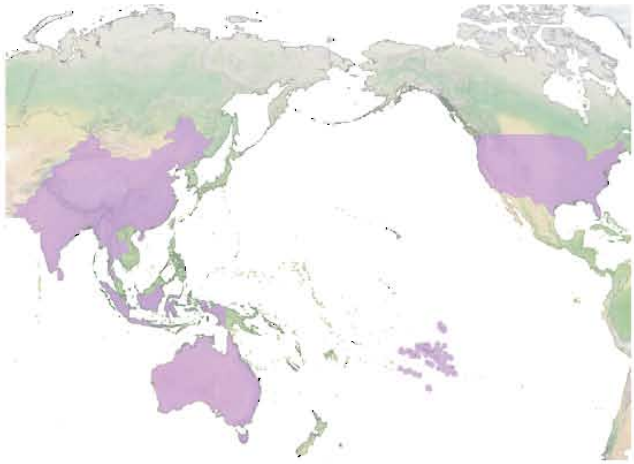
Native : Bhutan, India, Myanmar, Nepal, Oman, Pakistan

Family : Fabaceae

Synonyms : *Amerimnon sissoo* (Roxb.) Kuntze

Common names : Bombay blackwood, Himalayan raintree, Indian dalbergia, Indian rosewood

Dalbergia sissoo is a premier timber species that is also used as fuelwood, for shade, shelter and fodder. This nitrogen fixing tree has been widely introduced and planted in several countries throughout world. However, it is regarded as a noxious weed in Australia and Florida, United States. Roots are dimorphous. Seeds are dispersed through wind and water. Seed viability is poor and germination occurs within three weeks in spring. Vegetative propagation is through suckers arising from the root system.



Distribution : Australia, Bangladesh, Bhutan, China, French Polynesia, India, Indonesia, Myanmar, Nepal, New Caledonia, Pakistan, Sri Lanka, Thailand, United States.

Description : Medium trees, deciduous, bark rough, longitudinally furrowed, young branches pubescent. Leaf imparipinnate, rachis 3.7 - 7.5 cm long, leaflets 3.5 -6.5 cm long, broadly ovate or suborbicular, acuminate, glabrescent; petiolule 0.5 - 0.8 mm long, stipules 5 mm long. Inflorescence an axillary panicle, composed of several short spikes with sessile to subsessile flowers. Flowers yellowish-white, bract small, pubescent, caducous. Fruit a pod, 3.7 - 10 x 0.7 - 1.3 cm, strap-shaped, glabrous, 1-4 seeded. Seeds flattened, bean-shaped, pale brown, reniform, compressed, with papery testa and sometimes germinating readily in the pod.

Habitat : The tree is primarily found in agricultural areas, along riverbanks, in natural forests, planted forests and urban areas from sea level to 1, 500 metres. It can tolerate various soil types ranging from pure sand and gravel to the rich alluvium of riverbanks. It can grow in slightly saline soils and can withstand light freezing temperatures. Seedlings are intolerant to shade but mature trees can withstand moderate shade. The average rainfall required by the tree is up to 2, 000 mm and it will tolerate drought of three to four months.

Threat and damage : *D. sissoo* invades disturbed and undisturbed areas as well as hardwood forests and pine rockland habitats in Florida. It crowds out native plants and regenerates profusely in new areas.

Uses : *D. sissoo* is a highly valuable timber and fuelwood. It is grown along field boundaries of agricultural crops, around fruit orchards and as windbreaks and shelterbelts. It is used as a stimulant in folk medicine and remedies. It reduces soil erosion, improves soil fertility and provides fodder. The leaf powder mixed with *Aegle marmelos* fruit powder is a good medicine for diarrhoea in calves. In Cameroon, some ethnic groups use young leaves as food. The root suckers and runners make it useful for erosion control in gullies. An ethanolic extract of the fruits is a molluscicide effective against the eggs of the freshwater snail *Biomphalaria pfeifferi* Krauss.

Management : Fire is a good control option. Herbicidal applications to the base of the trunk, cut stem and by tree injection are effective. Biological control is unknown.

Delairea odorata Lem.

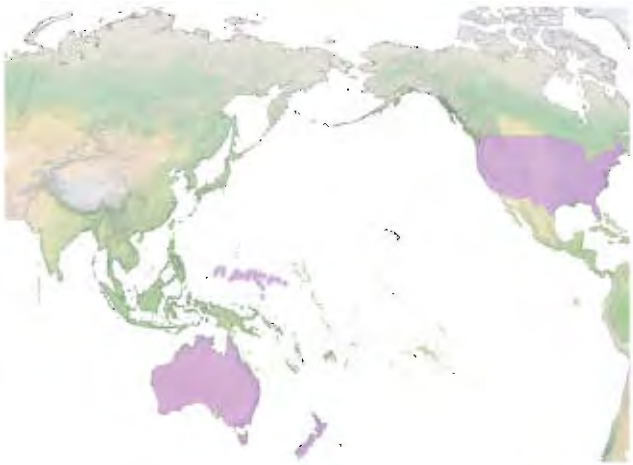
Native : South Africa

Family : Asteraceae

Synonyms : *Delairea scandens* Lem.
Senecio mikanioides Otto ex Walp.

Common names : African ivy, cape ivy, German ivy, Italian ivy, parlor ivy

Delairea odorata is an aggressive and smothering vine widely used in landscaping. It often escapes from cultivated areas and invades different habitats spreading both vegetatively and through seeds. The plant is very hard to control physically because the fragments of the stem can re-sprout. Propagation is through seeds and stem cuttings. Long-distance dispersal is aided by men. Seeds are wind-dispersed. Rhizomes grow to a depth of 90 cm.



Distribution : Australia, Federated States of Micronesia, New Zealand, United States.

Description : Perennial climbing or creeping vines, to 6 m long, woody at base, rhizomatous. Leaves simple, alternate, lamina 5 - 10 x 3 - 6 cm, glabrous, broadly deltate, palmately-veined, semi-succulent, shallowly 3 - 10 lobed; petiole 1.5 - 7 cm long. Inflorescence a head. Flowers yellow, grouped on terminal and axillary cymes, ray florets absent, disk florets 4 - 5 mm long, arranged in clusters. Fruit an achene, ca. 2 mm long, reddish brown, often with a pappus or a crown of hairs.

Habitat : Common in natural moist forests, coastal areas, riparian zones and wetlands. It can grow in full sunlight or in shade and can establish in dry and moderately wet areas. The plant is tolerant to drought, freezing temperatures and high soil pH.

Threat and damage : The fast and dense growth of the vine smothers trees and shrubs and inhibits their growth. It can also cover the ground intensively over a wide area, thereby preventing seeds of native plants from germinating. The dense vegetation also displaces burrowing shorebirds by taking available space used for nesting. It increases soil erosion along watercourses due to its shallow root system, which cannot hold soil. *D. odorata* contains substances toxic to humans, mammals and fish.

Uses : Grown as an ornamental for its dense foliage.

Management : Hand-pulling small plants or digging out roots are useful. Foliar application of glyphosate plus triclopyr or a clopyralid herbicide are effective. A galling fly (*Parafreutreta regalis* Munro), a small leaf-mining moth (*Acrolepia* sp.) and a defoliating moth (*Diota rostrata* Wallengren) are potential biocontrol agents.

Dipogon lignosus (L.) Verdc.

Native : South Africa

Family : Fabaceae

Synonyms : *Dolichos capensis* Thunb.
D. gibbosus Thunb., *D. lignosus* L.

Common names : Australian pea, dolichos pea, mile-a-minute, okie bean

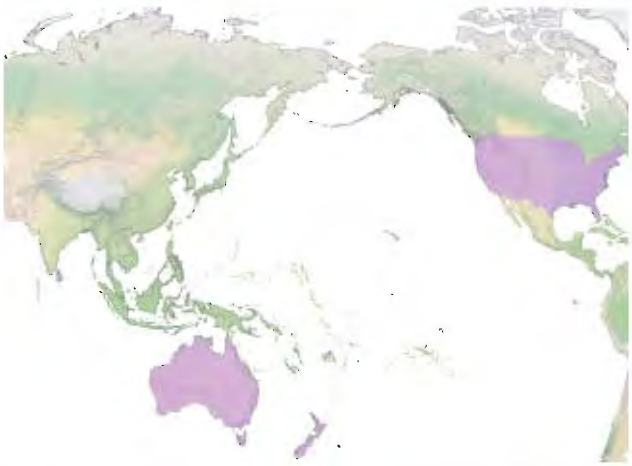
Dipogon lignosus is a beautiful climbing vine that can fix nitrogen in the soil. Due to its vigorous growth and ability to smother native flora, the plant is a great threat in the Australasia-Pacific region. It produces seeds in copious numbers that are dispersed by birds. Seeds are explosively ejected from pods over several metres and they lie dormant for a few years. Fire stimulates germination of seeds.

Description : Perennial woody climbers, stem twining, to 3 m long. Leaves compound, alternate, stipulate, composed of three rhomboid leaflets, 3-6 x 1.5-4 cm; petiole to 6 cm long. Flowers axillary racemes, bracts persistent, white or pale to pink, containing 3 - 6 pea-shaped flowers, 10 - 16 mm long. Fruit a pod, cylindrical, attenuate at both ends, brownish and stalked, glabrous, 2-5 x 0.5-0.1 cm, each with 3-6 seeds. Seeds brown or black with a conspicuous white spot, 3 - 4.5 x 2.5 - 3 mm.

Habitat : Grows on the perimeters of natural forests, disturbed areas and open forests. It grows best in sunny locations but seedlings can establish in shade.

Threat and damage : A serious threat to indigenous vegetation because the plant can smother native flora and break them down. It increases soil fertility, paving the way for other weeds to invade.

Uses : Used as an ornamental plant and as a vegetable.



Distribution : Australia, New Zealand, Sri Lanka, United States.

Management : Hand-pulling and digging out are generally practised. Cutting down and painting the stump with the herbicide metsulfuron-methyl is effective. Biological control is unknown.

Elaeagnus umbellata Thunb.

Native : East Asia

Family : Elaeagnaceae

Synonyms : *Elaeagnus argyi* H. Lev.
E. crispa var. *coreana* (H. Lev.) H. Lev.
E. crispa var. *praematura* Koidz.

Common names : Autumn elaeagnus, autumn-olive, silverberry

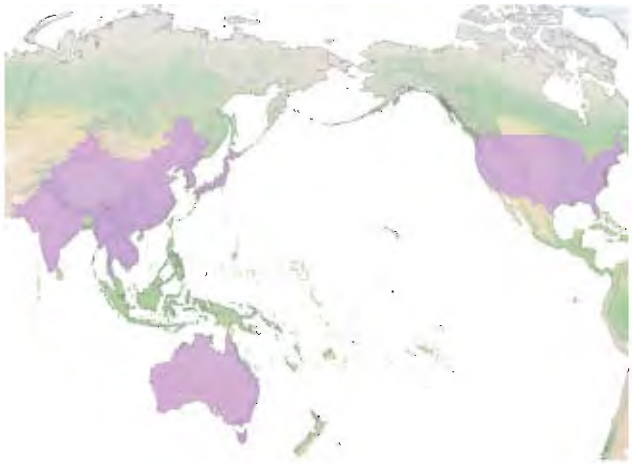
Elaeagnus is a deciduous shrub characterized by very attractive silvery scales on its shoot and young branches. It does very well on infertile soils because its root nodules can fix atmospheric nitrogen.

Description : Large shrubs or small trees, often spiny, shoots covered with peltate scales. Leaves simple, alternate, 2 - 9 x 0.8 - 3 cm, elliptic-oblong to oblong-lanceolate, obtuse or acute, dull green above, with peltate and stellate hairs, lower surface sometimes with ferruginous scales; petiole 2 - 6 mm long. Flowers in axillary clusters of 2-4, greyish-white or light yellow, fragrant, tubular; pedicel 3.5-6.5 mm long. Fruit a berry, red, 8 - 9 mm in diameter, elliptic-ovoid, succulent, covered with scales when young, 8 - ribbed, woolly within. Seeds 7 - 2 x - 8 - 3 mm, saffron yellow.

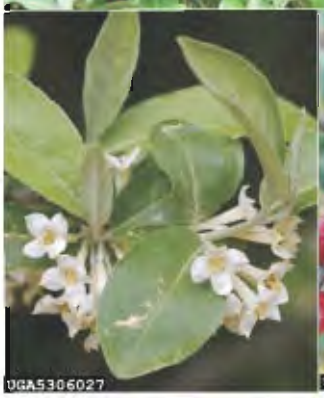
Habitat : Common in natural forests, grasslands and disturbed areas. It grows well on a variety of soils with a pH range of 4.8-6.5 and can tolerate drought. Mature trees tolerate light shade but produce more fruits in full sunlight; seedlings may be shade-intolerant.

Threat and damage : The plant invades grasslands and disturbed areas adjacent to plantings. The invasion can be rapid because of fast and vigorous growth, prolific fruit and seed production and high germinability of seeds. Seeds are widely disseminated by birds and the seedlings can adapt to many sites. The nitrogen-fixing capability of the plant has adversely affected the nitrogen cycle of native communities that grow on infertile soils. The plant is highly competitive against native species and it can resprout quickly after fire damage or cutting.

Uses : Seeds and flowers of *E. umbellata* are used as expectorant in coughs. The flowers are also used as an astringent and in cardiac ailments. Fruits are rich in vitamins and are edible. They have a remarkable shelf-life and can be stored for up to 15 days at room temperature. The plant is commonly grown as a protective hedge around fields as well as around houses and gardens.



Distribution : Australia, Bhutan, Cambodia, China, Democratic People's Republic of Korea, Guam, India, Japan, Lao PDR, Myanmar, Nepal, Pakistan, Republic of Korea, Thailand, United States, Viet Nam.



Management : Pulling, digging out, cutting down, girdling and burning or a mix of these techniques performed together are effective in controlling the weed. Cutting down the plant at the main stem and painting the stump with glyphosate is useful. Basal applications of triclopyr alone or in combination with 2,4-D provide excellent control at very low concentrations. Dicamba applied with a surfactant either killed or severely retarded growth of surviving stems the following year. Although not a viable option, the use of sheep and goats to browse the plants has been attempted.

Eugenia uniflora L.

Native : Tropical South America

Family : Myrtaceae

Synonyms : *Eugenia arechavaletae* Herter
E. costata Cambess.

Common names : Barbados cherry, Brazilian cherry, French cherry, Surinam cherry

Eugenia uniflora is an evergreen shrub often used in gardens as a hedge or screen. It was grown predominantly for its edible fruits but it then escaped cultivation and became invasive in certain countries. The plant is a hardy species that can flourish in a variety of habitats.

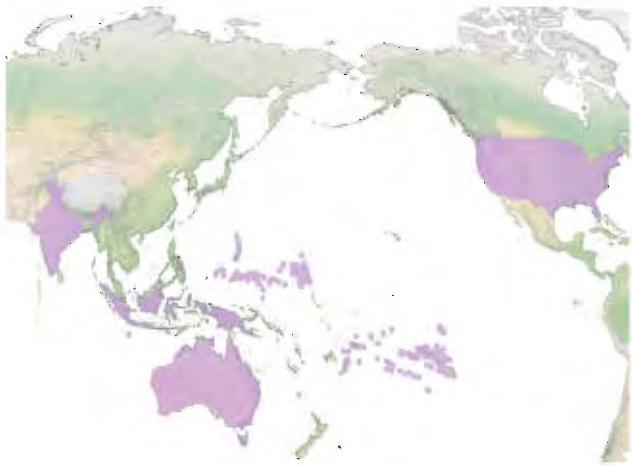
Description : Shrubs or small trees, bark scaly, peeling off. Leaves simple, opposite, lamina ovate to elliptic, 3.2 - 4.2 × 2.3 - 3 cm, papery, both surfaces dark green, glabrous, with numerous pellucid glands, secondary veins to five, slightly conspicuous, intramarginal veins ca. 2 mm from the margin, base rounded, slightly cordate, or cuneate, apex acuminate, mucronate or obtuse; petiole ca. 1.5 mm. Flowers white, fragrant. Fruit a berry, dark red when ripe, globose, 1-2 cm in diameter, 8-ridged, 1 or 2- seeded.

Habitat : *Eugenia* prefers fertile, moist soils and partial shade. It can grow in natural forests, planted forests and grasslands. The plant requires moderate rainfall and does not tolerate salty soil.

Threat and damage : The plant can invade a wide variety of habitats and form dense thickets preventing the regeneration of native plants. It also can change the micro-environment of an invaded habitat and host pests and pathogens.

Uses : Used to recover and manage disturbed and fragmented areas. The fruits are consumed fresh and are also used to make juice, wines, jams and jellies. It is also an ornamental tree that can be pruned as a hedge.

Management : Hand-pulling or digging out the seedlings. Garlon applied at the cut surface can be effective. Biological control is unknown.



Distribution : American Samoa, Australia, Christmas Island, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, India, Indonesia, Marshall Islands, New Caledonia, Niue, Norfolk Island, Northern Mariana Islands, Papua New Guinea, Samoa, Tonga, United States.

Falcataria moluccana (Miq.) Barneby & Grimes

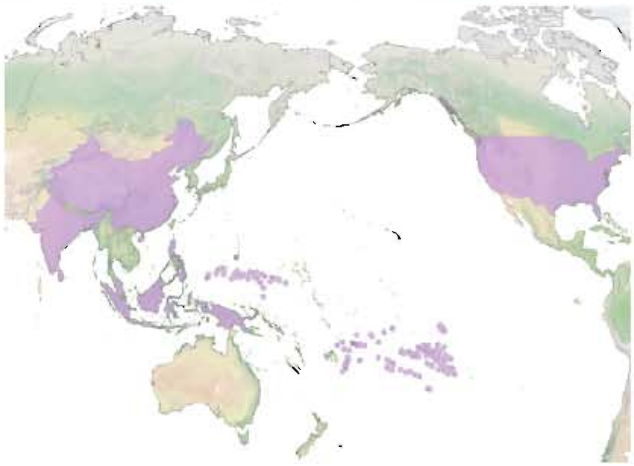
Native : Moluccas, Papua New Guinea, New Britain, Solomon Islands

Family : Fabaceae

Synonyms : *Albizia falcataria* (L.) Fosberg
Paraserianthes falcataria (L.) L C. Nielsen

Common names : Batai, bataiwood, Moluccan sau

Falcataria moluccana is a multipurpose nitrogen-fixing tree widely introduced throughout the tropics as a fast-growing plantation species. It is also grown as an ornamental and shade tree. It escaped cultivation and became invasive threatening the native flora and fauna in several countries. This light-demanding tree regenerates when soil is exposed to sunlight and it can easily colonize forest gaps. The tree can produce abundant seeds that are dispersed mainly through wind and human transportation.



Distribution : American Samoa, Bangladesh, China, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, India, Indonesia, Malaysia, New Caledonia, Niue, Palau, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Tonga, United States, Wallis and Futuna Islands.

Description : Large trees, branchlets minutely pubescent with lenticels, stipules caducous, small. Leaves pinnately compound, rachis to 40 cm, usually with a large, oval, disk-shaped gland near the base; pinnae 6 - 20 pairs, densely rusty tomentose, to 10 cm, leaflets sessile, 10–40, opposite, slightly falcate, obliquely oblong, 1-2 x 0.3 - 0.6 mm, abaxially sparsely puberulent, adaxially glabrous, base obtuse-rounded or nearly cuneate, apex acute. Inflorescence a solitary, axillary, spike, or several arranged in a panicle. Flowers greenish-yellow to cream. Fruit a legume, straight, strap-shaped, flat, 10 -13 x 1.3 -2.3 cm, late dehiscent through both sutures. Seeds 10 - 15 per pod, compressed, ellipsoid, ca. 7 x 3 mm, testa brown, with a narrow U-shaped pleurogram.

Habitat : *F. moluccana* grows near or inside natural forests, open areas, planted forests and riparian zones. The plant is distributed from sea level to 1, 500 metres. It can adapt to monsoon climates with annual rainfall of 2, 000 to 4, 000 mm and can withstand temperatures ranging from 22 to 34° C.

Threat and damage : The tree can shade out native plants and stimulate growth of non-native plants. It alters the composition and structure of forest plants, modifies nutrient regimes, increases competition, causes ecosystem change and also facilitates invasion by other exotic plants like *Psidium cattleianum*. In Hawaii, the tree leaf litter sheltered an invertebrate community that is entirely different from that of the leaf litter of the native plant, *Metrosideros polymorpha*.

Uses : The tree is grown as an ornamental due to its attractive grey bark and feather-like flowers. The wood is used for canoe-building and furniture-making. It is also planted as a shade tree for cacao, coffee and tea plantations. In Hawaii, it is used as a biofuel for generating electricity. The leaves are used as feed for chicken and goats and also as a green manure. The bark produces 'Kino', which has some tanning properties, and is also used as soap. The pods are edible.

Management : Girdling at the sapling stage is effective. Uprooting the plant followed by chemical treatment is also useful. Application of 2,4-D and glyphosate to the trunk after debarking injures the tree. However, treatment with dicamba and triclopyr can kill the trees. Biological control is unknown.

Gunnera tinctoria (Molina) Mirbel

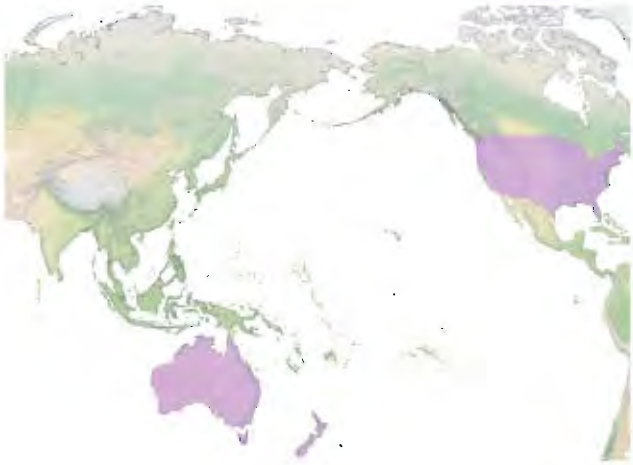
Native : South America

Family : Gunneraceae

Synonyms : *Gunnera chilensis* Lam.
G. chilensis var. *meyeri* L.E. Moro

Common names : Chilean gunnera, Chilean rhubarb, giant rhubarb

Gunnera tinctoria is a large-leaved subshrub, introduced into various countries as an ornamental and edible plant. In alien ranges, it forms thickets that shade out and prevent growth of native vegetation. The plant is a prolific seed producer and birds facilitate its spread. *Gunnera* reproduces mainly via its rhizomes and intense effort is required to manage the weed. It is capable of symbiosis with cyanobacteria inside its cells.



Distribution : Australia, New Zealand, United States.

Description : Perennial clump-forming subshrub, stem with stout horizontal rhizomes, and massive umbrella-sized leaves on sturdy petioles. Leaves 1-2 m long, thick, rounded, lobed and irregularly toothed, covered with stiff prickles; petioles 1-1.5 m long. Inflorescence of spike, 50-75 x 10 cm, consisting of lateral branches, 2-5 cm long, bearing small flowers, red in colour. Fruit a drupe, reddish, oblong, 1.5 -2 mm long. Seeds numerous, 1-1.3 mm in diameter.

Habitat : It can invade and occupy a variety of habitats. The plant is of common occurrence in shrub lands, riparian zones, meadows, gardens and woodlands. It can tolerate seasonally waterlogged wet soils but cannot grow well on excessively-drained and drought-prone sandy or stony soil.

Threat and damage : *G. tinctoria* can shade out and suppress growth of rare and endangered indigenous flora and fauna. The areas that have been cleared of mature plants can become recolonized with numerous seedlings from the original plant, and the rhizome pieces can also regrow. The plant can block drains and streams and obstruct access to natural and recreational areas.

Uses : The young leaf stalks can be cooked as a vegetable or eaten raw. It is also used as an astringent. A black dye is extracted from the root. Roots are useful for roof covering.

Management : Physical control is ineffective due to heavy regrowth. Spraying with triclopyr plus any penetrant is effective. Biological control is unknown.

Hedera helix L.

Native : North Africa, West Asia and Europe

Family : Araliaceae

Synonyms : *Hedera chrysocarpa* Walsh
H. helix var. *digitata* Bosse

Common names : Common ivy, English ivy

Hedera helix is an evergreen ornamental vine that can thrive under shade, climb on tree trunks and spread on the forest floor. It is popular as a house and pot plant, but is also planted as ground cover in shady areas. Blankets of ground cover formed by the plant prevent germination of other plants, cut light and harbour disease. Seeds are mainly dispersed by birds. Chemical control is difficult due to a waxy coating on the leaves.

Distribution : Australia, Bhutan, French Polynesia, Japan, New Caledonia, New Zealand, Russian Federation, Singapore, United States, Viet Nam.

Description : Woody perennial vines, creeping with adventitious roots; young shoot and petiole green to purplish or burgundy red, with few to numerous ray stellate or scale-like hairs. Leaves of sterile branches broadly ovate, 4 - 10 cm long, 3 - 5 lobed. Flowering branches ovate to rhombic and entire. Flowers in terminal umbels, petals yellowish-green, 3 - 5 mm long. Fruit a drupe, deep bluish-purple to black when ripe, 8-10 mm in diameter. Seeds 2 - 3 per drupe, black.

Habitat : Occurs in riparian zones, wetlands, closed forests, rocky and shady places and on forest margins and roadsides. It is also found in natural and planted forests and urban areas.

Threat and damage : It forms dense populations that inhibit the regeneration of native herbaceous species, trees and shrubs. As a climber, the plant is capable of smothering host trees. The vine is not useful to native wildlife in areas where it is introduced. The leaves cause severe contact dermatitis in some people.

Uses : Used as an ornamental for its attractive foliage. It is a bitter herb with a nauseating taste and is used in folk remedies especially in the treatment of rheumatism, skin eruptions, swollen tissue and burns. The leaves contain emetine and triterpene saponins, which are effective against liver flukes and fungal infections.

Management : Repeated cutting of the vines is effective for short term control. Herbicides are not very effective. Biological control is unknown.

Hedychium flavescens Carey ex Roscoe

Native : Eastern Himalayas including Nepal and Northeast India

Family : Zingiberaceae

Synonyms : *Gandasulium peregrinum* (N.E. Br.) Kuntze
Hedychium emeiense Z.Y. Zhu

Common names : Cream garland lily, cream ginger, cream ginger lily, wild ginger

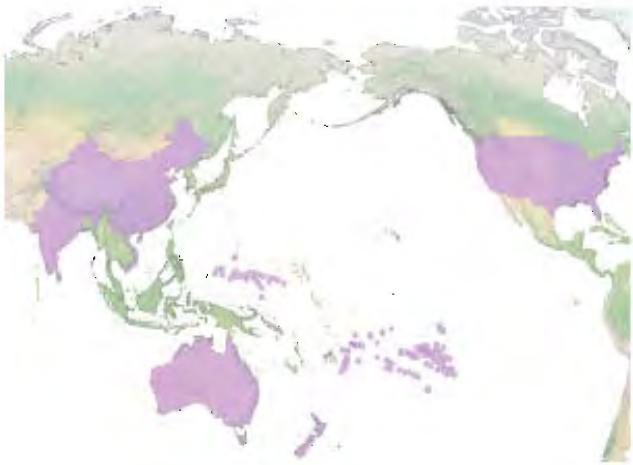
Hedychium flavescens, an aggressive ornamental herb, invades new ranges through rhizomes. It can form monospecific stands that can affect growth and establishment of native flora. Moist warm climates favour growth of the plant.

Description : Perennial rhizomatous erect herbs, to 2.5 m tall. Leaves sessile, elliptic-lanceolate or lanceolate, 20-50 × 4-10 cm, abaxially pubescent, base attenuate, margin membranous, apex caudate-acuminate; leaf sheath slightly pubescent, ligule 3-5 cm, membranous. Inflorescence a spike, terminal, oblong, 15-20 × 3-6 cm, bracts imbricate, oblong to ovate, 3-4.5 × 2-4 cm, concave, 4-5 flowered; bracteoles tubular, membranous. Flowers yellow or yellowish - white, lanceolate, 3-3.5 cm long, fragrant. Fruits globose, with three valves. Seeds numerous.

Habitat : Occurs in natural and planted forests, agricultural areas, along roadsides and in open habitats. In India, it is found at altitudes between 1, 200 and 2, 000 metres.

Threat and damage : The plant is an aggressive invader that prevents regeneration of native plant species. It is a major weed in many locations around the world. The spread is mainly through rhizomes.

Uses : Mainly used as an ornamental plant but parts of the plant are medicinal also.



Distribution : American Samoa, Australia, Bhutan, China, Cook Islands, Fiji, French Polynesia, Federated States of Micronesia, Guam, India, Nepal, New Caledonia, New Zealand, Niue, Samoa, Sri Lanka, Tonga, United States, Viet Nam.

Management : Mature plants are to be dug out and seedlings hand-pulled. Herbicides such as glyphosate and metasulfuron-methyl are effective in controlling spread. Biological control is unknown.

Hedychium gardnerianum Sheppard ex Ker Gawl.

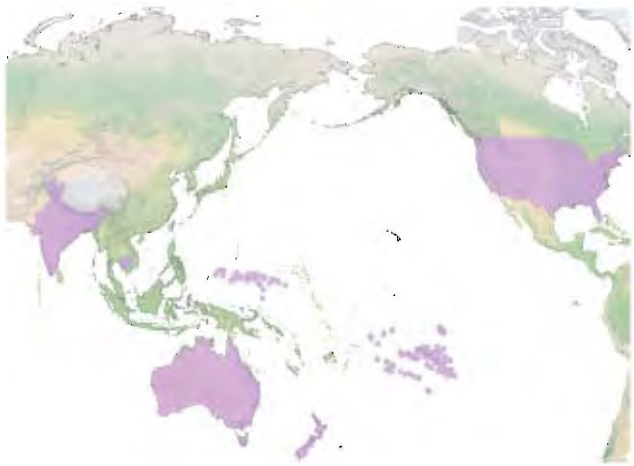
Native : Eastern Himalayas including Nepal and Northeast India

Family : Zingiberaceae

Synonyms : *Gamochilus speciosus* T. Lestib.
Hedychium pallidum Regel

Common names : Kahila garland-lily, kahili ginger

Hedychium gardnerianum is a perennial ornamental herb that grows in wet climates from sea level to 1700 m. A native of the Eastern Himalayas, the plant is ranked among the top 100 of the world's worst invaders in the Global Invasive Species Database. The plant can displace native plants, form vast dense colonies and choke understorey vegetation. It has been introduced around the world mainly through horticultural trade. The fragrant rhizomes are the primary source of spread of *Hedychium*. The fleshy red seeds are spread by birds and also through garden waste. The plant also exhibits clonal reproduction, with the small root fragments having the potential to resprout.



Distribution : Australia, Bangladesh, Bhutan, Cambodia, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, India, Nepal, New Caledonia, New Zealand, United States.

Description : Perennial rhizomatous herbs, 1.5 - 2 m tall; rhizomes branching, to 3.5 cm in diameter. Leaves ovate-elliptic, glabrous or sparsely pubescent along the midrib on the lower surface, apex shortly acuminate; 20 - 45 x 10 - 15 cm, petiole 1-2 cm long, ligules membranous, 1.5-3 cm long, entire or very shallowly two-lobed, glabrate; sheath glabrous or glabrate. Inflorescence yellowish, terminal, erect, cylindrical, 16-30 cm long, primary bracts widely spaced, ovate-elliptic, spreading or obliquely ascending, enfolding the cincinni, much shorter than the floral tube, 3 - 5 cm long, glabrous. Rachis glabrous, exposed, cincinnus two-flowered, greenish-yellow, linear, 3.5 - 5 cm long. Fruit a thin walled capsule, 1.5 cm long, with three compartments. Seeds bright scarlet, ca. 4 mm long; aril bright red, fleshy.

Habitat : The plant prefers open areas with warm moist climate but can also grow in full shade beneath a forest canopy. It is common in agricultural areas, coastlands, natural forests, planted forests, open ranges and grasslands, riparian zones, ruderal and disturbed areas, scrub- and shrublands, urban areas and wetlands.

Threat and damage : It may form dense growth in native forests, smother seedlings, displace them and prevent regeneration. This results in alteration of

forest habitats and ecosystems and degradation of native forest communities. The plant may also block stream edges, altering water flow. Aircraft-based analysis has shown that the plant reduces the amount of nitrogen in the metrosideros forest canopy in Hawaii, a finding later corroborated by ground-based sampling. Such alteration in natural ecosystem processes could alter the type of fauna in those habitats. The plant is poisonous to grazing animals.

Uses : Widely cultivated as an ornamental.

Management : Manual removal of the weed is an option for controlling local infestations. Small seedlings can be hand-pulled. Metasulfuron-methyl and glyphosate are effective in controlling *Hedychium* populations. *Ralstonia solanacearum* (Smith) Yabuuchi *et al.*, a host specific bacterium, which causes wilt has been identified as a potential biological control agent against the plant.

Hiptage benghalensis (L.) Kurz

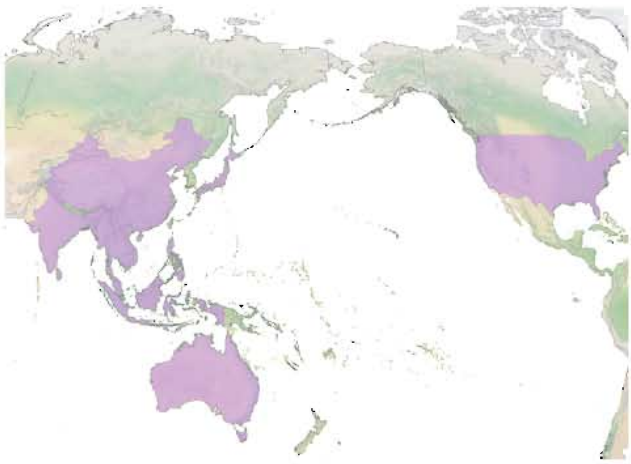
Native : South and Southeast Asia

Family : Malpighiaceae

Synonyms : *Banisteria benghalensis* L.
B. tetraptera Sonnerat

Common names : Hiptage

The genus name *Hiptage* is derived from the Greek *'hiptamai'* (to fly) and refers to the plant's unique three-winged fruit. The plant is invasive in Australian rain forests and in dry lowland forests in Mauritius and Réunion, where it forms dense thickets preventing growth of native vegetation. The Global Invasive Species Database ranks this species in the top 100 of the world's worst invaders. The seeds are dispersed by wind and propagation is mainly by seeds and cuttings.



Distribution : Australia, Bangladesh, Cambodia, China, India, Indonesia, Japan, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Sri Lanka, Thailand, United States, Viet Nam.

Description : Woody climbers, young shoots sparsely pubescent, often with minute medifixed hairs. Leaves simple, opposite, elliptic, 9-19 x 4-9 cm, acute or acuminate, pale and sparsely pubescent beneath, shiny above; petiole to 1 cm long. Raceme axillary and terminal, to 20 cm, erect, softly tomentose. Flowers creamy-white, fragrant, the posterior one being the largest and with a yellow centre, with appressed pubescent hairs to the outside, glabrous to sparsely pubescent within. Fruit a samara with three spreading, papery wings. Seeds globose to sub-globose, 9 - 10 mm long.

Habitat : The habitat of *Hiptage* is very variable but it is common in natural forests. The plant prefers climates ranging from warm temperate to tropical.

Threat and damage : *Hiptage* is invasive in many countries especially the United States (Florida and Hawaii) and Australia. It has been recorded as a pest in tropical Australian rain forests. On Réunion Island and Mauritius, it climbs over and smothers native vegetation.

Uses : Widely cultivated as an ornamental for its attractive and fragrant flowers. It can be trimmed to form a small tree or shrub or can be trained as a vine. The plant is also medicinal. The leaves and bark are hot, acrid, bitter, insecticidal and useful in treatment of biliousness, coughs, burning sensations, thirst, inflammation, skin diseases and leprosy.

Management : Very low volume basal bark applications of triclopyr are effective. Also, cutting branches where *Hiptage* touches the ground and painting the stumps with triclopyr is useful in managing the population. Mechanical and biological control are unknown.

Hypericum perforatum L.

Native : Europe, Northwest Africa, West, North and South Asia

Family : Clusiaceae

Synonyms : *Hypericum marylandicum* Biroli ex Colla
H. vulgare Bubani

Common names : Goatweed, klamath weed, St. John's wort

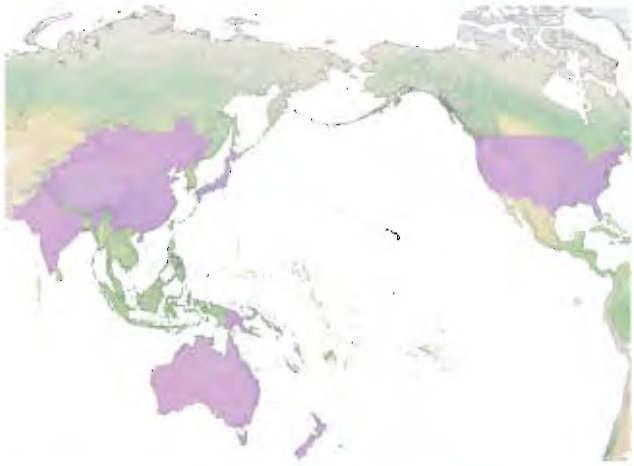
Hypericum perforatum can grow in a wide range of habitats and environments and has the ability to store reserves in its root crown which helps survival during harsh weather. The plant has an underground rhizomatous stem and deep taproot with many lateral roots. It has two distinct growth phases, a fall/winter prostrate or basal growth, and spring/summer erect woody stem growth. The plant spreads by runners and through seeds.

Description : Perennial subshrubs, stem sometimes rooting at the base, two-lined, smooth, with ascending branches, 30-70 cm tall. Leaves simple, opposite, sessile or subsessile, 0.5 - 3.5 x 0.2 - 1.4 cm, narrowly ovate to elliptic-oblong or linear or sometimes oblanceolate, apex obtuse or mucronate to rounded, base cuneate to rounded, entire with intramarginal and often a few laminar black glands. Inflorescence a many-flowered, subcorymbose or broadly pyramidal cyme with ultimately monochasial branches. Flowers 1.5-2.5 cm in diameter, yellow, with marginal black dots and sometimes laminar black lines. Fruit a capsule, reddish-brown, 5-9 mm long, ovoid to pyramidal, each valve with dorsal vittae and lateral vesicles, splits open when mature. Seeds 1.0 - 1.2 mm, shortly apiculate, testa reticulate-pitted.

Habitat : The plant can grow on various types of soils, from dry, rocky to deep fertile soil but cannot grow in densely-shaded areas. As a weed, it is commonly found in agricultural areas, natural forests, planted forests and urban areas in upland temperate regions.

Threat and damage : Displaces and inhibits the settlement and establishment of native flora. The plant contains two toxic compounds, hypericin and hypericum red, which cause photosensitization in grazing livestock.

Uses : Used in treatment for anxiety and depression, sleep disorders, bacterial and viral infections, skin wounds, cancer and inflammatory arthritis. In gardens, it is used as an ornamental and a perennial border plant.



Distribution : Australia, China, India, Japan, Mongolia, New Zealand, Pakistan, Papua New Guinea, United States.

Management : Hand-pulling or digging-out provides temporary control. Glyphosate and picloram are effective in controlling propagation. Biological control is unknown.

Impatiens glandulifera Royle

Native : Bhutan, Northeast India, Nepal, Northwest Pakistan

Family : Balsaminaceae

Synonyms : *Balsamina glandulifera* (Royle) Ser.
B. macrochila (Lindl.) Ser.

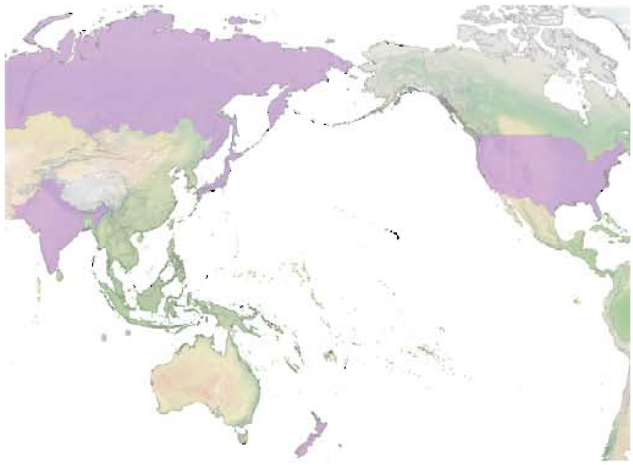
Common names : Himalayan balsam, Indian balsam, ornamental jewelweed

Impatiens glandulifera, introduced as an ornamental plant in several countries, turned invasive due to its inherent features such as aggressive seed dispersal and high nectar production, which attracts pollinators. Eradication of the plant is difficult once established.The shape of the flower resembles an English police man's hat.

Description : Robust succulent herbs, annual, glabrous, to 2.5 m tall. Leaves simple, opposite-verticillate, 6 - 15 x 1.8 - 6.5 cm, elliptic-ovate, serrate, base glandular stipitate; petiole 30-35 mm long. Inflorescence axillary racemes with 5 - 12 deep to pale purplish, rarely white flowers, 2.5-4 cm long, zygomorphic, with a sepal sac of 1.2 - 2 mm, abruptly contracted to a spur of 2 - 8 mm length. Fruit a capsule, broadly clavate, 1.4 - 2 cm long, nodding. Seeds black, subglobose, 3 mm long, rugose.

Habitat : Common in agricultural areas, natural forests, riparian zones and wetlands at elevations between 1, 800 - 3, 200 metres. It tolerates a wide range of soil textures and structures, a pH range of 4.5 to 7.7 and relatively low sunlight.

Threat and damage : *I. glandulifera* is a fast-growing invasive plant that competes with native species and negatively affects wildlife habitats. Its hardiness, high reproductive rate, rapid growth, early germination and propensity to establish thick, dense stands all make *I. glandulifera* a successful competitor. The plant can alter water flow and promote erosion in watercourses.



Distribution : Christmas Island, Coco (Keeling) Islands, India, Japan, Nepal, New Zealand, Pakistan, Russian Federation, United States.

Uses : A popular ornamental; an edible oil is obtained from the seed.

Management : The plant can easily be removed by hand-pulling, grazing or cutting. The removal has to be continued until no more growth occurs for at least two to three years. Spraying the leaves with glyphosate is also effective but its use near waterbodies is not advisable. Biological control is unknown.

Imperata cylindrica (L.) P. Beauv.

Native : Pantropical

Family : Poaceae

Synonyms : *Imperata angolensis* Fritsch
I. arundinacea Cirillo

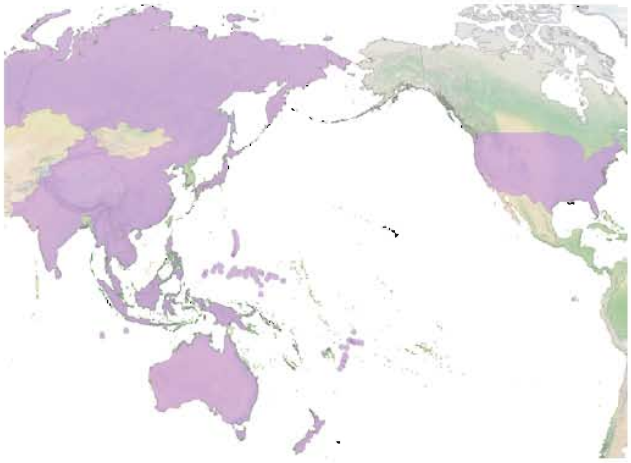
Common names : Alang-alang, blady grass, cogon grass, japgrass, satintail

Imperata cylindrica is one of the most noxious colonizers of degraded humid tropical forests. It also invades abandoned shifting cultivation areas. It is reported as a pest in 35 crops in 73 countries. The Global Invasive Species Database has ranked *Imperata* among the top 100 of the world's worst invaders. The species is extremely polymorphic, but it could easily be recognized by the dense, narrowly cylindrical, silky white inflorescence. Each plant produces as many as 3, 000 seeds which are highly germinable.

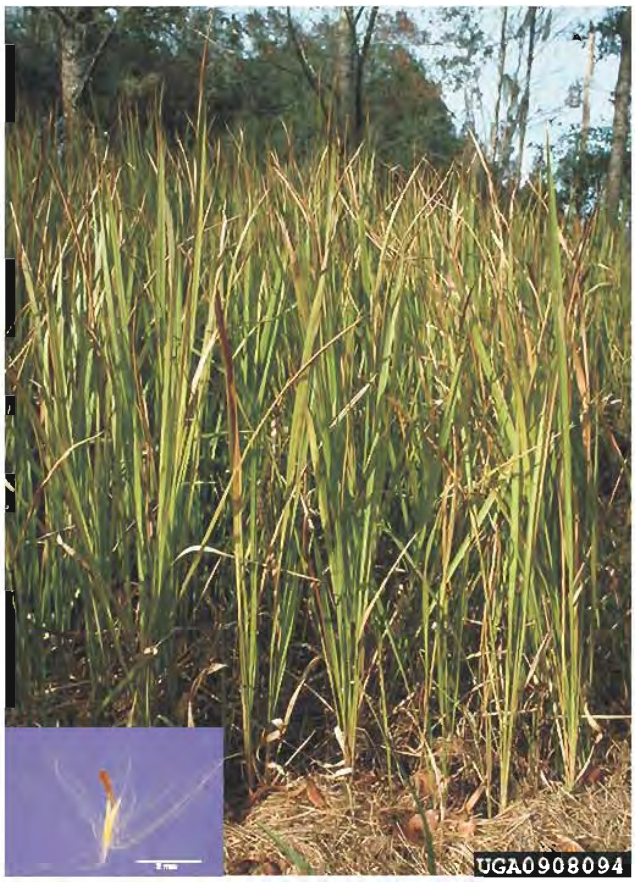
Description : Perennial grass, culms 20-150 cm high, tufted, nodes bearded. Leaves 15-70 x 0.8-2 cm, lanceolate, narrowed towards the base, glabrous, sheath rounded, glabrous; ligule membranous. Panicle to 30 x 1.5 cm, cylindrical; rachis glabrous, spikelets ca. 4 x 1 mm, similar, lanceolate, pedicelled, callus with long hairs, glumes equal, ca. 3 x 1 mm, lanceolate, with long silky white hairs on the dorsal surface; lower floret empty, upper bisexual; first lemma ca. 2 x 1 mm, oblong, hyaline, epaleate, second lemma ca. 1.5 x 1 mm, hyaline, 3 - lobed, paleate. Caryopsis 1-1.3 mm long.

Habitat : A common weed in hot climatic conditions in several countries of Africa south of the Sahara and in South and Southeast Asia. It invades a wide variety of natural habitats such as desert dunes, wetlands, savannahs and forests, where it outcompetes native plants. *Imperata* habitat also includes dry sand dunes of shores and deserts as well as swamps and river margins. It grows on grasslands and areas cultivated with annual and plantation crops, retarding their growth. The plant quickly enters and colonizes abandoned farmlands, railway lines, roadsides, highway embankments and deforested and reforested lands. It can withstand long dry spells on light soils and will tolerate waterlogging on heavy soils. *Imperata* quickly establishes on medium to good soils but is less frequently a pest on poor soils.

Threat and damage : It is a noxious weed because of



Distribution : American Samoa, Australia, Bhutan, Brunei, Cambodia, China, Christmas Island, Coco (Keeling) Islands, Federated States of Micronesia, Fiji, Guam, India, Indonesia, Japan, Lao PDR, Malaysia, Myanmar, Nepal, New Zealand, Northern Mariana Islands, Pakistan, Palau, Papua New Guinea, Philippines, Russian Federation, Samoa, Singapore, Solomon Islands, Sri Lanka, Thailand, Tonga, United States, Vanuatu, Viet Nam.



wide distribution, high competitive ability and adaptation to a wide range of climatic conditions and soils. The plant is resistant to many control methods including burning. Dry and vast *Imperata* wastelands are highly prone to frequent and intense fires, which destroy native vegetation and hamper the succession of native plants by killing shoots. Following fires, *Imperata* regenerates very rapidly from the underground rhizomes and may dominate on sites previously disturbed by slash-and-burn agriculture.

Uses : Used in folk remedies for cancer, colds, diarrhoea, gonorrhea, myalgia, night sweats, piles, rheumatism and tumours. Stands of this species are sometimes burned or cut so that the tender new growth can be used for short-term supplemental or emergency pasture, but it generally produces poor quality forage and animals avoid chewing the sharp-edged mature leaves. It is often planted for soil stabilization, paper-making, weaving into mats and bags and for roofing.

Management : Hand-pulling is an option but is extremely labour-intensive. Burning has also been used successfully in controlling the grass. As with mowing, burning stimulates the growth and spread of *Imperata*, making follow-up control a necessity. A 2 percent solution of glyphosate is recommended in areas that will be immediately revegetated. In areas where immediate revegetation is not planned and non-target plant damage is not a concern, application of imazapyr has been recommended. The gall midge *Orseolia javanica* Kieffer & Leeuwen – Reijnvaan and the pathogen *Colletotrichum caudatum* (Sacc.) Peck are considered as potential candidates for use in classical biological control.

Lantana camara L.

Native : Cental and South America

Family : Verbenaceae

Synonyms : *Lantana aculeata* L., *L. antillana* Raf.

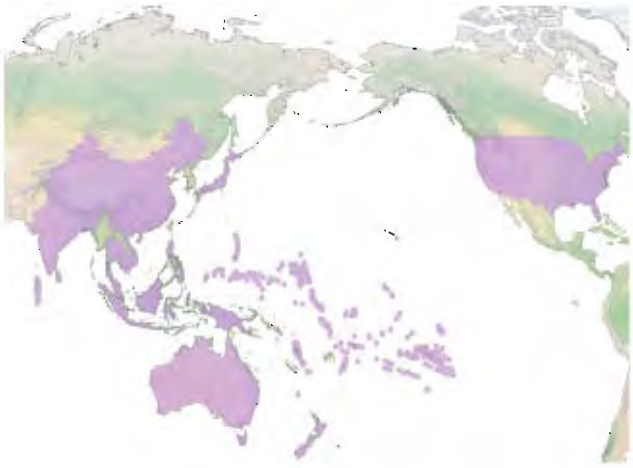
Common names : Lantana, sleeper weed, Spanish flag

Lantana camara is ranked among the top 100 of the world's worst invaders in the Global Invasive Species Database. It has approximately 650 varieties in over 60 countries including island groups. The plant has established and expanded its territory in many parts of the world often as a result of clearing of forests for timber or agriculture. Its allelopathic properties lead to reduced vigour of native plant species growing in the vicinity and decrease productivity in all invaded ecosystems. Mature plants produce up to 12, 000 seeds annually. Seed germination occurs when sufficient moisture is present; germination is reduced by low light conditions. The root system is very strong with a main taproot and a mat of many shallow side roots.

Description : Low erect or subscandent shrubs, armed with stout recurved prickles, up to 4 m in height. Stem square in cross section, hairy when young, cylindrical, up to 15 cm thick. Leaves simple, opposite, lamina ovate to oblong, 2-10 x 2- 6 cm, bright green, papery, wrinkled, very rough, with short stiff hairs, emits a pungent odour when crushed, base rounded to subcordate, margin crenate, lateral veins of 5 pairs, prominent; petiole 1-2 cm, pubescent. Flower heads with 20 - 40 flowers, each up to 2.5 cm across. Flower colour varies from white, cream or yellow to orange pink, purple and red. Fruit a drupe, greenish blue-black, globose, ca. 4 mm in diameter, shining, one seeded.

Habitat: The wide geographic distribution of lantana, its luxuriant growth in diverse habitats and on different soil types in a reflection of its broad ecological tolerance. Lantana generally grows best in open areas such as wastelands, rain forest borders, roadsides, beach fronts and forests recovering from fire or logging.

Threat and damage : Lantana is a major invader in natural forests and agricultural systems around the globe. It can grow in clumps and dense thickets preventing regeneration and disrupting succession of native species in natural forests. As the density of lantana in a forest increases, species richness



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

decreases. Forest fires can stimulate growth of lantana. The plant is poisonous to cattle, buffalo, sheep and goats. Bushes of the plant provide shelter to several insects of health concern such as malarial mosquitoes and tsetse flies.

Uses : Lantana is a favoured ornamental world wide. It is also used as fuel wood, hedge and mulch. The stems and branches are used for making furniture in some countries. Its leaf extract has antimicrobial, insecticidal and nematicidal properties. The use of lantana extract as a biocide has been suggested.

Management : Mechanical clearing and hand-pulling are suitable for small areas and fire can be used over large areas. Glyphosate is most effective as an overall foliar spray. Metsulfuron may be effective if application is timed before annual droughts. Triclopyr ester applied on the basal bark is effective. Fungal pathogens like *Prospodium tuberculatum* (Speg.) Arthur, *Puccinia lantanae* (Farlow) Lindquist and *Ceratobasidium lantanae-camarae* H.C. Evans, R.W. Barreto & C.A. Ellison have been identified as potential biocontrol agents. Though several insects feeding on lantana in its native range have been introduced as bio-control agents from time to time success in controlling the weed has been limited.

Leucaena leucocephala (Lam.) de Wit

Native : Mexico and Central America

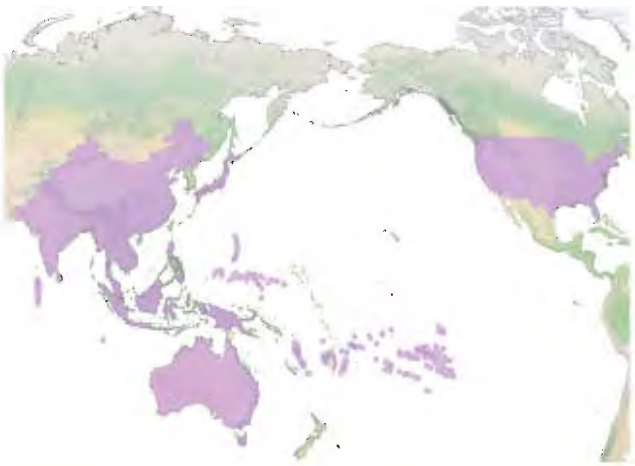
Family : Fabaceae

Synonyms : *Acacia frondosa* Willd.
A. leucocephala Lam.

Common names : Wild tamarind, jumbie bean, lead tree, leucaena

Leucaena leucocephala is a nitrogen-fixing tree species widely promoted for tropical forage production and reforestation. However, it spreads and colonizes naturally and is widely considered as an invasive tree. The genus *Leucaena* is distinguished from other mimosoid legumes by its hairy anthers. *L. leucocephala* is distinguished from other species of *Leucaena* by its intermediate leaflets and large pods in clusters of 5 to 20 per flower head. In the past, *Leucaena* was known as a 'miracle' tree because of its worldwide success as a long-lived and highly nutritious forage tree and its use as fuelwood, charcoal, pulpwood and as a soil improver. This thornless tree can form dense monospecific thickets and is difficult to eradicate once established. The Global Invasive Species Database ranks this species among the top 100 of the world's worst invaders.

Description : Small trees, to 20 m tall, bark greyish-brown, slightly fissured, young shoot covered by tomentum. Leaves bipinnate, stipulate, stipule setaceous; rachis 7 - 15 cm long, pubescent, ending in a soft bristle, common rachis 15 - 20 cm long, pinnae 4 - 9 pairs, 5 - 10 cm long, hairy, ending in a bristle; leaflets 10 -17 pairs, sessile, 1 - 1.3 x 0.2 - 0.4 cm, linear, oblong, acute, glabrous or subglabrous, base oblique. Flowers in globose white heads, often in pairs, peduncle 2.5 - 3.8 cm long, head 1.5 - 2.2 cm in diameter. Fruit a pod, straight, flat, 12.5 - 20 x 1.5 - 2.0 cm, minutely pilose, acute at apex, stipe 1 - 2.5 cm long. Seeds 15 -25, 5.6 x 4.5 mm, oval, glaucous, dark brown, with a prominent U-shaped mark on either side.



Distribution : American Samoa, Australia, Bangladesh, Bhutan, Brunei, Cambodia, China, Cook Islands, Coco (Keeling) Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Hong Kong S.A.R., India, Indonesia, Japan, Kiribati, Lao PDR, Malaysia, Maldives, Myanmar, Nepal, New Caledonia, Northern Mariana Islands, Pakistan, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Thailand, Timor-Leste, Tonga, United States, Vanuatu, Viet Nam.

Habitat : It occupies agricultural areas, disturbed or degraded areas and open coastal and riverine habitats. It favours less acidic soils, sub-humid and humid climates and does not tolerate water logged soils or extended periods of flooding.

Threat and damage : *Leucaena* can form dense thickets excluding all plants and can spread rampantly through adjacent areas if not controlled. Such thickets can render extensive areas unsuitable and inaccessible. It can replace native forest land and is a threat to endemic species in some areas.

Uses : Pods, seeds and leaf tips are used as food, although mimosine toxicity is a problem. It is one of the best and most palatable fodder trees of the tropics. The leaf quality compares favourably with alfalfa or lucerne in feed value except for its higher tannin content and mimosine toxicity to non-ruminants. The tree makes excellent charcoal and it is also used as a shade over coffee and cocoa.

Management : Removal by cutting is not suitable because vigorous resprouting will follow. Treating cut stumps with diesel or other chemicals may provide some control. It is sensitive to foliar-applied triclopyr. Soil-applied tebuthiuron, cut-surface application of picloram and basal bark and stump bark application of triclopyr ester are all effective. A bruchid beetle seed predator, *Acanthoscelides macrophthalmus* Schaeffer, has been deliberately introduced and released in South Africa as a biocontrol agent and the same insect has been accidentally introduced to Australia. The accidental spread of the psyllid insect defoliator *Heteropsylla cubana* Crawford in Asia in the mid-1980s caused cyclical defoliation, but did not kill trees and the psyllid appears to have been brought under control by a number of generalist local psyllid predators and parasites.

Ligustrum lucidum W.T. Aiton

Native : East Asia

Family : Oleaceae

Synonyms : *Esquirolia sinensis* H. Lev.
Ligustrum esquirolii H. Lév.

Common names : Broadleaf privet, glossy privet, large leaf privet, ligustrum privet

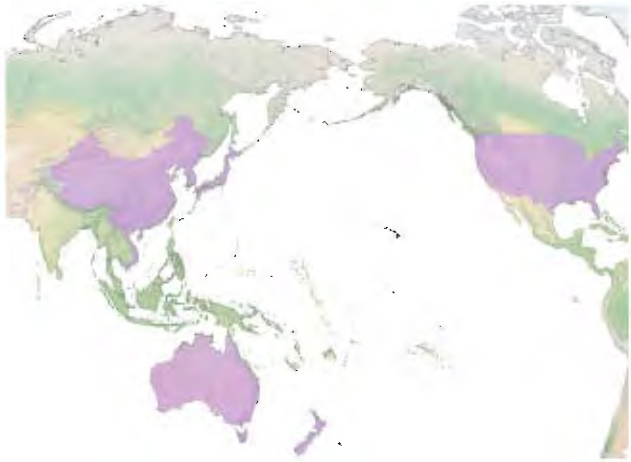
Ligustrum lucidum is a fast-growing species grown as a hedge or ornamental plant in different parts of the world. It is densely branched and can form thickets, destroying native animal habitats and wildlife corridors. Fruit-eating birds disperse the seeds and aid in spread of the plant.

Description : Large shrubs or small trees, branchlets terete with conspicuous white lenticels. Leaves simple, opposite, lamina ovate to broadly elliptic or elliptic to lanceolate, 6 - 17 × 3 - 8 cm, base rounded or sometimes attenuate, apex acute to acuminate or sometimes obtuse; 4 - 11 primary veins on each side of midrib, slightly raised or obscure; petiole 1-3 cm. Inflorescence paniculate, terminal, 8 - 20 × 8 - 25 cm, rachis angular in fruit. Flowers, 4-5 mm across, cream-coloured, scented, sessile or subsessile. Fruit a berry-like drupe, deep blue black, purplish-black on ripening, reniform, 7 - 10 × 4 - 6 mm. Seeds 1 - 3, kidney shaped with ribbed surface.

Habitat : Grows in agricultural areas, natural forests open woodlands, roadsides, waterways and disturbed areas; it prefers full sun to partial shade and is moderately drought-tolerant. The plant can thrive in any type of soil as long as it is not constantly wet.

Threat and damage : *Ligustrum* can invade closed forests wherever gaps occur. Once established, it forms dense understorey thickets which shade out and displace native vegetation. It germinates in the shade and seedlings rapidly grow into shrubs by utilizing canopy gaps. Damaged plants resprout from the root crown. The shoots contain a glycoside which is probably toxic.

Uses : Extracts from *Ligustrum* fruits stimulate the immune system, reduce inflammation and may have beneficial effects on the liver and anti-tumor activity. A commercial insect wax is produced on the branches as a result of eggs being laid by insects. The fruit is antibacterial, antiseptic, antitumour, cardiotonic and diuretic.



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

Management : Small plants can be hand-pulled but older trees need to be dug out. Herbicides such as 2,4,5-T ester, glyphosate, triclopyr, dicamba and metasulfuron-methyl are effective in controlling the weed. Biological control is unknown.

Ligustrum robustum (Roxb.) Blume

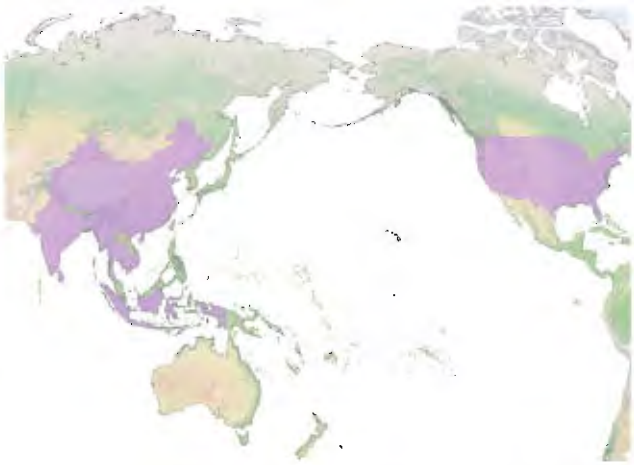
Native : South and Southeast Asia and China

Family : Oleaceae

Synonyms : *Ligustrum ceylanicum* Decne.
L. neilgherrence Decne.
Phyllyrea robusta Roxb.

Common names : Ceylon privet, Sri Lankan privet, tree privet

Ligustrum robustum is a highly invasive plant that disrupts primary forest regeneration and threatens native floral diversity. The high fruit production by the plant in invaded regions has been cited as one of the reasons for its high invasiveness. The Global Invasive Species Database ranks this species among the top 100 of the world's worst invaders. The tree can regenerate easily from root and stump remains. It behaves like a hemisciaphilous species which establishes in shady sites but requires light to mature.



Distribution : Bangladesh, Cambodia, China, India, Indonesia, Myanmar, Sri Lanka, Thailand, United States, Viet Nam.

Description : Shrubs or small trees, to 5 m tall, stem arched. Leaves simple, opposite, 3-9 x 1.5-2.5 cm, shortly petiolate, often glandular beneath, margin entire. Inflorescence terminal, thyrsoid or paniculiform, bracteate, ovate to lanceolate, to 8 cm in length. Flowers white, small, subsessile or short-pedicellate. Fruit a carnose berry or drupaceous. Seeds usually solitary, sometimes 2-4. Fruits are ingested by birds and propagated in their droppings, dispersing the seeds over long distances.

Habitat : The species is common in wet and intermediate low montane regions in India and in the submontane forests in Sri Lanka, at altitudes from 725 to 1, 650 metres. It also grows along roadsides, in agricultural areas, natural forests, planted forests, riparian zones, ruderal/disturbed land, scrub-/shrublands and urban areas.

Threat and damage : The dense foliage of the tree reduces light availability to the forest floor preventing regeneration of light-demanding understorey species. Heavy infestation by the weed alters the structure and composition of forests by affecting nutrient cycling and water availability. It can displace native species and affect successional patterns by competing with them for nutrients and water. The rapid growth rate, ability to tolerate high shade conditions, high seedling recruitment and dependence on birds to distribute seeds make this

species a formidable invader. The leaves and fruits are reported to be allelopathic.

Uses : Grown as an ornamental hedge plant and for fuel wood and soil erosion control. The wood of the tree is used for making tool handles.

Management : Small plants may be hand-pulled; older individuals need to be dug out. Seedlings are best pulled after rain when the soil is loose. The entire root must be removed because broken fragments may resprout. Application of glyphosate or triclopyr plus a non-ionic surfactant on the leaves is reported to be effective. Metsulfuron is also effective when sprayed on wet foliage. The cut-stump method can be used to treat individual bushes in environmentally-sensitive areas. Réunion Island identified several species including a moth viz., *Epiplema albida* Hampson, and a *Hyphasis* species which feed on *Ligustrum,* as potential biocontrol agents. The potential of *E. albida* as a biocontrol agent is being considered for testing.

Ligustrum sinense Lour.

Native : China, Lao PDR, Viet Nam

Family : Oleaceae

Synonyms : *Ligustrum calleryanum* Decne.
L. walkeri Decne.

Common names : Chinese ligustrum, Chinese privet, common Chinese privet, hedge privet

Ligustrum sinense is a small deciduous tree with small flowers that have an unpleasant smell. The tree can displace shrubs of alluvial forests and remain persistent in these areas. The fruits are consumed by wildlife, which often excrete the seeds at distant locations where they may germinate and become established.

Distribution : American Samoa, Australia, China, Fiji, Guam, Hong Kong S.A.R., Lao PDR, New Caledonia, New Zealand, Norfolk Island, Samoa, Singapore, Tonga, United States, Viet Nam.

Description : Shrubs or small trees, deciduous, branchlets terete, villous, pubescent, pilose, puberulent to glabrescent, up to 5 m in height. Leaves simple, opposite, 2 - 7 x 1 - 3 cm, ovate, densely villous to sparsely pubescent or glabrous, papery to subcoriaceous, leathery, base cuneate to subrounded, apex acute/acuminate; petiole 2-8 mm. Inflorescence terminal or axillary panicle, 4 - 11 × 3 - 8 cm. Flowers white, basally-fused petals with exserted stamens. Fruit a berry, blue-black, globular or ovoid, 5 - 8 mm in diameter. Seeds 3 - 4 mm long.

Habitat : Occurs commonly in open disturbed areas, low wet places, along roadsides and in natural forests and coastlands. It is also found in alluvial forest remnants, wastelands and shrublands.

Threat and damage : The trees can form dense thickets, outcompete native vegetation and alter the composition and structure of natural communities. The leaves and fruit are poisonous to livestock and humans.

Uses : Commonly used as an ornamental plant and for hedges; the fruits are used in brewing. An oil extracted from the seeds is used for soap-making. The bark, seed and leaves are medicinally useful.

Management : Hand-pulling of seedlings and digging out older individuals will help to control the spread of the tree. Foliar treatment with glyphosate is known to be useful. Biological control is unknown.

Lonicera japonica Thunb.

Native : East China, Korea and Japan

Family : Caprifoliaceae

Synonyms : *Caprifolium hallianum* Hort.
C. japonicum (Thunb.) Dum. Cours.

Common names : Chinese honeysuckle,
Hall's honeysuckle,
Japanese honeysuckle

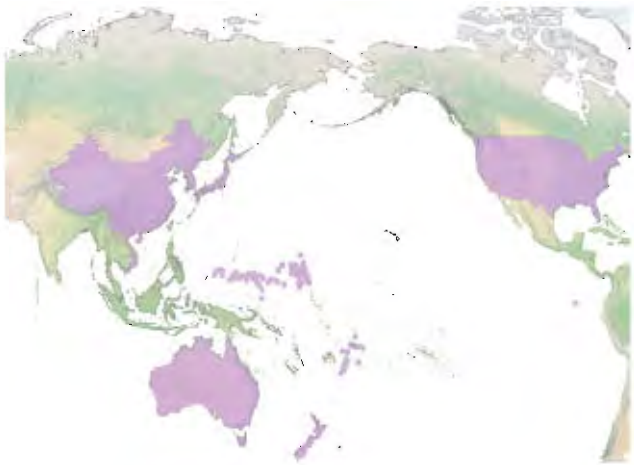
Lonicera japonica is a semi-deciduous shrub that can smother and kill other plants through competition for nutrients and light. The plant can bloom throughout the growing season and spread via aboveground runners that root at the nodes. Seeds are dispersed by birds.

Description : Woody climbers, branches hollow, young parts with yellow-brown stiff hairs, interspersed with long glandular hairs. Leaves simple, opposite, blade ovate or oblong to lanceolate, 3 - 8 x 1.5 - 4 cm, abaxially sparsely to densely hairy, adaxially hairy along veins, base rounded to subcordate, apex acute to acuminate, margin ciliate, occasionally sinuate; petiole 0.3-0.8 cm. Flowers white or creamy-yellow, fragrant, paired, axillary towards apex of branchlets; peduncle 0.5-4 cm, shorter toward apex of branchlets; bracts leaf-like, ovate to elliptic, 10 - 30 mm. Fruit a berry, black when mature, glossy, globose, 6 - 7 mm in diameter. Seeds brown, ovoid or ellipsoid, ca. 3 mm, shallowly pitted.

Habitat : *Lonicera* grows in riparian zones, disturbed sites, openings and along forest borders. It is shade and drought-resistant. It can be grown from sea level to 1,200 metres in altitude.

Threat and damage : The vine can spread rapidly and topple small trees and shrubs. It grows as a ground layer on the forest floor displacing native vegetation and quickly climbs into the forest canopy through tree gaps. It often forms a dense curtain of vines on forest borders.

Uses : Grown as an ornamental, as a ground cover and for erosion control. The vine provides a sweet fragrant screen for privacy or shade. The flowers attract humming birds and bees. *Lonicera* is a valuable medical herb in China, where it is used to treat chicken pox and to maintain human vascular homeostatsis. Birds and cotton-tailed rabbits eat the seeds and leaves of *Lonicera*.



Distribution : American Samoa, Australia, Bhutan, China, Democratic People's Republic of Korea, Federated States of Micronesia, Fiji, French Polynesia, Hong Kong S.A.R., Japan, Marshall Islands, New Zealand, Niue, Republic of Korea, Samoa, Singapore, Solomon Islands, Tonga, United States, Viet Nam.

Management : Hand-pulling, cutting and mowing. Foliar spray of glyphosate is effective. Cutting and painting the cut ends with a liberal dose of triclopyr are also useful. Biological control is unknown.

Macfadyena unguis-cati (L.) A.H. Gentry

Native : Central and South America

Family : Bignoniaceae

Synonyms : *Bignonia unguis-cati* L.
Dolichandra unguis-cati (L.) Lohmann

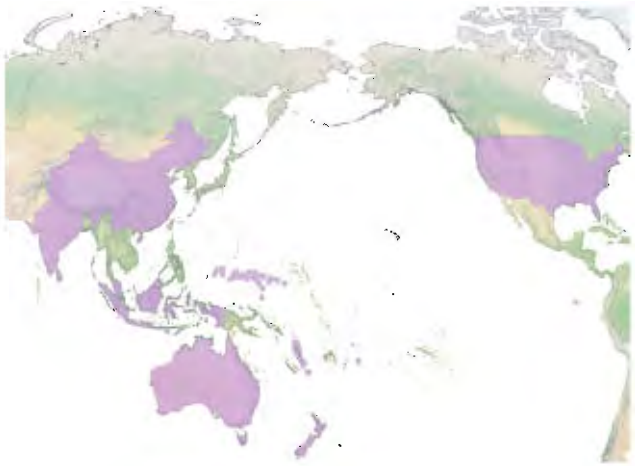
Common names : Catclaw-trumpet, cat's claw climber, cat's-claw creeper, cat's-claw vine

Macfadyena unguis-cati, a woody climbing liana, is one of the most destructive weedy species to have invaded all continents except Antarctica. The plant invades all layers of forest ecosystems by spreading both vertically and horizontally. Once established, it is difficult to eradicate the plant due to its rapid growth, extensive root system and prolific seed production. The production of multiple individuals from a single seed indicates that the plant may be apomictic. The species can produce long primary roots that extend across the soil surface producing large tubers every 50 cm from which runners are produced. The claw-like tendrils make the plant very distinctive.

Description : Perennial woody climbers, often rooting at nodes, up to 30 m in height. Leaves opposite, compound, dark green to nearly black, dimorphic, juvenile plants with small leaflets, 1-2 x 0.4-0.8 cm, mature leaflets narrowly ovate to lanceolate, 5-16 x 1.2-6.9 cm, both surfaces sparsely lepidote; tendril deciduous, three-forked, 0.1 - 3.5 cm long, each fork bearing a small horny hook. Flowers showy, trumpet shaped, 7 x 10 cm across, solitary or in few-flowered clusters at leaf axils, petals joined into yellow floral tube with orange lines in the throat. Fruit a capsule, blackish, linear, flattened, tapering at both ends, 26-95 x 1-2 cm, inconspicuously lepidote. Seeds 1-1.8 x 4.2-5.8 cm, wings membranous, adpressed.

Habitat : *Macfadyena* is a weed of tropical, sub-tropical and warmer temperate regions. It is an aggressive invader in natural forests, open areas, planted forests, orchards, gardens and roadsides from sea level to over 600 metres. The plant can tolerate most soil types except salty and poorly-drained soils.

Threat and damage : The plant can form a thick carpet of leaves and stems on the forest floor, interrupting regeneration and germination of other species. It can also grow to the top of the forest canopy and spread across suffocating the host trees with its weight and shade. The plant can survive grazing, fire and frost.



Distribution : Australia, China, Federated States of Micronesia, India, Indonesia, Malaysia, Nepal, New Zealand, Niue, Singapore, Sri Lanka, United States, Vanuatu.

Uses : Used as an ornamental, particularly to screen fences or buildings.

Management : Digging out or hand-pulling are effective in controlling small infestations. Cutting and stump painting using undiluted glyphosate is an effective chemical control method. Regrowth from stumps can be controlled by spraying diluted glyphosate. The potential of the leaf-feeding beetle *Charidotis auroguttata* Boheman, the leaf-sucking tingid *Carvalhotingis visenda* Drake & Hambleton and the leaf-tying moth *Hypocosmia pyrochroma* Jones in controlling the population of the plant is not known.

Maesopsis eminii Engl.

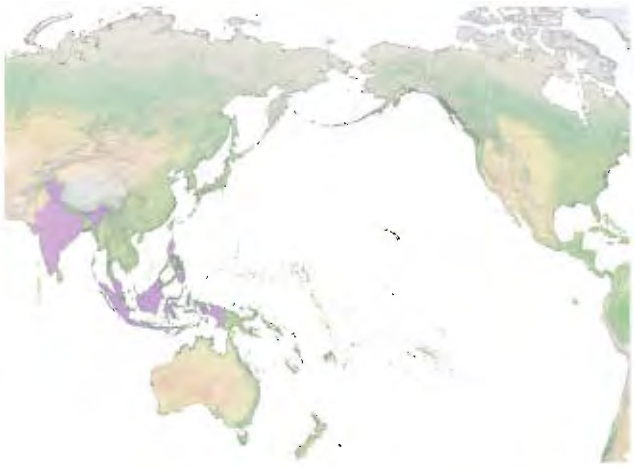
Native : West and Central Africa and parts of East Africa

Family : Rhamnaceae

Synonyms : *Karlea berchemioides* Pierre
Maesopsis berchemioides (Pierre) A. Chev.

Common names : Musizi, umbrella tree

Maesopsis eminii is a fast-growing tree species introduced to many countries for its useful timber. It escaped from plantations and invaded evergreen forests with negative impacts on ecosystems. The tree can be easily identified by its leaves that have dentate margins bearing very visible glands on the dry leaves. The leaves are also characterized by the presence of domatia in the axils of secondary nerves on the dorsal surface. The tree is notable for its ability for self-pruning. Seeds ripen about two months after flowering. Hornbills, bats, rodents and monkeys are the dispersal agents of the seed. When the trees are old, they lose their shedding ability and produce a spreading and rounded crown.



Distribution : Fiji, India, Indonesia, Malaysia, Philippines, Singapore.

Description : Trees, 15 - 25 (-45) m tall, bark pale brown, furrowed, blaze red, branchlets pubescent. Leaves opposite or subopposite, deccussate, stipules subulate, cauducous, lamina 8.5-12 x 2.5-4 cm, ovate-lanceolate, oblong-ovate or lanceolate, base obliquely obtuse, apex acuminate, margin dentate, glabrous, chartaceous, 7-10 pairs of lateral nerves, parallel, slender, prominent, intercostae reticulate; petiole 1-2 cm long, slender, glabrous. Inflorescence of axillary cyme, many flowered, 1 -5 cm long; peduncle 4 -25 mm long. Flowers bisexual, pentamerous, yellowish green, pedicel 1-3 mm. Fruit a drupe, to 3 x 1.5 cm, oblong-obovoid, green to yellow when young and purple-black at maturity, muricate; one seeded.

Habitat : The tree is common in moist forests especially forest edges. Its seedlings can survive under a dense canopy but need gaps to grow to the canopy. The tree is intolerant of frost and needs an annual temperature ranging from 20 to 23° C for effective growth. It grows well in areas with an annual rainfall of 800 to 3 100 mm and at altitudes from 500 to 1 500 meters above sea level. The tree prefers well drained but moist soils with medium fertility and a soil pH level of 4.5 to 7.5.

Threat and damage : *M. eminii* seedlings can outcompete native saplings and when it grows to the top canopy, it can spread out over nearby trees cutting sunlight available to them. The tree utilizes forest gaps and becomes dominant in logged and disturbed areas. It can affect the upper organic soil horizon by forming a dense superficial root mat, altering the pH, affecting soil fauna and increasing soil erosion. It is an aggressive colonizer of grasslands and disturbed areas within forests.

Uses : The wood is used for many purposes such as making poles, boxes, crates and plywood. The leaves are used as fodder. In Africa and India, it is used as a shade tree in coffee, cocoa and cardamom plantations. The seed contains an edible oil. The root is used to treat gonorrhea.

Management : Removal of bark from the stumps will kill the tree and prevent coppicing. Cutting down trees before fruiting is another control method. Seedlings and saplings should be dug out and removed. Biological control is unknown.

Melaleuca quinquenervia (Cav.) S.T. Blake

Native : Australia, New Guinea and New Caledonia

Family : Myrtaceae

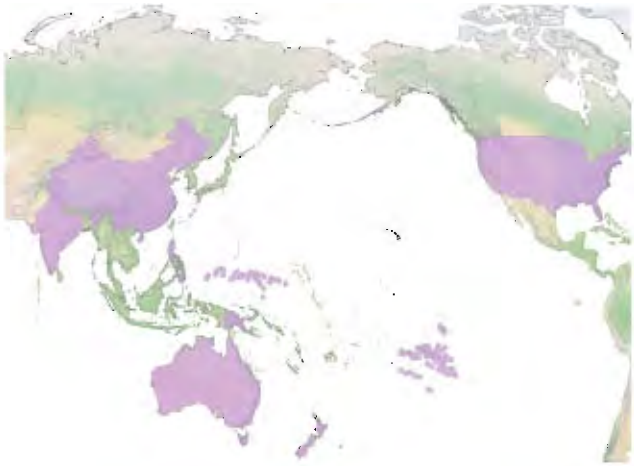
Synonyms : *Melaleuca leucadendra* var. *angustifolia* L. f.
M. leucadendra var. *coriacea* (Poir.) Cheel

Common names : Cajeput, paper bark tree, punk tree

Melaleuca quinquenervia has been widely introduced as an ornamental throughout the tropics from its native home in Eastern Australia and nearby islands. The specific name originates from the Latin words 'quinque' and 'nervis' meaning 'five-nerved', and refers to the common number of longitudinal veins in the leaves. The leaves have a resinous odour and taste when crushed. The bark is whitish or pale brown, spongy, peeling and in many layers. It is widely planted and naturalized in tropical regions, especially in dry tropical lowlands in India, the Philippines and the West Indies. In many areas it has become an undesirable plant. Large numbers of seeds are stored in the fruits and are released when fire or other disturbance occurs. Seeds are dispersed by wind and water and seedlings may grow into almost impenetrable monocultures. The Global Invasive Species Database ranks this species among the top 100 of the world's worst invaders.

Description : Trees, to 25 m tall, stem moderately straight to crooked, narrow, bark thick, pale-coloured, made up of many papery layers. Leaves simple, alternate, elliptic to lanceolate-elliptic, 5-9 x 0.8-1.5 cm, bright green, camphor-scented, apex acute. Inflorescence a terminal spike. Flowers white, sessile, 3-4 mm long. Fruit a capsule, woody, short cylindrical, grey-brown, 3-4 x 4-5 mm, hard, persistent, 200 - 350 seeded. Seeds minute.

Habitat : : In Australia and Papua New Guinea, this tree is generally confined to the lowlands below 100 metres, but in New Caledonia it forms extensive stands in the uplands up to an altitude of 900-1, 000 metres. The best-developed stands occur as open forest and woodland on favourable sites, but elsewhere they are reduced to low woodland or tall shrubland. In Australia, it grows along stream fringes of tidal estuaries and frequently forms pure stands in freshwater swamps. It often grows close to the beach and will tolerate wind-blown salt, prolonged flooding and a fluctuating water table. In waterlogged and flooded areas, the tree forms adventitious aerial roots.



Distribution : Australia, China, Federated States of Micronesia, Fiji, French Polynesia, India, New Caledonia, New Zealand, Palau, Papua New Guinea, Philippines, Singapore, United States.

The tree seeds profusely and can become a weed, especially where periodic fires provide a suitable seed bed. It is highly fire-tolerant during all but the early seedling stages. It also tolerates a dry season of up to seven months a year. Severe frosts will defoliate and kill the branches, but the tree generally recovers by epicormic sprouting.

Threat and damage : The tree is an aggressive invader that spreads rapidly forming impenetrable thickets. In a single year, one paper bark tree can produce a dense island hammock of nearly 180 metres in diameter. It grows very fast and produces dense stands that completely shade out all other vegetation and provide little food for wildlife.

Uses : Often planted as an ornamental for their peculiar bark and showy flowers. The tree is a good source of nectar and pollen for bees, helped by its extended flowering period. It exudes resin as it burns and as such the wood is excellent fuel and makes good-quality charcoal. The wood has been widely used as a source of pulp. However, because the wood contains silica, it rapidly blunts saws and planes. Essential oils are extracted from leaves and twigs and are used in local medicines. As an exotic, the tree is relatively free of pests and diseases in areas where it has been introduced and is suitable for beach planting and erosion control on degraded sites.

Management : Small seedlings can be hand-pulled. Herbicides like hexazinone and tebuthiuron are most effective in controlling *Melaleuca*. Current chemical control recommendations for *Melaleuca* include low-volume applications of glyphosate for control of saplings, and aerial or individual stem (girdle) applications of imazapyr alone, or in combination with glyphosate for mature trees. Two biocontrol agents, the Australian *Melaleuca* snout weevil (*Oxyops vitiosa* Pascoe) and the Australian melaleuca psyllid (*Boreioglycaspis melaleucae* Moore), have been approved by the United States Department of Agriculture for use against *Melaleuca* and have been released in the field in the United States. Research is being conducted on other potential biocontrol agents, including leaf, stem tip and flower bud feeders.

Melia azedarach L.

Native : Southeast Asia and Northeast Australia

Family : Meliaceae

Synonyms : *Azedara speciosa* Raf.
Azedarach commelinii Medik.

Common names : Bead tree, Chinaberry, Indian lilac, margosa tree, Persian lilac

Melia azedarach is a fast-growing tree species commonly planted as an avenue or shade tree. The leaves have an unpleasant odour when crushed. Traditionally, it is planted in courtyards where it is thought to bring good luck.

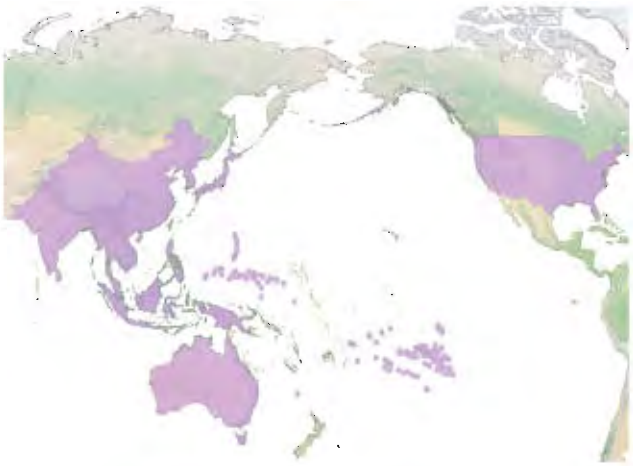
Description : Small trees, deciduous, bark brownish-grey, longitudinally exfoliating, branches spreading. Leaves odd-pinnate, pinnae 2 or 3, 20 - 40 cm, leaflets opposite, lamina ovate, elliptic or lanceolate, 3 - 7 × 2 - 3 cm, terminal one usually slightly larger, both surfaces with stellate trichomes when young. Inflorescence thyrses, glabrous or covered with short lepidote pubescence. Flowers pink to lilac, fragrant, male and female flowers separate. Fruit a drupe, globose to ellipsoid, 10-30 x 8-15 mm; endocarp ligneous. Seed single, ellipsoid, 6-7 mm long, enclosed in a thick, hard and bony endocarp.

Habitat : Grows in natural forests, riparian zones, disturbed lands and wetlands up to an altitude of 1, 800 metres. The plant is highly adaptable and tolerates a wide range of climatic and soil conditions.

Threat and damage : The tree is an aggressive invader in lowland to highland rain forests. It builds up dense stands that outcompete other plants, thus disrupting regeneration. The tree flowers throughout the year and produces many seeds that are dispersed by birds. It begins to flower even at the seedling stage.

Uses : Leaves are used as fodder and are highly nutritious. The wood is used to make agricultural implements, furniture and tool handles. The shiny seeds are used as beads and for rosaries. Extracts from the bark and fruits have pharmacological properties and are used to kill parasitic roundworms. The extract of leaves and seed is insecticidal.

Management : Seedlings can be hand-pulled. Grazing by cattle is effective in controlling spread. Triclopyr is useful in controlling the growth of seedlings. Biological control is unknown.



Distribution : Australia, Bangladesh, Bhutan, Brunei, Cambodia, China, Cook Islands, Democratic People's Republic of Korea, Federated States of Micronesia, Fiji, French Polynesia, Guam, Hong Kong S.A.R., India, Indonesia, Japan, Kiribati, Lao PDR, Malaysia, Myanmar, Nauru, Nepal, New Caledonia, Niue, Norfolk Island, Northern Mariana Islands, Pakistan, Palau, Papua New Guinea, Philippines, Republic of Korea, Samoa, Solomon Islands, Sri Lanka, Thailand, Tonga, United States, Viet Nam.

Merremia peltata (L.) Merr.

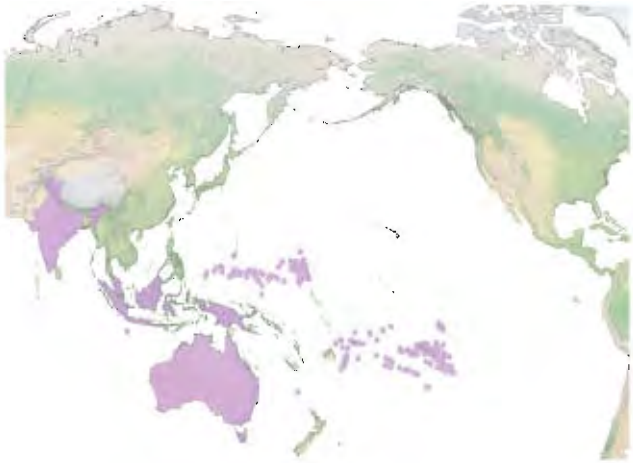
Native : Africa, Asia and the Pacific islands

Family : Convolvulaceae

Synonyms : *Convolvulus bufalinus* Lour.
C. crispatulus Wall., *C. peltatus* L.
Ipomoea peltata L.

Common names : Merremia

Merremia peltata is used as a ground cover in some countries but it has turned invasive affecting natural forests and disturbed/degraded areas. The low seed viability of the plant is compensated by efficient vegetative propagation from nodes. It is used as an erosion control agent and helps to protect nutrient loss when land is disturbed.



Distribution : American Samoa, Australia, Christmas Island, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, India, Indonesia, Malaysia, Marshall Islands, New Caledonia, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Wallis and Futuna Islands.

Description : Gregarious vines, root tuberous; stem smooth, twiny at the tips. Leaves simple, alternate, 7.5-25 x 7-20 cm, broadly cordate to orbicular, peltately attached, base obtuse, apex acuminate, strongly nerved with purple veins beneath, leaf margins waxy; petiole 3 - 24 cm long. Twigs and leaves produce a milky or pale yellow exudate. Flowers in cymose clusters, axillary, white or yellow, funnel-shaped, 5 - 6 cm in diameter; peduncle 15-30 cm long. Fruit a capsule, about 15 mm long, 4 seeded. Seeds dull brown, densely long-pilose, 8-10 x 4 mm.

Habitat : Grows well in forests and thickets, agricultural areas, planted forests, riparian zones and urban areas. In Samoa, *Merremia* is reported up to an elevation of 300 metres affecting lowland ecosystems.

Threat and damage : *Merremia peltata* threatens native biodiversity and helps invasion of other invasive species like *Mikania micrantha*. The plant can crawl up and smother forest trees and other vegetation and also form dense ground cover.

Uses : A decoction of the leaves is used against boils, infections, appendicitis and cysts. Tea made by crushing leaves gives relief to headache and ear pain and roots are used to cure muscular rigidity. The leaves contain an alkaloid, namely convolamine, which has antimicrobial properties.

Management : Grazing by cattle is an effective control method. Application of herbicides like 2,4-D, dicamba, triclopyr, picloram and glyphosate are also useful. Mycoherbicide developed from host-specific strains of *Glomerella cingulata* (Stoneman) Spauld. & H. Schrenk. is used worldwide to control the plant.

Miconia calvescens DC.

Native : Central and South America

Family : Melastomataceae

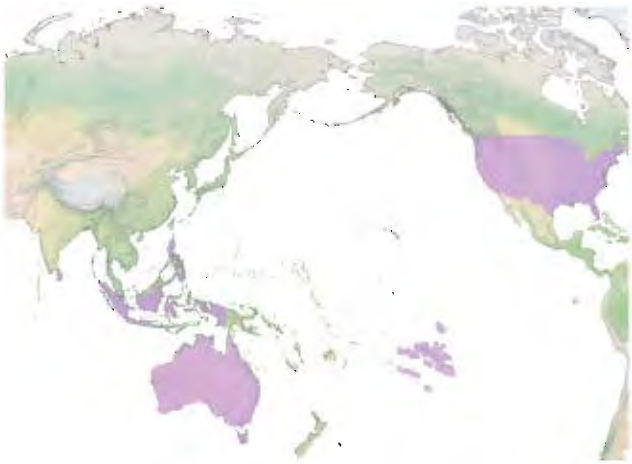
Synonyms : *Melastoma mandioccana* Raddi
Miconia magnifica Triana

Common names : Bush currant, Miconia, purple plague, velvet tree

The huge red and purple leaves make *Miconia* a highly desirable species for gardeners. Perhaps the most characteristic feature of the leaves is the three prominent longitudinal veins. In many of the introduced areas, *Miconia* has become a dominant canopy tree over large areas shading out the entire understorey. The tree is still valuable as an ornamental in many parts of the tropics although its invasive nature is now well known. The Global Invasive Species Database ranks this species among the top 100 of the world's worst invaders. Young stems and leaves of the tree are covered with velvet hairs. The seeds are photosensitive and can remain viable in the soil for more than five years. Seeds are dispersed by wind, water and fruit-eating birds and small mammals. The longevity of the soil seed bank is about six to eight years. However, most of the seeds germinate within 15 to 20 days.

Description : Shrubs or small trees, to 15 m tall, young parts deciduously stellate-puberulous; branchlets quadrisulcate, terete with age. Leaves simple, opposite, oblong-elliptic, apex shortly blunt-acuminate, base obtuse to rounded, 3-nerved, membranaceous, obscurely undulate-serrulate, 17 - 30 x 7 - 15 cm, venules laxly reticulate beneath, green above and bright purple below; prominent petioles 3 - 6 cm long. Inflorescence of panicle 20-30 cm long, multiflorous (with 1 000 - 3 000 short-lived flowers), with paired primary branches. Flowers white or pinkish, bracteoles 2-3 mm long and caducous, oblong, hypanthium 2-2.7 mm long. Fruit a berry, up to 1 cm across, bluish-black or dark purple when ripe, sweet, attractive, 140-230 seeded. Seeds 0.5 mm across. A mature tree can produce up to five million seeds.

Habitat : *Miconia* is common in pastures, forest borders, riverbanks, trail sides, roadsides, disturbed areas, coastlands, riparian zones, scrub-/shrublands, urban areas, wetlands and planted and natural forests. The plant is shade-tolerant, but it regenerates freely and grows more rapidly in forest gaps and open



Distribution : Australia, French Polynesia, Indonesia, New Caledonia, Philippines, Singapore, Sri Lanka, United States.

areas. The distribution of *Miconia* suggests wide climatic adaptation with a preference for tropical climates with distinct seasonality. The tree normally grows up to 1 800 metres above sea level and where annual rainfall is more than 2 000 mm.

Threat and damage : *Miconia* forms dense monospecific stands shading out native vegetation with its large leaves suppressing the growth and regeneration of native species in the understorey. It also affects wildlife populations. The shallow and tentacular root system of the tree exacerbates soil erosion and landslides. *Miconia* is considered as the most invasive and damaging alien plant species to threaten rain forests in the Pacific islands.

Uses : Preferred as an ornamental for its attractive leaves and flowers.

Management : Good sanitation is essential to control the spread of *Miconia*. To prevent human dispersal of seeds, people working in infested areas should change their clothes and shoes before leaving the area. Thorough washing of agricultural tools, machinery and other potential dispersing agents at the site also helps to prevent spread of seeds. Mechanical control is through hand-picking of seedlings and juvenile plants. Application of triclopyr plus 2,4-D at the cut surfaces of trees will prevent regrowth. The Chinese rose beetle (*Adoretus sinicus* Burmeister) causes up to 50 percent defoliation but does not cause tree mortality. The high level of host specificity of the leaf-defoliating sawfly (*Atomacera petroa* Smith) makes it a good biocontrol agent for *Miconia*. A fruit-feeding gall wasp (*Allorhogas* sp.) and a fruit-feeding beetle (*Apion* sp.) were evaluated for host specificity in Brazil.

Mikania micrantha Kunth

Native : Central and South America

Family : Asteraceae

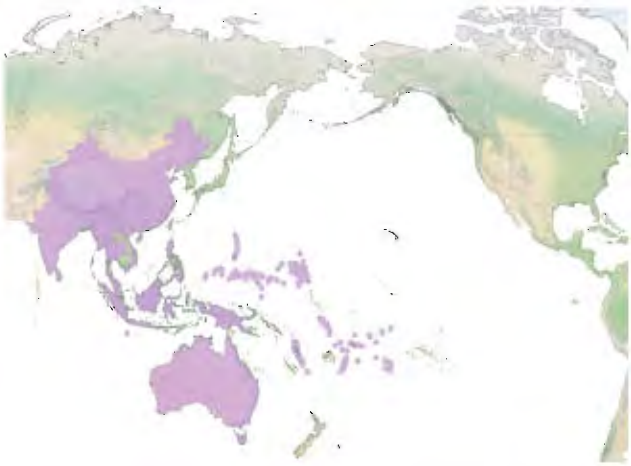
Synonyms : *Eupatorium denticulatum* Vahl
E. orinocense (Kunth) M. Gómez

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 panicled corymbs, capitula cylindrical, 1.5 mm across; flowers 4 per capitula, involucral 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 Carribean

Family : Fabaceae

Synonyms : *Mimosa invisa* C. Martius
M. invisa var. *inermis* (Adelb.) Gilli

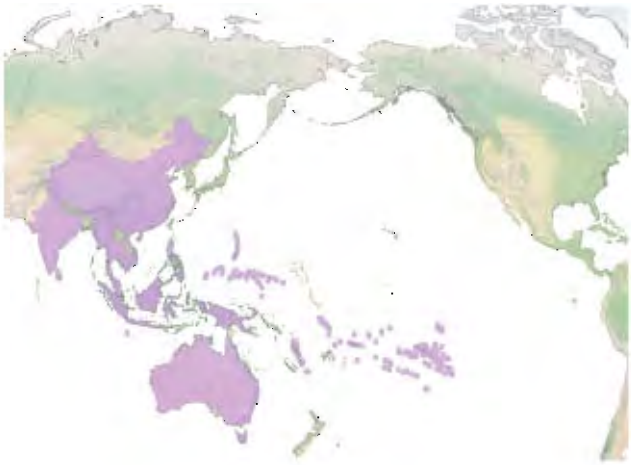
Common names : Creeping sensitive plant, giant sensitive plant, nila grass

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,



Distribution : American Samoa, Australia, Bhutan, Cambodia, China, Christmas Island, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, India, Indonesia, Malaysia, Myanmar, New Caledonia, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Thailand, Vanuatu, Viet Nam, Wallis and Futuna Islands.

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.

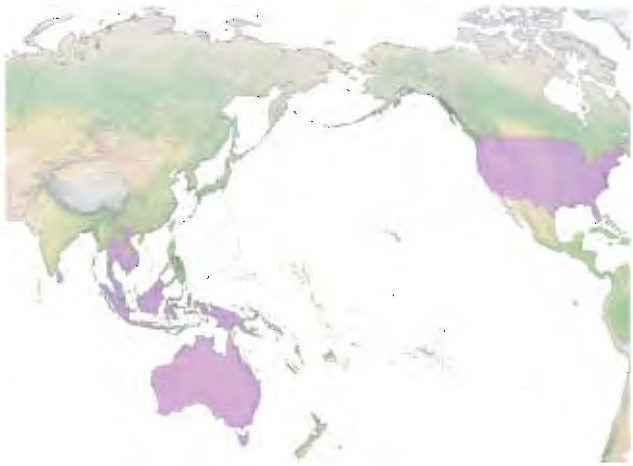
Native : Mexico, South and Central America and the Carribean

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 hardy 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.



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

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, pinne 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 - 12 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

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, gonorrhea 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., *Neurostrota gunniella* Busck and *Carmenta mimosa* Eichlin & Passoa, were released in Australia to control the weed. *N. gunniella* established readily. The fungus *Phloeosporella* 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.

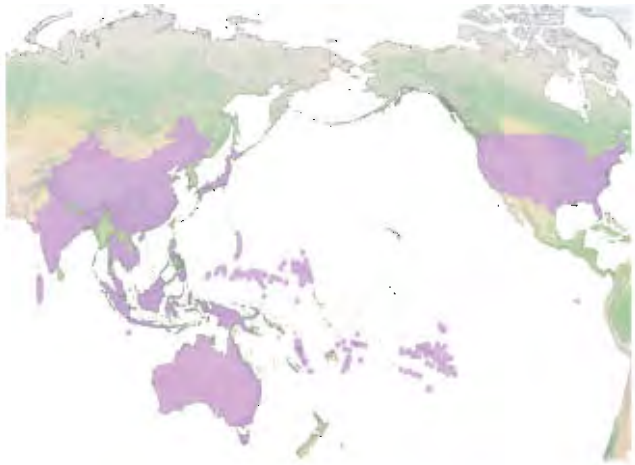
Native : Central and South America

Family : Fabaceae

Synonyms : *Mimosa hispidula* Kunth
M. pudica L. var. *tetranda* (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.



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

Description : Perennial subshrubs, stem cylindric, 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 x 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 x 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

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

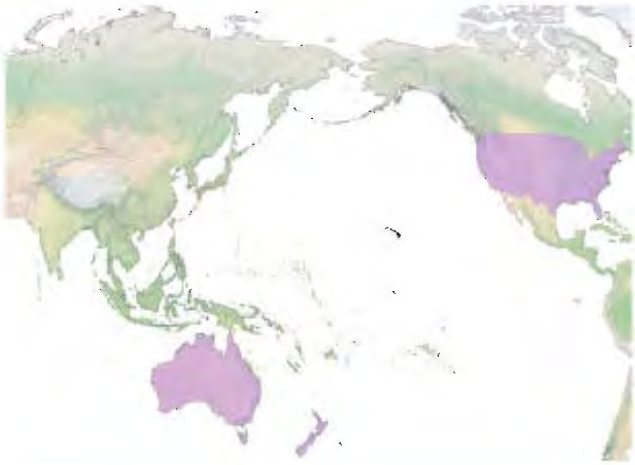
Native : Canary, Madeira and Azores Islands

Family : Myricaceae

Synonyms : *Myrica faya* Aiton

Common names : Fire tree

Morella faya has been introduced to several countries including the Unites 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.



Distribution : Australia, New Zealand, United States.

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 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.

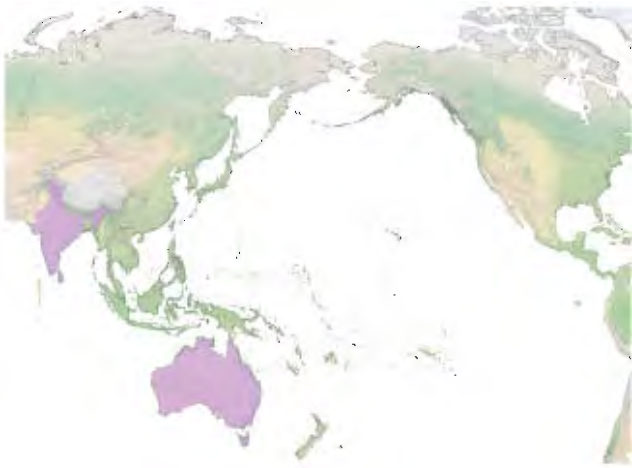
Common names : Araluen pear, Australian pest pear, common prickly pear, erect prickly pear

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 Carribean

Family : Asteraceae

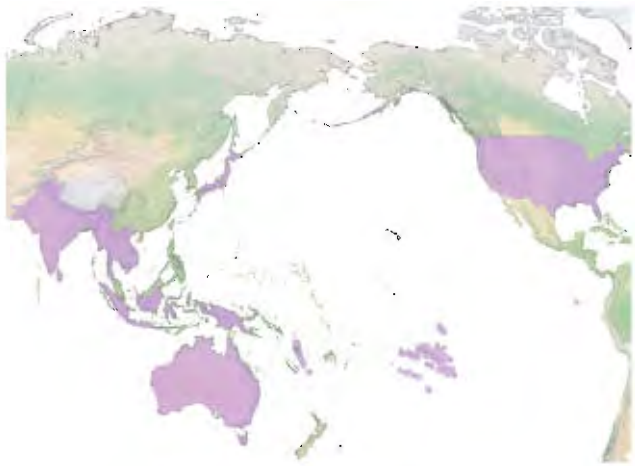
Synonyms : *Argyrochaeta bipinnatifida* Cav.
A. parvifiora Cav.

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.



Distribution : Australia, Bangladesh, Bhutan, Cambodia, Fiji, French Polynesia, India, Indonesia, Japan, Lao PDR, Maldives, Myanmar, Nepal, New Caledonia, Pakistan, Papua New Guinea, Sri Lanka, Thailand, United States, Vanuatu, Viet Nam.

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

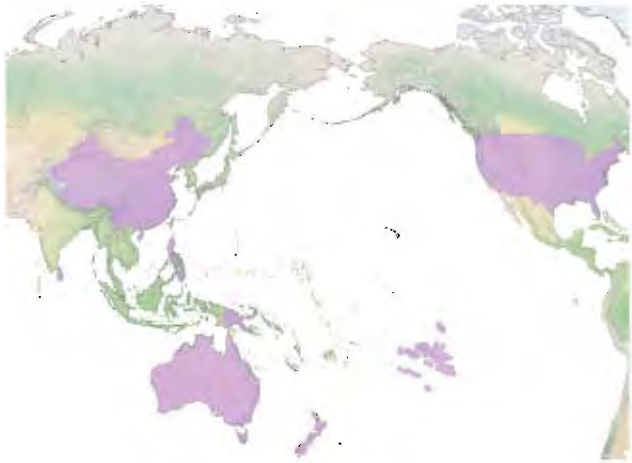
Native : Tropical South America

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.



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

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.

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.

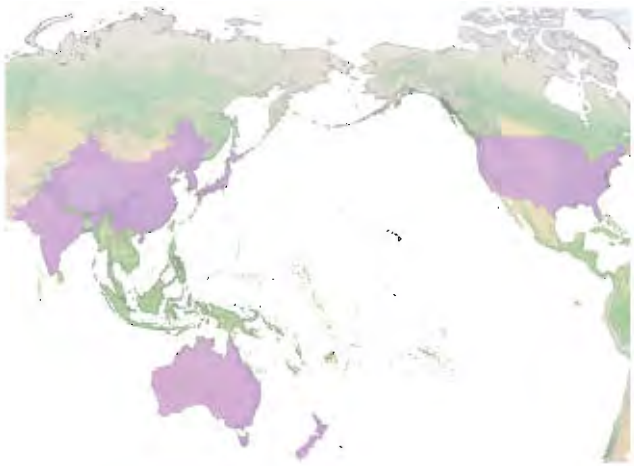
Native : China

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.



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

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 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.

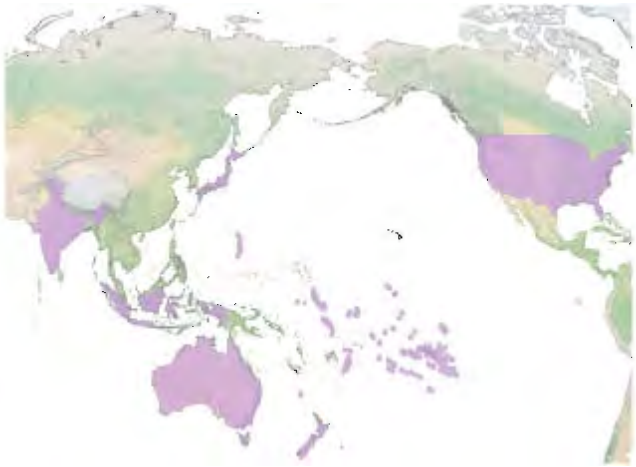
Description : Perennial herbs or subshrubs, 1-2 m tall, stem erect, sparingly branched, densely pubescent. Leaves simple, alternate, broadly ovate to cordate, 6-15 x 4-10 cm, base cordate, apex short acuminate, margin entire or with a few indistinct teeth. Flowers solitary, axillary, yellow, spotted 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

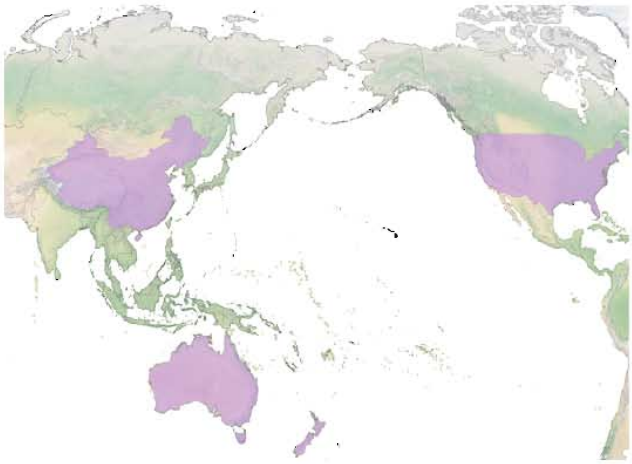
Native : Northwest Africa and South Europe

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.



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

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.

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.

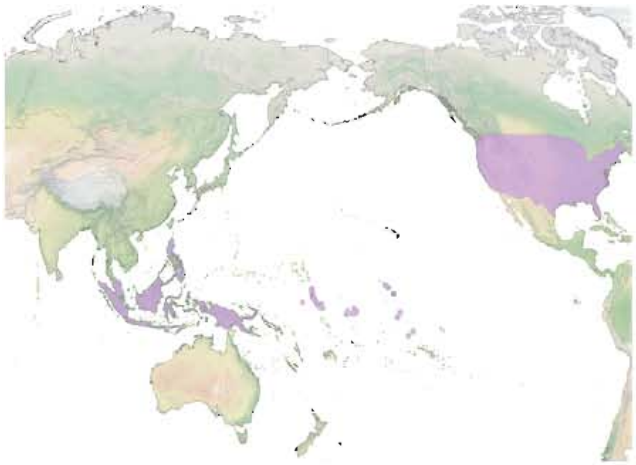
Native : West Indies and tropical America

Family : Piperaceae

Synonyms : *Artanthe aduncа* (L.) Miq.
A. aduncа 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.



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

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 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 triplopyr 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.

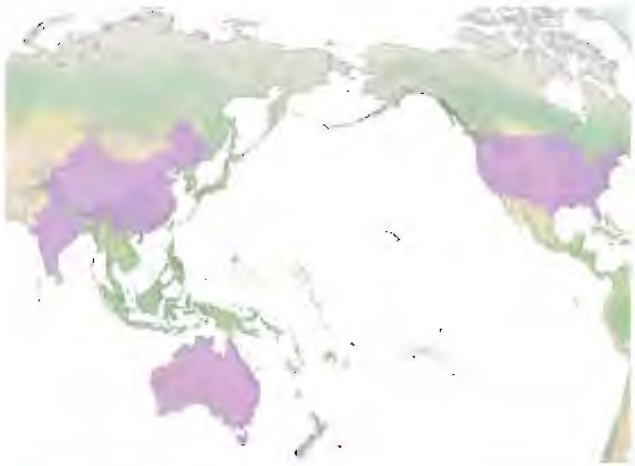
Description : Shrubs or small trees, to 14 m tall, bark smooth, grey. Leaves simple, alternate, 3 - 8 x 10 - 15 cm, lanceolate, pointed at both ends, shiny, with prominently wavy margins, often crowded at the ends of slender, light brown branches. Flowers bell-shaped, creamy-white, few, fragrant, borne 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

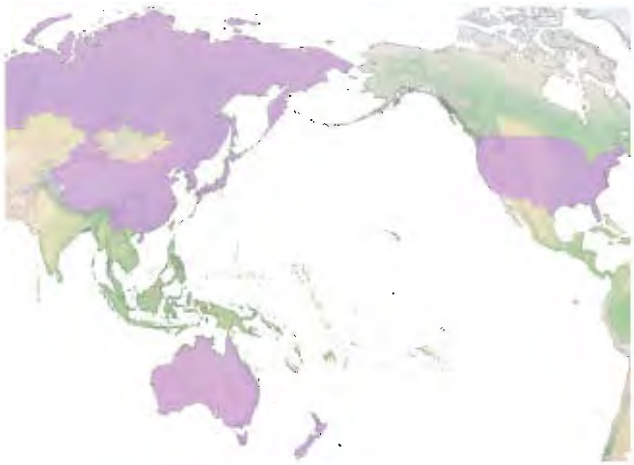
Polygonum cuspidatum is a perennial herb introduced as an ornamental in several countries. The Global Invasive Species Database ranks this species among the top 100 of the world's worst invaders. It is also used to stabilize soil, especially in coastal areas. The overwintering canes and leaves of the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

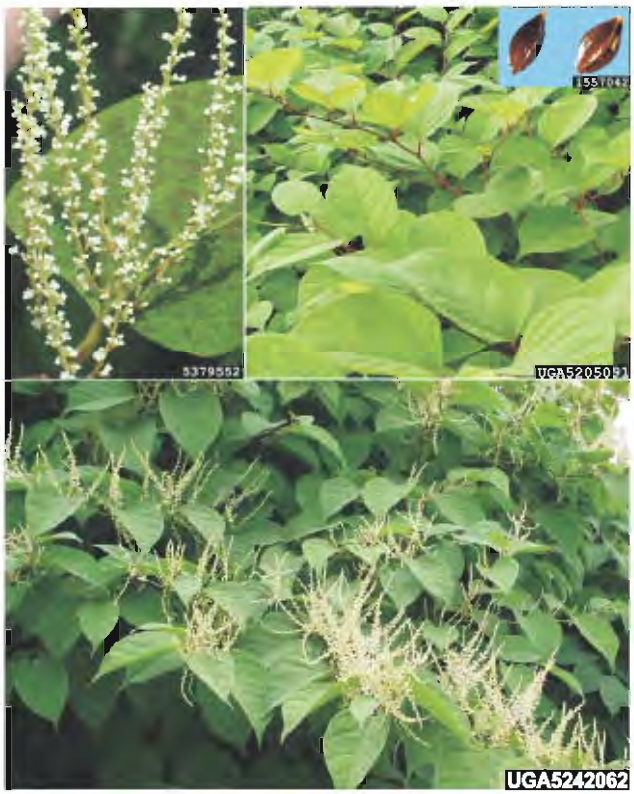
Threat and damage : The plant is a threat to riparian corridors, stream sides, natural forests and open areas where it spreads rapidly to form dense stands, smothering native vegetation and inhibiting regeneration. Once established, the plant is extremely persistent and difficult to control. Its extensive 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

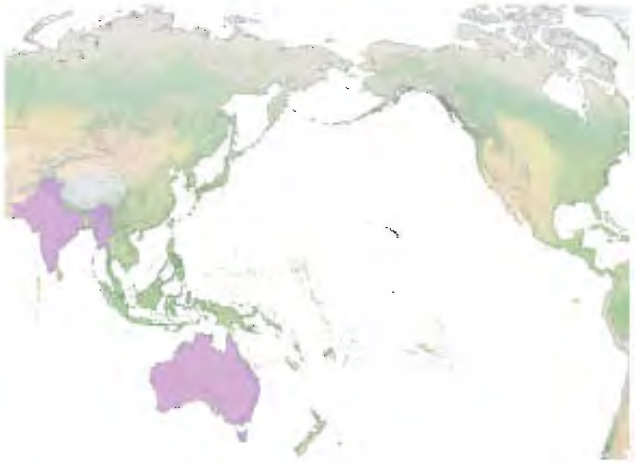
Family : Fabaceae

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 subsessile, 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.

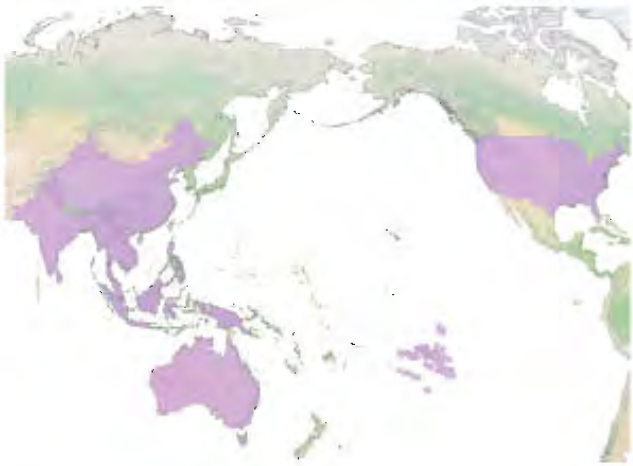
Native : Central and South America and Mexico

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.



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.

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 cented, 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 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 : Cattley guava, cherry guava, Chinese guava, strawberry guava

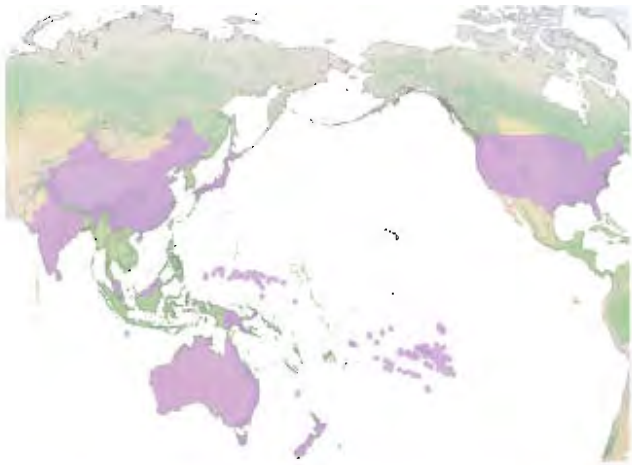
Psidium cattleianum is cultivated in many parts of the world for its delicious fruits. But, it can invade a variety of habitats, form dense thickets and suppress growth of native flora. It has caused devastating effects on native plants in Mauritius and Hawaii, where it invaded natural forests. The feral 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 : *Guaiava pyrigormis* Gaertn.
G. pumila (Vahl) Kuntze

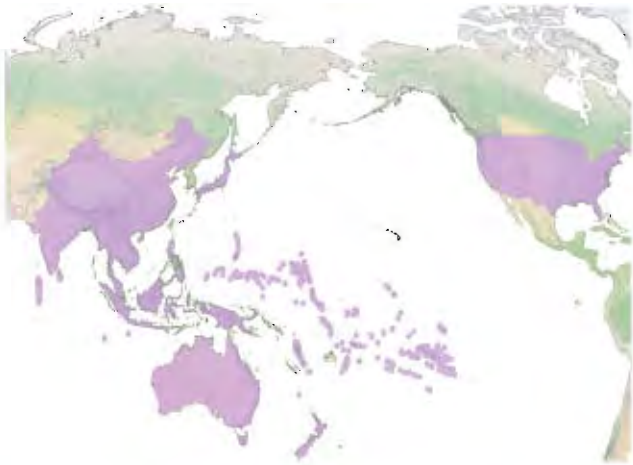
Common names : Guava, lemon guava, common guava

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

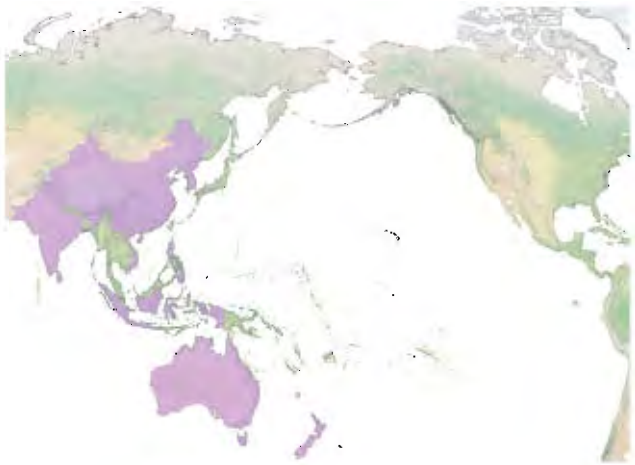
Synonyms : *Pteridium esculentum* (Forst.) Nakai
P. revolutum (Bl.) Nakai

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.

Pueraria montana (Lour.) Merr. var. *lobata* (Willd.) Maesen & S. Almeida

Family : Fabaceae

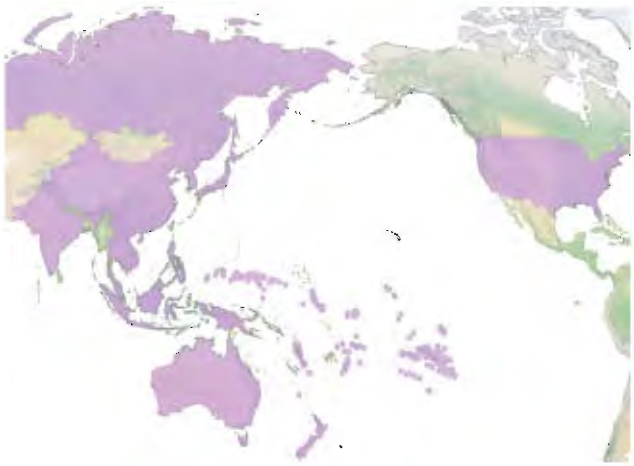
Synonyms : *Dolichos hirsutus* Thunberg
D. lobatus Willd.

Common names : Foot-a-night vine, Japanese arrowroot, kudzu, kudzu vine

Pueraria montana var. *lobata* is a highly aggressive vine that has spread to several countries in the tropics and subtropics posing a threat to native flora and fauna. It was introduced to many countries as a cover crop in rubber and other plantations crops and eventually escaped from these habitats. The vegetative growth is very rapid which adversely impacts the productivity of invaded plantations, if not managed. The beautiful purplish flowers appear in late summer and perfume the air. The plant root comprises over 50 percent of the plant's biomass, serving as an organ for carbohydrate storage for recovery after disturbance. The main mode of reproduction is vegetative.

Description : Gregarious woody climbers, roots thickened or tuberous, covered with long, yellow-brown hairs, tubers 1.8 m x 15 cm. Leaves alternate, 3-foliate, 8-20 x 5-19 cm, slightly lobed, margins thin, fine golden hairy, leaf stalks 15-30 cm long with long hairs, swollen bases, and deciduous stipules. Flowers in many-flowered axillary racemes, 15-40 cm long. Flowers pea-shaped, violet, purple, blue or pink with a yellow spot near the centre, 1.4-2 cm long. Fruit a pod, densely brown-hairy, flat, oblong-linear, 9-12 cm long, 8-12 seeded. Seeds compressed, kidney-shaped, 3-4 mm long.

Habitat : The plant grows well under a wide range of conditions and most soil types. It is common in disturbed areas, natural and planted forests, agricultural areas, grasslands, abandoned fields and on roadsides and forest ridges. It grows best where winters are mild and the summer temperature is above 27° C. The plant cannot survive in very cold climates (below -15°C) but the roots may send up new growth in the spring. Spread is through runners and rhizomes and vines that root at nodes. Because of its large roots, which act as water reservoirs, kudzu can also withstand fairly dry climates. Kudzu can survive in both sunlit and shaded habitats, but it does best on sunny forest ridges.



Distribution : American Samoa, Australia, Bhutan, Cambodia, China, Democratic People's Republic of Korea, Federated States of Micronesia, Fiji, French Polynesia, Hong Kong S.A.R., India, Indonesia, Japan, Kiribati, Lao PDR, Malaysia, New Caledonia, New Zealand, Niue, Norfolk Island, Pakistan, Palau, Papua New Guinea, Philippines, Republic of Korea, Russian Federation, Samoa, Solomon Islands, Thailand, Tonga, United States, Vanuatu, Viet Nam, Wallis and Futuna Islands.

Threat and damage : The plant displaces or kills other plants by growing over them under a solid blanket of leaves. Once established, kudzu can conquer large areas within a short span of time. It causes mortality of forest-fringe trees and also increases the fire hazard during winter. Kudzu grows fast in invaded areas, rapidly covering the soil, affecting native plants and modifying the structure of the affected ecosystems. The plant can act as a reservoir for soybean rust and *Phytophthora* species.

Uses : The powdery extract derived from the plant root is used as cooking starch. The leaves, shoots and flowers are used in salads, soups and sautéed dishes. In China and Japan, the plant is used to cure a wide range of common ailments. The fibre from the vines is used for weaving baskets and for paper-making. As the plant can fix atmospheric nitrogen, its growth will enrich the soil.

Management : Burning, grazing and cutting the vine just above ground level are practised. Herbicides such as clopyralid, picloram, triclopyr, metasulfuron and tebuthiuron are used to control kudzu. These are either applied at the cut end of the stem or sprayed on the foliage. Studies on biocontrol of kudzu using native pathogens like *Pseudomonas syringae* pv. *phaseolicola* (Burk.) Young *et al.*, *Myrothecium verrucaria* (Alb. & Schwein.) Ditmar and *Colletotrichum gloeosporioides* (Penz.) Penz. & Sacc. are currently underway in the United States.

Rhamnus alaternus L.

Native : South Europe, Northwest Africa and West Asia

Family : Rhamnaceae

Synonyms : *Alaternus angustifolia* Mill.
A. balearica Duhamel ex Steud.

Common names : Alaterne, evergreen buckthorn, Italian buckthorn

Rhamnus alaternus is a hardy evergreen ornamental that can grow in a wide variety of soil types including sand dunes and riparian environments. It develops dense leafy canopies under which native plants fail to thrive.

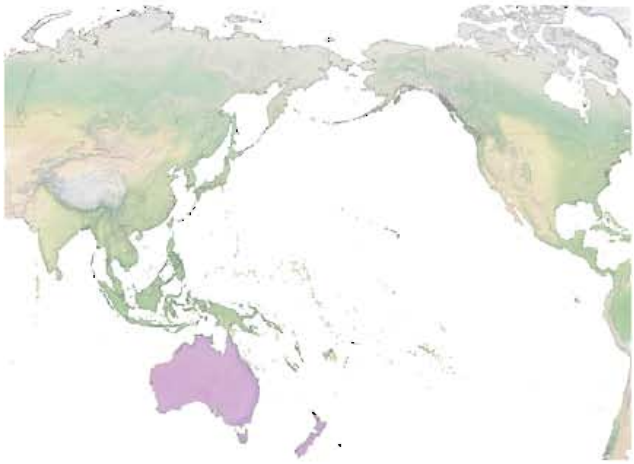
Description : Shrubs or small trees, to 5 m tall, dioecious, young shoot reddish, hairy. Leaves simple, alternate, glabrous except for bearding in the axils of the veins beneath, ovate to elliptic, 3-7 x 2-3 cm, acute, margin horny-serrate; petiole to 0.8 cm long. Flowers in condensed panicles, pentamerous, pale green, fragrant, 3-4 mm in diameter. Fruit a drupe, glossy, dark red, turning black at maturity, egg-shaped, to 7 mm across, 3 seeded, surrounded by endocarp.

Habitat : It grows in areas with a Mediterranean climate and is commonly found in agricultural areas, natural forests, riparian zones, waste areas, open woodlands and near watercourses. The plant tolerates salt, wind, poor soils, frost and heat. Seedlings tolerate deep shade and grow quickly when a light gap appears.

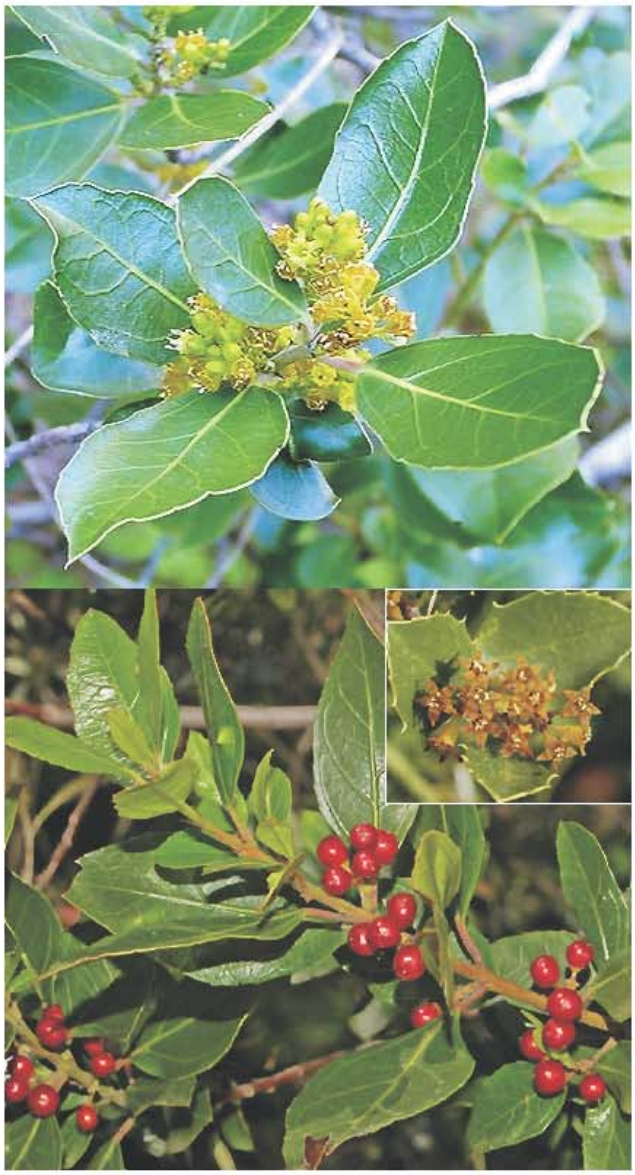
Threat and damage : The shrub is fast growing and resprouts vigorously from the base after damage. Its dense canopy affects the growth of native flora and prevents regeneration of trees and shrubs. The plant also alters the composition of vegetation associations impacting upon local fauna.

Uses : As a windbreak, hedge or as an ornamental plant. Also used for reforestation programmes in the Mediterranean region.

Management: Pull or dig small plants with roots. Cut down larger trees and treat with picloram in combination with 2,4-D and metsulfuron methyl. Biological control is unknown.



Distribution : Australia, New Zealand.



Robinia pseudoacacia L.

Native : Southeast United States

Family : Fabaceae

Synonyms : *Robinia pringlei* Rose
R. pseudoacacia var. *inermis* DC.

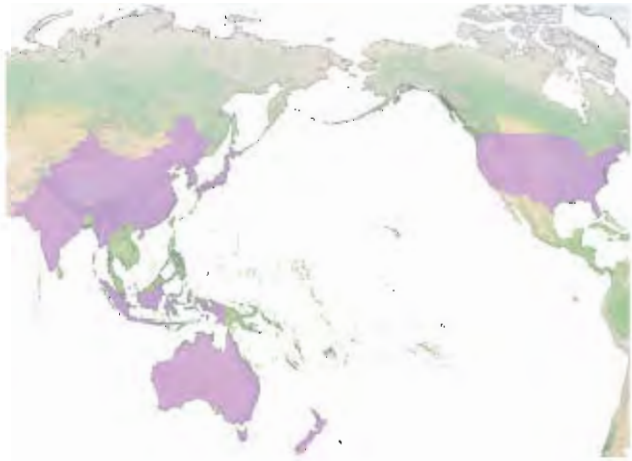
Common names : Black locust, false acacia, post locust, yellow locust

Robinia pseudoacacia is a leguminous tree widely planted in temperate climates around the world to reclaim land and also for ornamental purposes. The genus *Robinia*, with its four species, is native to temperate regions of north America. It reproduces vigorously through root suckers and stump sprouting to form groves of trees interconnected by a common root system.

Description : Medium-sized trees, deciduous, bark grey brown to dark brown, longitudinally fissured, rarely smooth, branchlets grey brown, sparsely hairy, glabrescent; stipulate spines to 2 cm. Leaves pinnate, 10-40 cm, rachis adaxially grooved; petiole 0.1-0.3 cm, stipel acicular. Leaflets 2-12 pairs, opposite or subopposite, oblong, elliptic, or ovate, 2-5 x 1.5-2.2 cm, abaxially greyish-green with appressed pubescence when young, adaxially green, base rounded to broadly cuneate, apex rounded, margin entire, retuse and apiculate. Inflorescence an axillary raceme, 10 - 20 cm, pendulous, many flowered, fragrant, bracts caducous; pedicel 7-8 mm. Flowers pea-shaped, white with yellow spots, stipitate, to 1.5 x 2 cm across. Fruit a legume, brown or with reddish-brown stripes, linear-oblong, 5 -10 x 1-1.7 cm, compressed, calyx persistent, apex volute and mucronate, carpopodium short, narrow wings along ventral suture, 2-15 seeded. Seeds brown to dark brown, slightly glossy, sometimes with stripes, subreniform, 5-6 x 3 mm, hilum rounded, oblique to one end.

Habitat : Grows in agricultural areas, natural forests, planted forests and disturbed areas. It easily adapts to environmental extremes such as drought, air pollutants, frost and high light intensities. Rapid growth rate, dense wood and the ability to fix nitrogen makes this plant ideal for greening degraded sites.

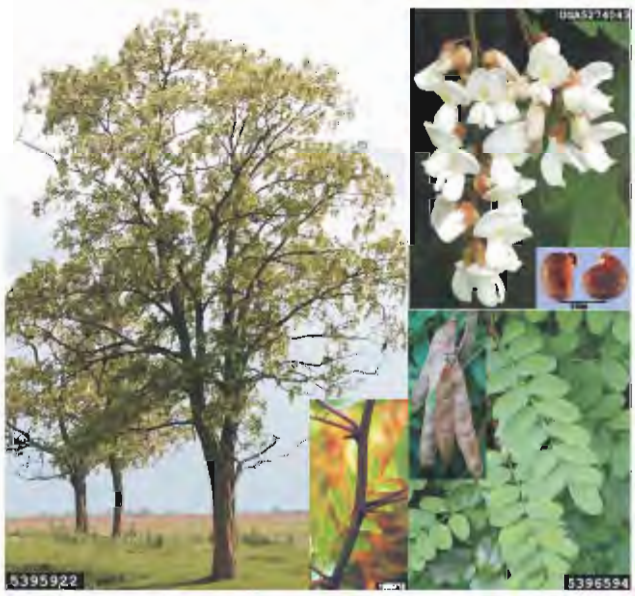
Threat and damage : The tree aggressively shades out other native vegetation and averts growth. The fragrant blossoms compete with native plants for pollinating bees.



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

Uses : The seeds and pod pulp are used as food. A strong narcotic and intoxicating drink is made from the skin of the fruit. Piperonal, a vanilla substitute is extracted from the plant. The fragrant flowers are used to make jams and pancakes. The wood is hard, rot resistant, durable and used for furniture and panelling. Flavonoids in the heartwood allow the wood to last over 100 years in soil.

Management : Seedlings can be pulled out. Treatments with herbicides like glyphosate, picloram or triclopyr are effective. Biological control is unknown.



Rubus discolor Weihe & Nees

Native : North Africa and Western Europe

Family : Rosaceae

Synonyms : *Rubus armeniacus* Focke
R. fruticosus L.

Common names : Armenian blackberry,
Himalayan blackberry

Rubus discolor is basically an ornamental plant but it is also cultivated for its fruits. It escaped from cultivated areas and became invasive. The thorny stems and bushy growth of the plant obstruct the movement of humans, wildlife and waterways. Mature plants form a tangle of dense arching stems with the branches rooting from the node tip when they reach the ground. The asexual mode of reproduction includes rooting at cane apices, through root suckers and root and cane fragments. Seeds are dispersed by birds and animals. Thickets of *Rubus* can produce up to 13,000 seeds per m^2 and each seed contains two ovules. The seeds can remain viable for several years.

Distribution : Australia, Japan, New Zealand, United States.

Description : Scandant shrubs, rooting at nodes, young shoots pilose-pubescent, glabrous with age, stem angled and furrowed, bearing well-spaced, heavy, broad-based, straight or curved prickles, 0.6 - 1 cm long. Leaves 3-5 foliolate, pubescent beneath, glabrous above when mature, hooked prickles on petioles and petiolules, leaflets are large, broad, oblong, 6 -13 cm long, dentate, upper surface bright green and smooth, lower surface greyish, hairy. Flowers, white or rose, 2-2.5 cm across, in large terminal clusters with branches in the lower axils; peduncles and pedicels tomentose, prickly. Fruit a drupe, roundish, black and shiny when ripe, to 3 cm across, succulent. Seeds light brown, triangular or irregular, surface deeply pitted, 2 - 3 mm long.

Habitat : The plant colonizes disturbed areas, planted forests, agricultural areas and near watercourses. It prefers full sunlight and light forest cover and can grow well in a wide range of soil types up to 1 500 metres in elevation. The plant can tolerate flooding and it vigorously re-sprouts after fire.

Threat and damage : The plant forms large thorny thickets and dense shade, which affect native species diversity; such thick growth limits the movement of animals in gaining access to water. The thickets and leaf litter pose a potential fire hazard. Controlling the plant is very difficult as it can regenerate from small sections of root stock. The thorns injure the nasal passages of livestock during grazing. The plant has the potential to hybridize with native species of *Rubus*.

Uses : The fruits, buds and leaves are eaten by birds and small mammals. Fruits, roots and stems have medicinal properties.

Management : Digging up or hand-pulling small seedlings will help to control the weed. Cut stump and basal stem treatment using glyphosate or triclopyr is effective. Biological control is unknown.

Rubus niveus Thunb.

Native : South and Southeast Asia

Family : Rosaceae

Synonyms : *Rubus albescens* Roxb., *R. bonatii* H. Lév. *R. boudieri* H. Lév., *R. distans* D. Don

Common names : Ceylon raspberry, hill raspberry, Mysore raspberry

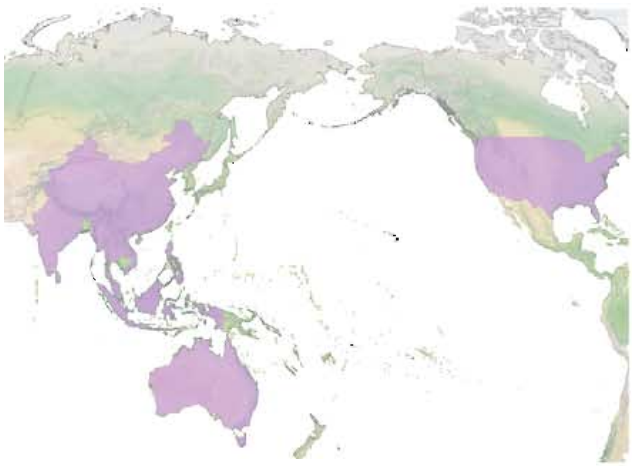
Rubus niveus has been introduced and cultivated in several tropical countries for its edible fruit. It can thrive well in a wide range of environmental conditions. The plant is propagated through seeds and cuttings. Seeds are dispersed by birds and animals.

Description : Scandent scrambling shrubs, to 4.5 m tall, stem prickly, glabrous, covered with whitish bloom, prickles 0.4 - 0.7 cm long. Leaves palmately compound, 5-7, terminal leaflets 5 - 17 x 4 - 8 cm, green above and white tomentose beneath. Leaflets ovate, dentate; petioles 1.5-5 cm long. Flowers pink or mauve, 1-1.5 cm in diameter, borne in dense clusters, 2 - 5 cm long. Fruit a berry, ovoid-globose, white, pink or deep purplish, 10 - 15 mm in diameter. Seeds small, irregular in shape, surface deeply pitted.

Habitat : The plant occupies natural forests, slopes, agricultural areas and riverbanks below 3 000 metres. The plant prefers wet habitats and well-drained acidic soils. It cannot tolerate drought.

Threat and damage : The plant can grow into dense bushes due to the arching and intertwining stems. These thickets with sharp thorns are a menace in wildlife habitats. Its invasion in agricultural land poses problems to farming and harvesting activities. Regeneration of native flora is also affected by *Rubus* invasion.

Uses : The edible fruit is juicy with a sweet and rich raspberry flavour. A purple or dull blue dye is obtained from the fruit.



Distribution : Australia, Bhutan, China, India, Indonesia, Lao PDR, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, United States, Viet Nam.

Management : Mechanical control is difficult due to the sharp thorns and dense thickets. Isolated shrubs can be dug out. Drizzle application of triclopyr ester in a crop oil carrier is effective. Goats have been effective in controlling the shrub via grazing.

Saccharum spontaneum L.

Native : Tropical Africa and Asia

Family : Poaceae

Synonyms : *Imperata klaga* Jungh.
I. spontanea (L.) P. Beauv.

Common names : African fodder cane, Asian fodder cane, fodder cane, wild sugar cane

Saccharum spontaneum is a species of grass that grows in areas with moderate but prolonged dry periods. The extensive network of rhizomes and allelopathic effects of the plant impede growth of other plants. There are three distinct biotypes of *S. spontaneum*; plants found in dry areas are xerophilous, those in wetlands and swamps are hygrophilous and an intermediate type is found on loamy soils. The plant can propagate vegetatively via rhizomes and stem fragments. Seed dispersal by wind is aided by callus hairs in a parachute mechanism. Seed production is variable from around 3, 000 to 12, 800 seeds/plant.

Distribution : Australia, Bangladesh, Federated States of Micronesia, Guam, India, Indonesia, Japan, Malaysia, Myanmar, Nepal, New Caledonia, Pakistan, Palau, Papua New Guinea, Philippines, Russian Federation, Samoa, Solomon Islands, Sri Lanka, Thailand, Viet Nam.

Description : Perennial grass, to 3 m tall, erect, rhizomatous, nodes waxy. Leaves 45-110 x 0.6-1.2 cm, linear-lanceolate, base rounded, margins serrulate, apex acuminate, involute, glaucous; sheath to 40 cm in length, silky villous at the collar, ligules 4 - 5 mm long, ovate, membranous. Inflorescence of panicles, 20 - 32 cm long, densely silky white. Spikelets paired, one sessile and the other pedicelled, similar, 3 - 4 mm long, lanceolate, reddish-brown; callus densely long, villous, lower glume 3 - 4 x 1 mm, ovate-lanceolate, subcoriaceous, margins hyaline, ciliate. Upper glume 3-4 x 1mm, ovate-lanceolate, dorsally-keeled, margins ciliate. Lower floret empty. Pedicelled spikelets similar to the sessile ones. Caryopsis ca. 1.5 mm long.

Habitat : *S. spontaneum* is common in fallow fields, wastelands, riverbanks, roadsides and railroads. It is found in areas up to 1 500 metres in elevation and can withstand different soil types and moisture levels. The plant prefers rainfall that exceeds 1 500 mm. It has a high degree of tolerance to drought and flood.

Threat and damage : *S. spontaneum* is a serious weed of cultivated land and heavy infestation necessitates abandoning the area. In India, the plant affects the productivity of crops like tea, sugar cane, cotton and sorghum. It is a major weed in sugar cane crops in Bangladesh. In Indonesia, it affects the productivity of rubber and tea. The leachates from rhizomes and

roots inhibit the growth of wheat varieties. The plant contains hydrocyanic acid and is toxic to livestock while green. It acts as an alternative host of many pests like the sugar cane top borer (*Scirpophaga excerptalis* Walker), Asian corn borer (*Ostrinia furnacalis* Guenee) and the white mite of sugar cane (*Schizotetranychus* spp.). *Saccharum* quickly colonizes disturbed soil.

Uses : It is a good fodder for goats and camels. The plant is used for thatching roofs or fencing vegetable gardens in Nepal. The extensive rhizome network helps to bind soil and prevent soil erosion. Its roots are medicinal. Aqueous extract of the plant is reported to have mild antipsychotic activity.

Management : Deep ploughing and mulching are effective. Pre-emergence application of oxyfluorfen followed by oxyfluorfen + paraquat, bromacil, dalapon, amitrole and glyphosate are effective. Biological control is unknown.

Salix cinerea L.

Native : Europe, Russian Federation and West Asia

Family : Salicaceae

Synonyms : *Salix aquatica* Sm.
S. deserticola Goerz ex Pavl.

Common names : Grey sallow, grey willow, pussy willow

Salix cinerea, an aggressive shrub, common in wetlands and tolerant to a wide range of environmental conditions, is invasive in the Asia-Pacific region. It can divert stream flow and invade shallow water by layering of branches. The short-lived seeds are dispersed by wind and water.

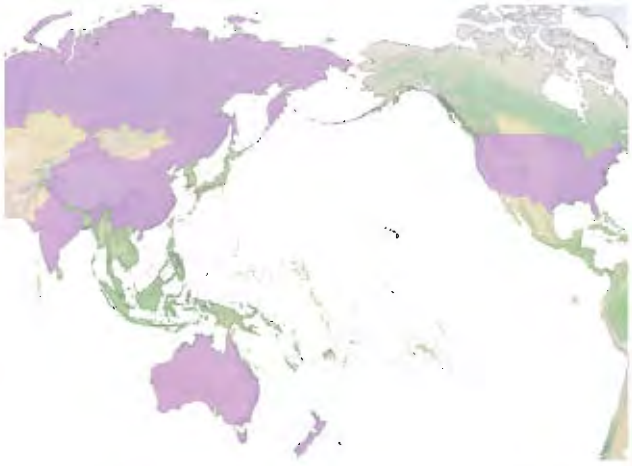
Description : Shrubs or small trees, bark dull grey, branchlets densely grey tomentose, buds brown, flattened, oblong, stipules reniform or semiovate. Leaves simple, alternate, obovate or obovate-lanceolate, 4 - 10 x 1 - 1.5 cm, abaxially densely grey tomentose, adaxially dull green or greyish-green, base attenuate, margin shallowly serrulate, rarely entire, apex acute, lateral veins raised abaxially; petiole 5 - 7 mm. Flowering precocious or coetaneous; catkins appear in advance of the leaves, cylindrical, 2 - 3 cm long, male catkin 1-2 cm; bracts brown, spatulate, long pubescent. Flowers many, female catkin 3 - 4 cm, smaller and narrower. Fruit a small hairy capsule, to 10 mm long, with two valves, containing many tiny seeds.

Habitat : It is a weed of wet temperate regions commonly found along waterways, lake-edges, swamps and wetlands. It is capable of growing in a wide range of soils and can withstand permanent water logging.

Threat and damage : *Salix* spreads aggressively and forms thick growth along rivers, competing for space, water and nutrients. The thickets reduce light availability to understorey species and eliminate almost all vegetation. The species can alter the shape of riverbanks and streambeds through sediment accumulation and shading affects the richness and abundance of aquatic fauna.

Uses : It is used as an anodyne and febrifuge; also used in the treatment of rheumatism, arthritis, gout, inflammatory stages of autoimmune diseases, diarrhoea, dysentery, colic and headache. It is sometimes planted for soil stabilization.

Management : Seedlings and small plants can be hand-pulled or dug out. Injection of stems and cutting and painting of stumps with common herbicides are effective. Biological control is unknown.



Distribution : Australia, China, India, New Zealand, Russian Federation, United States.

Schinus terebinthifolius Raddi

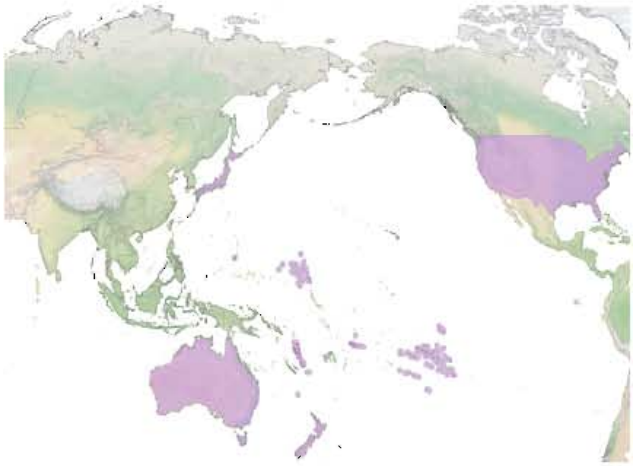
Native : Argentina, Paraguay and Brazil

Family : Anacardiaceae

Synonyms : *Sarcotheca bahiensis* Turcz.
Schinus antiarthriticus Mart. ex Marchand
S. terebinthifolia Raddi

Common names : Brazilian pepper, christmas berry, Florida holly

Schinus has been introduced by several countries for ornamental and shading purposes. It can be a pioneer plant in disturbed sites, but is also successful in undisturbed areas. The plant can shade out and affect growth and survival of native flora and fauna. The fruits have a paralyzing effect on birds and grazing animals when ingested. The leaves are aromatic when crushed, smelling like pepper or turpentine. This plant is ranked among the top 100 of the world's worst invaders in the Global Invasive Species Database. The seeds are is dispersed by birds and mammals.



Distribution : American Samoa, Australia, Fiji, French Polynesia, Guam, Japan, Marshall Islands, New Caledonia, New Zealand, Norfolk Islands, Samoa, Singapore, United States, Vanuatu.

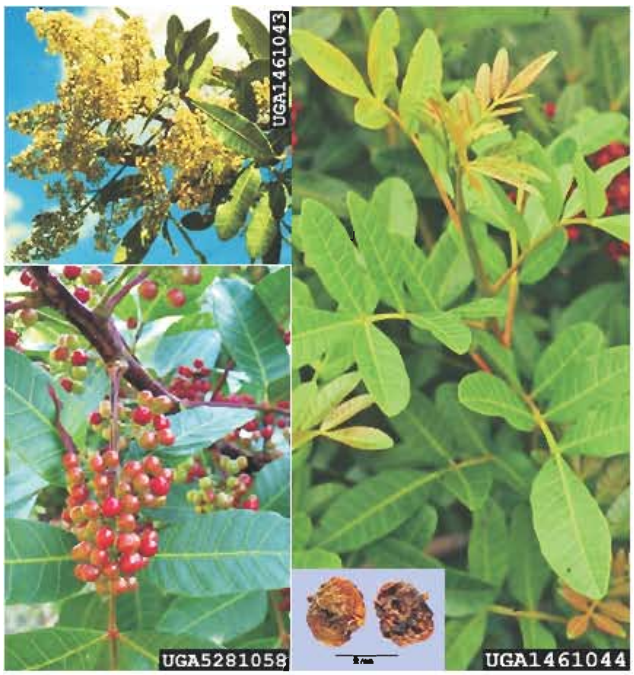
Description : Shrubs or small trees, to 7 m tall, dioecious, bark smooth, grey, exudate resinous, turn black on exposure. Leaves compound, alternate, rachis 3-14 cm, often winged, leaflets 5-9, lanceolate to elliptic, 1.5 - 7.5 x 1-4 cm, acute at both ends, margin entire to serrate, midribs, rachis and petiole are often reddish, especially when young; crushed foliage smells like turpentine. Inflorescence of a panicle mostly in axils. Flowers 1.2-2.5 mm long, white. Fruit a drupe, 4-6.5 mm in diameter, bright-red, pulp aromatic brown. Seeds one per drupe, elliptic, light brown.

Habitat : The plant is common along roadsides, in mangrove forests, natural forests, planted forests and grasslands. It is drought-resistant and can survive fire well. It is mostly associated with damp soils but can also appear as a dry savannah plant.

Threat and damage : The plant can form thick monospecific stands and displace native flora through release of allelopathic chemicals. The high concentration of volatile and aromatic monoterpenes in the plant causes respiratory problems, itchy skin rash and inflammation and swelling of the face and eyes in human beings.

Uses : The berries are used as a spice and serve as a good food source for wintering songbirds. The bark yields tannin and the wood is used for construction purposes such as railway sleepers and posts.

Management : Seedlings and saplings can be pulled by hand. Fire is used as a control measure in fire-adapted communities. Herbicides such as triclopyr, bromacil and hexazinone are useful to manage the population of the weed. The Brazilian pepper leafroller, *Episimus utilis* Zimmerman, the Brazilian pepper sawfly, *Heteroperreyia hubrichi* Malaise and several fungal pathogens are being tested for their potential as biocontrol agents.



Securigera varia (L.) Lassen

Native : Europe, North Africa and Southwest Asia

Family : Fabaceae

Synonyms : *Coronilla haussknechtii* Boiss.
C. hirta Boiss., *C. varia* L.

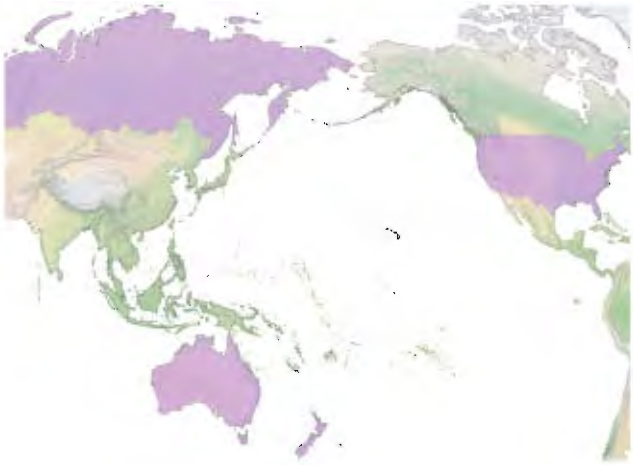
Common names : Axseed, crown-vetch, trailing crown-vetch

Securigera varia, a perennial legume, is widely planted for ground cover on steep banks, mine reclamation sites and as a cover crop on cropland. It can invade and dominate over a variety of vegetation types. The plant reproduces vegetatively via rhizome sprouts. Seeds remain viable in the soil for less than a year to five years. The seeds are light in weight and 1 kg may contain around 240, 000 – 245, 000 seeds.

Description : Rhizomatous subshrubs, densely branched, perennial, decumbent to ascending, with angular hollow stems, 1-1.5 m tall. Leaves pinnately compound, leaflets 11-21 pairs, ovate or linear-elongate. Inflorescence of racemes, umbellate, 15 - 20 flowered, peduncle exceeding leaves; pedicels twice as long as the cup. Flowers white, pink or purple, 12 - 13 mm in length; wings and carina almost white, beak dark red. Fruit a pod, 4.5 - 8 x 2 - 2.5 mm, narrowed towards apex, surface with longitudinal wrinkles. Seeds ovate-oblong, 3-3.5 x 1 - 1.5 mm, reddish brown.

Habitat : The plant creeps and spreads along the ground, blanketing anything on the way with its feathery compound leaves carried on thin wiry stems. Beneath the ground, it spreads by underground rhizomes sending up still more plants as it tries to cover the invaded areas. It tolerates drought, heavy precipitation and cold temperatures, but does not tolerate shade. The weed is adapted to all coarse- and medium-textured soils, but does not grow well in fine-textured, saline and alkaline soils.

Threat and damage : Rapid vegetative spread and prolific seeding ability help *S. varia* to create dense, single-species stands. It can alter ecosystem functions and nutrient cycling, leading to further degradation of infested habitats. When it invades new habitats, soil nitrogen increases and the overall fuel-load changes in fire-adapted communities. It can be poisonous to single-stomached animals if eaten in large quantities.



Distribution : Australia, New Zealand, Russian Federation, United States

Uses : An excellent soil binder that quickly covers slopes, especially dry rocky slopes. It is commonly used on sloping highway shoulders. The whole plant, used either fresh or dried is a cardiotonic. A decoction of the bark has been used as an emetic. The crushed plant is rubbed on rheumatic joints and cramp limbs for relief.

Management : Hand-pulling may be effective to control small initial infestations. Mowing plants in the flower bud stage for two or three consecutive years may reduce the vigour and control further spread. Plants should be cut close to ground level before the seeds mature. Dicamba, glyphosate, triclopyr or clopyralid may be used, and glyphosate can be foliar-applied for good control when the weed is actively growing. Clopyralid is a more target-specific herbicide than others. Biological control is unknown.

Sida acuta Burm. f.

Native : Central America

Family : Malvaceae

Synonyms : *Malvastrum carpinifolium* (L. f.) A. Gray
Malvinda carpinifolia (L. f.) Medik.

Common names : Broomweed, southern sida, spiny-head sida

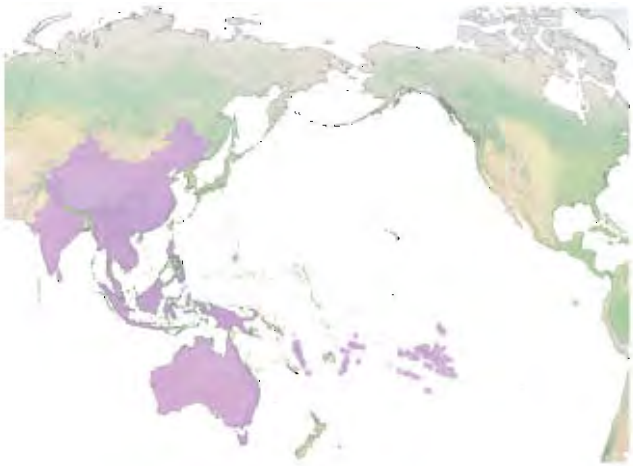
Sida acuta, a native of Central America, is a pantropical weed. The plant is sometimes confused with *Sida rhombifolia* but *Sida acuta* differs from the former by its smaller and narrower leaves. It is widely cultivated as a medicinal plant and is an integral component of Indian Ayurvedic medicine. It is among the top 100 of the world's most serious weeds. The plant will flower throughout the year. The germination rate of seeds is very high.

Description : Perennial subshrubs, to 1 m tall, branchlets pilose or subglabrous. Leaves simple, distichous, ovate, oblong, lanceolate, or linear-lanceolate, 1.2-9 x 0.5-4 cm, both surfaces glabrous or sparsely stellate pilose, rarely with simple hairs adaxially; base obtuse, margin dentate, sometimes partly entire above, apex acute or acuminate. Stipules filiform, usually persistent. Flowers solitary or paired, axillary, sometimes congested at the stem apex, yellow, less often white or yellow-orange. Fruit a capsule, hard, brown, 3-5 mm in diameter, breaking into 5 - 8 triangular segments, each segment contains one seed with a pair of sharp awns, roughly triangular, with a deep depression on each of the sides, reddish-brown or black.

Habitat : *S. acuta* is commonly found in pastures, wastelands, cultivated lands, open areas, along roadsides and in degraded forests. It can grow well in most soils and commonly occurs from near sea level up to 1500 metres elevation.

Threat and damage : The plant is a major problem for plantation crops and vegetables. In Sri Lanka, it is a weed in tea plantations and in Mexico it is a nuisance in maize fields. Once established, the plant will compete with the native flora and displace them. The deep taproot helps the plant to withstand drought.

Uses : Fresh leaves are used for dropsy and chronic renal failure. The plant has aphrodisiac, analgesic and anti-inflammatory properties. It is used to treat fever, headache, infectious diseases and as an astringent and



Distribution : American Samoa, Australia, Cambodia, China, Fiji, French Polynesia, Guam, Hong Kong S.A.R., India, Indonesia, Lao PDR, Malaysia, Myanmar, New Caledonia, Niue, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Thailand, Tonga, Vanuatu, Viet Nam.

antidote for scorpion stings and snake bites. *Sida* is cultivated in many parts of India for its medicinal properties. In Australia, the plant is traditionally used to treat diarrhoea. In Mexico, leaves are smoked for its stimulative effects. In some parts of India, *Sida* leaves are used in tea for the same purpose. Some traditional societies use the plant for the treatment of tuberculosis, chronic dysentery and urinary and cardiac diseases.

Management : Slashing or mowing before flowering are effective. Application of herbicides such as 2,4-D, glyphosate, dicamba, fluroxypyr and metasulfuron methyl are useful for short-term control. In Australia, a chrysomelid beetle viz., *Calligrapha pantherina* Stal, which causes defoliation in *Sida*, is now undergoing host specificity tests. The fungus *Fusarium lateritium* Nees (*Gibberella baccata* (Wallr.) Sacc.) is used as a biocontrol agent in the United States.

Solanum mauritianum Scop.

Native : South America

Family : Solanaceae

Synonyms : *Solanum auriculatum* Aiton
S. tabacifolium Vell.

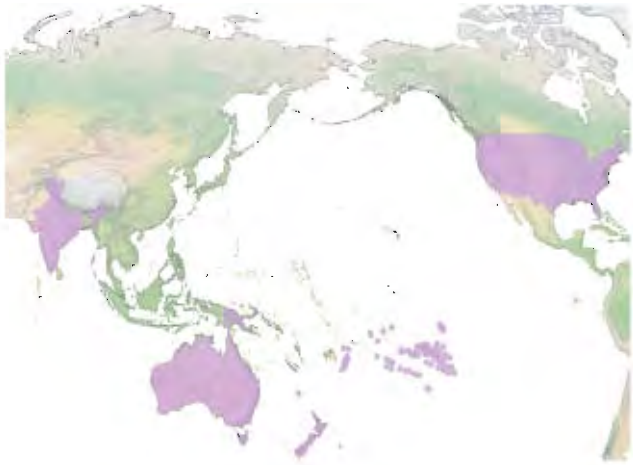
Common names : Bugweed, flannel leaf, kerosene plant, tobacco weed, wild tobacco

Solanum mauritianum is an ornamental plant that has escaped from gardens and started to occupy vacant lands and disturbed areas. All parts of the plant are poisonous to human beings especially the berries. The leaves emit a strong smell of diesel fuel when crushed. The plant can prevent growth of native vegetation by overcrowding. It is a favoured food plant of the African olive pigeon. The seeds are dispersed by birds and seed germination is stimulated by fire.

Description : Large perennial shrubs, branches form a rounded canopy, all parts densely pubescent with sessile to long-stalked stellate hairs, loose and floccose when young. Leaves simple, alternate, elliptic,18 - 30 x 6-12 cm, entire, apex acuminate, base cuneate, often oblique; petioles 3 - 9 cm long, each with one or two smaller auriculate leaves in axils that are sessile, rounded and sometimes absent from weak or distal shoots. Flowers numerous, in branched corymbs, lilac blue with a pale star-shaped area at the base, stellate, 1.5 - 2.5 cm in diameter; peduncles to 15 cm long to first fork, pedicels 2-3 mm long. Fruit a berry, dull-yellowish, succulent, globose, 1-1.5 cm in diameter, pubescent at least in early stages. Seeds numerous, light brown or yellowish, flattened, 1.5 - 2 mm, testa minutely reticulate.

Habitat : It tolerates many soil types and quickly establishes in disturbed areas, agricultural land, natural forests, planted forests, riparian zones and urban areas. In Hawaii, it is naturalized on slopes and ridges of disturbed rain forest. It is common in high rainfall areas in New Zealand.

Threat and damage : It invades almost all ecosystems and forms dense stands that retard the growth of other species by overcrowding and shading. The dust from the plant can cause respiratory problems in men. Also, fine hairs on the plant are an irritant. In New Zealand, propagation and selling of this plant are illegal because of its aggressive growth and impact on human health. The plant is also allelopathic.



Distribution : Australia, Bhutan, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, India, New Caledonia, New Zealand, Norfolk Island, Papua New Guinea, Solomon Islands, Tonga, United States.

Uses : The fruit is a valuable food source for native birds that helps with long distance seed dispersal.

Management : Hand-pulling, digging out and ring barking trees are efficient mechanical control methods. Use of glyphosate, triclopyr and imazapyr as foliar, basal stem or cut stump applications is reported to be effective. In South Africa, release of a sap-sucking lace bug, *Gargaphia decoris* Drake, has not been effective but a flower bud weevil *Anthonomus santacruzi* Hustache, which prevents fruiting, is currently under trial as a biocontrol agent.

Spathodea campanulata P. Beauv.

Native : West Africa

Family : Bignoniaceae

Synonyms : *Bignonia tulipifera* Schum.
Spathodea nilotica Seem.
S. tulipifera (Schum.) G. Don

Common names : African tulip tree

Spathodea campanulata is an evergreen tree with very large, red-orange, cup-shaped flowers. The corolla emerges from the calyx during the preceding afternoon and gradually swells, straightening its wrinkles and emitting a pleasant smell during the night. It favours moist habitats and will grow best in sheltered tropical areas. The Global Invasive Species Database ranks this species among the top 100 of the world's worst invaders. The tree flowers in spurts all through the growing season, but peak bloom is usually seen in the spring. A rare yellow variety of the tree is called *Lutea*. The seeds are mainly dispersed by wind but spread also occurs through root suckers and cuttings. The flowers are pollinated by birds and bats. Seeds are light and winged and dispersed by wind.

Description : Large trees, trunk buttressed, branches lenticellate, subglabrous to thinly puberulent. Leaves compound, usually opposite, rarely three at a node, to 50 cm long; leaflets broadly elliptic or ovate, entire, to 15 x 7.5 cm, puberulent and prominent beneath, apex very slightly acuminate, base asymmetrically obtuse, veins 7 - 8 pairs, lower leaflets tending to be reflexed, petiolule short, 2-3 mm, rachis brownish-puberulent; petiole to 6 cm long, thickened at base. Inflorescence a raceme, 8-10 cm long, with a pair of reduced leaves about halfway up the peduncle; rachis and pedicels thick, brownish puberulent, bracts subtending, pedicels lanceolate, curved, ca. 3-4 cm long, caducous; the pair of bractlets near the summit of the pedicel is similar, opposite. Flower bright vermillion or scarlet, 10-12 cm long, mouth of limb 7 cm across. Fruit a capsule, 15-23 cm long, slightly compressed, lanceolate-oblong, brownish, woody, 2-valved, splits open. Seeds many, 1.5 - 2.5 cm across, winged.

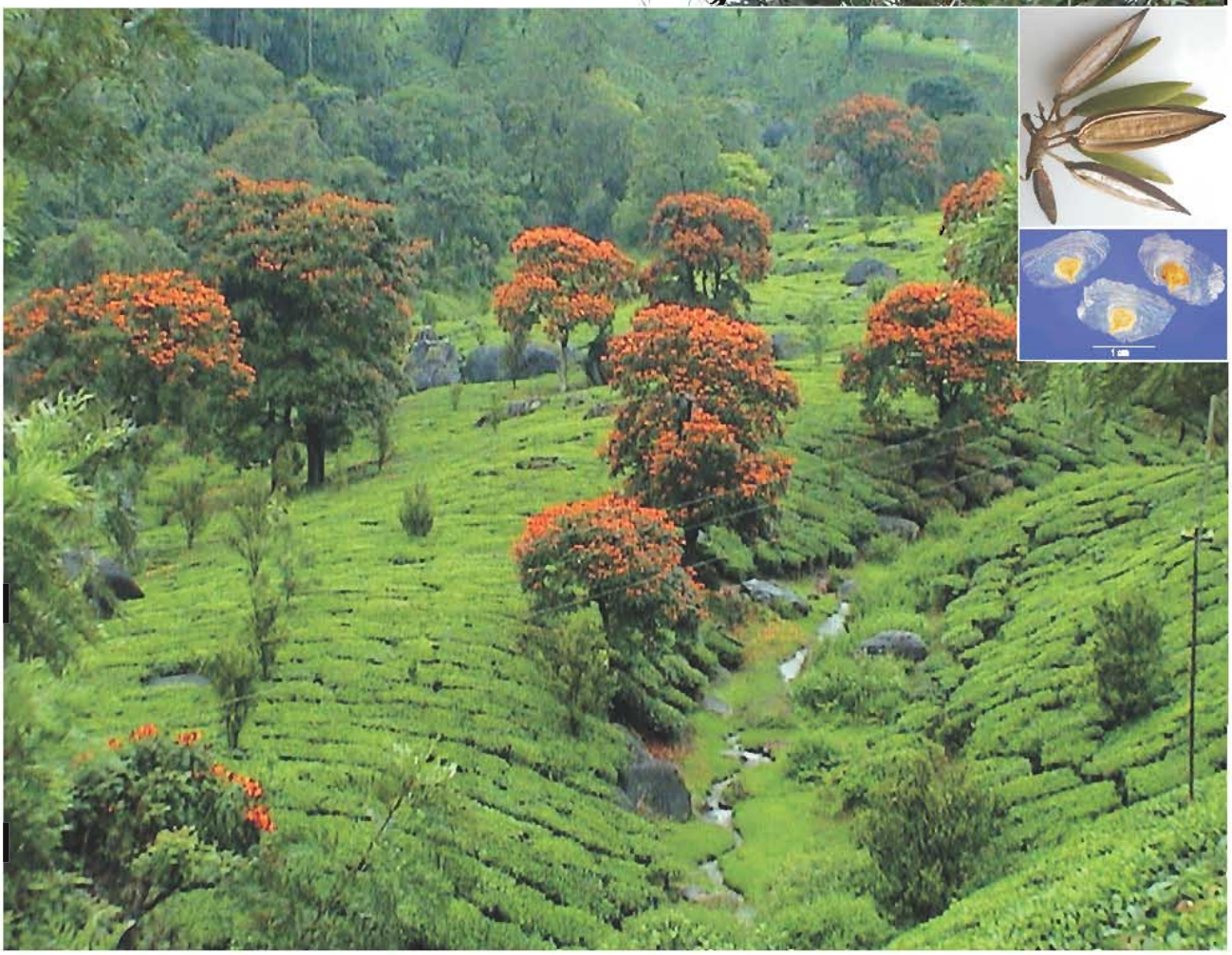
Habitat : *Spathodea* commonly grows in agricultural areas, natural forests and abandoned land. Though good growth is observed in moist, fertile, deep and well-drained loams, it can also tolerate dry and heavily-eroded sites and some salinity.

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

Threat and damage : *Spathodea* is capable of smothering other trees and crops and dominating in areas wherever it grows. The tree is a major problem in mature forests, where the seed germinates and forms understorey thickets from which a few saplings grow into the canopy.

Uses : Grown as an ornamental tree in the tropics. The seeds are edible. In Singapore the timber is used for making paper and in West Africa, it is used to make drums and blacksmith's bellows. The bark, flowers and leaves are used in traditional medicine in its native home range. The tree is used for fire-resistant landscaping since its wood is not easy to burn.

Management : Hand-pull or dig out seedlings and young plants. Cut large plants and treat the stumps with herbicides such as dicamba and glyphosate. Saplings are sensitive to basal bark applications of 2,4-D and triclopyr. Biological control is unknown.



Sphagneticola trilobata (L.) Pruski

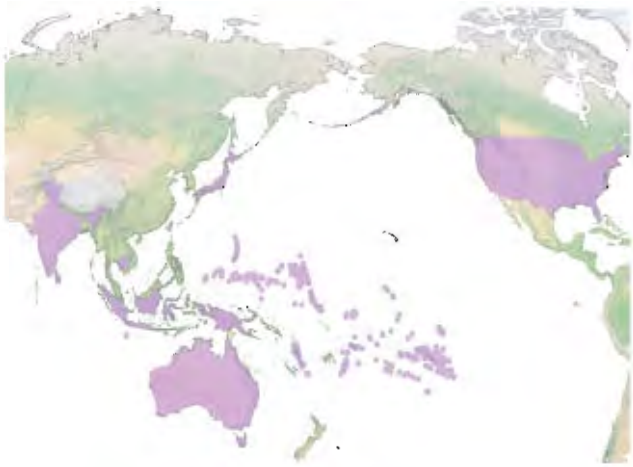
Native : Mexico, Central and South America and the Carribean

Family : Asteraceae

Synonyms : *Acmella brasiliensis* Spreng.
A. spilanthoides Cass.
Silphium trilobatum L.
Wedelia trilobata (L.) Hitchc.

Common names : Creeping ox-eye, Singapore daisy, wedalia

Sphagneticola trilobata, widely cultivated as an ornamental, can readily escape from gardens and form dense ground cover, crowding out or preventing regeneration of other species. The weed is very toxic to wild and farm animals; aborted fetuses have been reported after animals have grazed on the plant. In the Global Invasive Species Database, it is ranked among the top 100 of the world's worst invaders. It is currently naturalized in many tropical areas. Stems form new plants where they touch the ground by readily taking roots. The main mode of spread is through garden waste. Vegetative propagation is common and the plant usually produces a few fertile seeds.



Distribution : American Samoa, Australia, Cambodia, Christmas Island, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, India, Indonesia, Japan, Kiribati, Marshall Islands, Nauru, New Caledonia, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Singapore, Sri Lanka, Tonga, United States, Vanuatu.

Description : Perennial prostrate and diffuse herbs, rooting at nodes. Leaves simple, dark green above, paler below, elliptic-obovate, usually with three angular lobes with toothed margins, acute at apex, base cuneate, 3-10 x 3-7 cm, glabrous to sparingly pubescent; petiole to 5 mm long. Flower heads radiate, solitary on bracteate peduncles, 2-2.5 cm across; peduncles strigose, 4-15 cm long. Involucre green; bracts lanceolate, 1-1.5 cm long, ciliate, inner narrower, ray florets 5 -8, bright yellow, 1.5-2.0 x 0.5-0.7 cm, 3 - 4 denticulate, tube short, disc florets many, yellow, tube 5-8 mm long, 5-lobed; lobes deltoid, densely pubescent within. Fruit an achene, blackish, warty, 4-6 mm long, crowned by the persistent pappus cup.

Habitat : *Sphagneticola* is a noxious weed along road sides and trails in open and wasteland, agricultural areas, disturbed sites and garbage dumps. It is also invasive along streams, canals, mangroves and coastal vegetation. Since the plant has a wide ecological tolerance range, it is suited to dry and moist sites. It can grow on almost all soil types and is tolerant to dry periods, inundation and salinity. Though it prefers sunny sites for proliferation, it can grow in shady areas as well.

Threat and damage : *S. trilobata* will compete with crops for nutrients, light and water, and reduce yield.

Uses : The plant is an excellent ground cover in warm climates and is also used for soil retention and erosion control. *Sphagneticola* is very attractive because of nearly constant and prolific blooming. It must be mown to keep it low and manicured. The plant is used in traditional medicine; crushed leaves are used as a poultice, tea is given to alleviate symptoms of colds and flu and it is used in combination with other herbs to clear the placenta after birth.

Management : The top few centimetres of soil needs to be removed along with the plant using a suitable tool such as a fire hoe to control spread. Application of glyphosate will keep the population under check. Biological control is unknown.

Tabebuia heterophylla (DC.) Britton

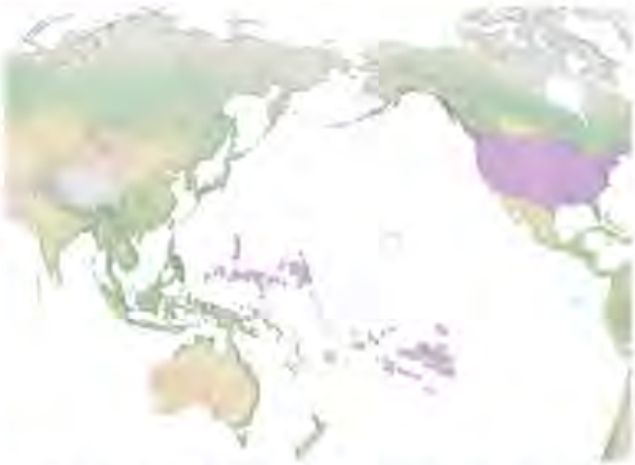
Native : South America

Family : Bignoniaceae

Synonyms : *Bignonia leucoxylon* L., *B. pentaphylla* L. *Handroanthus pentaphyllus* (L.) Mattos

Common names : Pink trumpet tree, white cedar, whitewood

Tabebuia heterophylla is a deciduous tree introduced to many countries for ornamental purposes and its valuable timber. It can thrive under various environmental conditions and has become invasive, especially in humid and frost-free areas of Africa, Asia and Australia. The mature fruits are dark brown cigar-like pods and are seen on the tree throughout the year. The seeds are dispersed by wind. The seeds are so tiny that 1 kilogram will contain over 70 000.



Distribution : American Samoa, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Marshall Islands, Northern Mariana Islands, Palau, Singapore, Solomon Islands, United States.

Description : Small to medium size trees, crown narrow columnar, bark furrowed. Leaves palmately compound, opposite, leaflets 3-5, elliptic to oblanceolate or obovate, 6-16 cm long, leathery, acute-blunt, acute-rounded or oblique at the base, surfaces glabrous, margins entire; petiole 3-12 cm long. Inflorescence paniculate, one to several flowers in terminal clusters. Flowers bilabiate, campanulate, 6-9 cm long, pink or lavender with a pale yellow throat. Fruit a narrow cylindrical capsule, 70-160 cm long, each contains numerous winged seeds. Seeds to 2 cm long.

Habitat : *T. heterophylla* is common in dry, coastal woodlands, secondary forests and abandoned pastures but is rarely seen in dry or wet natural forests. It can grow in sand, limestone, alluvial and heavy clay soil.

Threat and damage: The tree is a pioneer species that can spread rapidly and shade out other native plants by forming monocultures. Its thick litter prevents growth of native seedlings.

Uses : The wood of *Tabebuia* is widely used for flooring, furniture, interior work, boat building and sporting equipments. It is planted as an ornamental because of the large and showy flowers. It is used as a shade tree in coffee and cocoa plantations and in degraded sites as a soil improver.

Management : The seedlings can be dug up or cut. Chemical and biological control are not known.

Tamarix ramosissima Ledeb.

Native : West Asia and East Europe

Family : Tamaricaceae

Synonyms : *Tamarix altaica* Nied.
T. eversmannii C. Presl ex Bunge
T. pentandra Pall.

Common names : Salt cedar, tamarisk

Tamarix ramosissima, an aggressive ornamental shrub, is a major invasive plant in Southwest United States and desert regions of California, consuming large amounts of groundwater in riparian and oasis habitats. The mature plants secrete salt from their stems and leaves that form a crust above and belowground inhibiting the growth of other plants. *Tamarix* drastically alters the habitat and food web, depletes water sources and increases erosion. It can produce roots from buried or submerged stems or stem fragments. The Global Invasive Species Database ranks *Tamarix* among the top 100 of the world's worst invaders. The seeds are tiny and without endosperm.

Description : Shrubs or small trees, bark reddish or reddish-brown. Leaves simple, alternate, bright green, sessile, ovate or deltoid cordate, 0.2 - 0.5 x 0.1 - 0.2 cm, acute, subamplexicaul. Inflorescence in summer appears as densely compound racemes, in spring they are simple, loose, 1 - 7 x 3 - 5 cm; peduncles 0.2 - 1 cm, bracts ovate, trullate, triangular, 1.5 - 2 x 0.5 mm, acute or acuminate, with denticulate margin especially in their lower parts; pedicel ca. 0.5 mm long. Flowers pink to pinkish-purple, rarely white. Fruit a capsule, trigonous, 4 - 5 x 0.75 - 1 mm, dehiscing by three longitudinal slits. Seeds ca. 0.5 mm long with a tuft of hairs at one end, ca.2 mm.

Habitat : The plant invades agricultural areas, coastlands, disturbed areas, urban areas and watercourses. It grows well in damp places, especially on saline and alkaline soils.

Threat and damage : The plant is an ecological as well as an environmental problem because it can degrade natural ecosystems by altering their physical and chemical properties. It is an aggressive colonizer and can form dense monotypic stands, replacing native flora. It can also cause water stress to native vegetation by lowering the water table. Its extensive root system can choke stream beds resulting in floods.

Distribution : Australia, China, Democratic People's Republic of Korea, Mongolia, Pakistan, Republic of Korea, Russian Federation, United States.

Uses : Used mainly as an ornamental plant and for preventing soil erosion. The wood is used in furniture-making, as fuelwood and for tannin extraction.

Management : Hand-pulling can be used to remove small plants. Aerial application of imazapyr in combination with glyphosate is effective. The cut stump method is successful with triclopyr application. Grazing by cattle is reported to control growth and spread. The saltcedar leaf beetle (*Diorhabda elongata* [Brulle] sensu lato) is an effective biocontrol agent.

Tradescantia spathacea Sw.

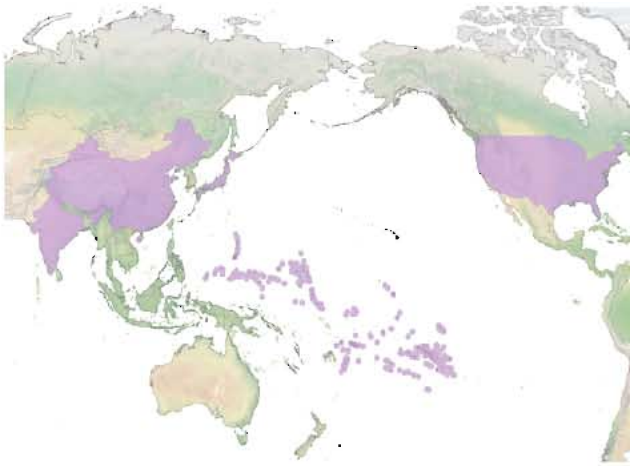
Native : Mexico, Central America and the Carribean

Family : Commelinaceae

Synonyms : *Ephemerum bicolor* Moench
E. discolor Moench
Rhoeo discolor (L' He'r) Hance

Common names : Boat lily, boat plant, Moses-in-a-basket, Moses in a boat, oyster plant

Tradescantia spathacea is a herbaceous succulent introduced to many countries for its ornamental leaves and flowers. It is an invasive weed in Florida where it disrupts the native plant ecosystem. The plant flowers all year round and is pollinated by insects or self-pollinated. It reproduces by seeds and stem cuttings. The seeds are wind-dispersed.



Distribution : American Samoa, China, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Hong Kong S.A.R., India, Japan, Kiribati, Marshall Islands, Nauru, New Caledonia, Niue, Northern Mariana Islands, Palau, Samoa, Tonga, United States, Wallis and Futuna Islands.

Description : Perennial erect herbs, often forming clusters, simple, glabrous. Leaves alternate, sometimes seemingly spirally arranged, sessile; leaf sheath sometimes pilose at the mouth, lamina dark green adaxially, purple abaxially, oblong-lanceolate, 20-40 x 3-6 cm, glabrous, somewhat fleshy, base narrowed and semi-clasping, apex acuminate. Inflorescence axillary, short; bracts subsessile, boat-shaped. Flowers white, 3-6 mm, many-flowered, clustered with in a folded bract, 3-4 cm long, short stalked from leaf axils. Fruit a capsule, three-valved, rugose, 2-seeded, in clusters with in the bract.

Habitat : The plant grows well in natural forests and is occasionally seen in urban areas. It sometimes grows as an epiphyte and being drought-resistant, it can grow on sand or even coral outcrops. The plant can grow in high- to medium-light conditions.

Threat and damage : It forms dense cover and clumps quickly and can prevent germination of forest seeds. It causes stinging, itching and rashes in humans if the plant surface or the copious astringent juice is contacted. If eaten, it may cause severe burning in the mouth and throat.

Uses : A favorite garden plant in the tropics. The leaves are eaten by raccoons. The flower is used as a medicine to treat dysentery, enterorrhagia and hemoptysis.

Management : Pulling up or digging out seedlings and treating them with common herbicides are usual control methods. Biological control is unknown.

Ulex europaeus L.

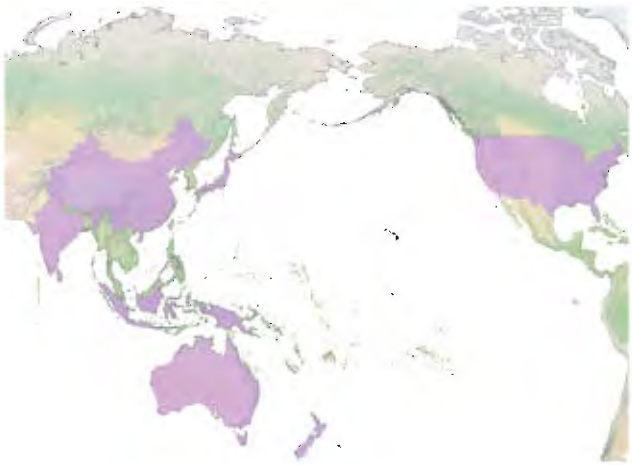
Native : Cental and West Europe and the British Islands

Family : Fabaceae

Synonyms : *Ulex armoricanus* Mabille
U. compositus Moench, *U. europaea* L.

Common names : European gorse, furze, golden gorse

Ulex europaeus is a spiny evergreen legume that can grow in dense thickets and exclude grazing animals from rangelands and pastures. Its invasion in plantations interferes with operations, increases pruning and thinning costs and affects the growth of seedlings. It is ranked among the top 100 of the world's worst invaders by the Global Invasive Species Database. The species can be recognized by its thorny impenetrability, yellow flowers and the conspicuous appendage over the seed scar. Seeds may remain dormant yet viable in the soil for up to 30 years, with one report of 70 years of dormancy.



Distribution : Australia, China, India, Indonesia, Japan, New Zealand, Papua New Guinea, Sri Lanka, United States.

Description : Perennial shrubs, to 2.5 m tall, stem woody, densely-branched, spiny, rooting at nodes, green to brown when mature, longitudinally ridged, hairy, with numerous long spines modified into primary branches; secondary branches with primary, secondary and tertiary spines. Leaves compound, leaflets 3 in seedlings but reduced to 4.5 - 6.5 cm long spines on maturity such that plants are densely covered with sharp spines. Flowers yellow, showy, fragrant, mostly axillary or in terminal clusters, 15 - 20 mm long. Fruit a pod, hairy, 1 - 2 cm long, slightly compressed. Seeds 2 - 6, 2 - 4 mm across, rounded at one end, broader and shallowly notched at the other, with a conspicuous straw-coloured appendage over the scar, smooth, shiny, olive green to brownish.

Habitat : *Ulex* grows profusely in agricultural areas, coastlands, grasslands, roadsides, ruderal/disturbed areas, natural and planted forests, scrub/shrublands, watercourses and wetlands. The geographical distribution of the plant is mainly determined by temperature. It cannot survive in arid climates or in continental regions. Day length may also affect its latitudinal distribution, as short-day conditions inhibit maturation, thorn formation and flowering. The plant will grow on most soil types and on shady slopes with high soil moisture and good drainage. Optimal growth is observed with soil pH of 4.5-5.

Threat and damage : The plant is extremely competitive and as such it displaces cultivated and

native plants, and alters soil conditions by fixing nitrogen and acidifying the soil. It creates an extreme fire hazard due to its oily, highly flammable foliage, seeds and litter. *Ulex* may also increase erosion on steep slopes where the plant has replaced grasses or forbs. Spiny and mostly unpalatable when mature, *Ulex* reduces pasture quality where it invades rangeland.

Uses : Used as a hedge plant and windbreak. On marginal land, it is a source of food for cattle and ponies. Lectins extracted from the seeds will bind selectively to certain glycoproteins and glycolipids, and are widely used in tissue typing. Flowers of *Ulex* are used in the treatment of jaundice and scarlet fever in children.

Management : Hand-pulling of seedlings and bulldozing of large stands are generally used. Mature plants are difficult to kill with a single application of any herbicide. Use of herbicides such as picloram, triclopyr, glyphosate and metsulfuron are reported to be effective. In the United States, the seed weevil *Apion ulicis* (Forster), introduced from France, was partially successful in controlling the plant. Several insect enemies of *Ulex* are currently being tested for biological control. Grazing by goats is used in some countries to control growth and spread.

Urochloa maxima (Jacq.) R.D. Webster

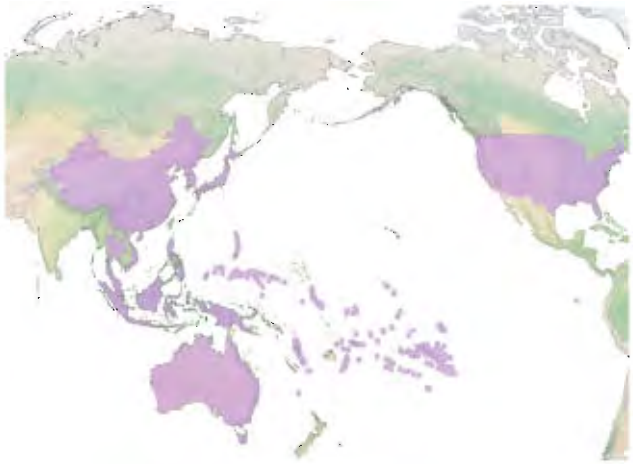
Native : Africa

Family : Poaceae

Synonyms : *Panicum hirsutissimum* Steud.
P. maximum Jacq.

Common names : Buffalo grass, guinea grass

Urochloa maxima is regarded as one of the most valuable fodder grasses capable of growing in a wide range of environmental conditions and habitats. However, it can cause fatal colic in cattle if eaten excessively. The grass attracts many seed-eating birds such as *Lonchura cucullata* Swainson, which feed in flocks. It produces numerous seeds that are dispersed by wind, birds and water.



Distribution : American Samoa, Australia, China, Cook Islands, Democratic People's Republic of Korea, Federated States of Micronesia, Fiji, French Polynesia, Guam, Indonesia, Japan, Kiribati, Malaysia, New Caledonia, Niue, Norfolk Island, Northern Mariana Islands, Palau, Papua New Guinea, Philippines, Republic of Korea, Samoa, Solomon Islands, Thailand, Tonga, United States, Vanuatu, Viet Nam, Wallis and Futuna Islands.

Description : Perennial rhizomatous grass; culms robust, nodes glabrous or pilose. Leaves cauline, leaf sheaths glabrous to hispid, blades linear to narrowly lanceolate, flat, 20 - 60 x 1 - 3.5 cm, narrowed at base, glabrous or pilose, margins scabrid, apex acuminate; ligule 1-3 mm, membranous, with dense cilia dorsally. Inflorescence of panicle, oblong or pyramidal in outline, 10-45 cm, many branched; branches spreading, lowest arranged in whorls, spikelets oblong, 3-4.5 mm, glabrous or pubescent, often tinged purple, obtuse or acute, occasionally overtopped by long hairs from the apex of the pedicel. Grain 2 mm long.

Habitat : Guinea grass grows profusely in open grasslands and abandoned cultivated lands forming colonies. It can grow quickly in moist areas, providing huge biomass but cannot tolerate long dry periods and frost.

Threat and damage : Guinea grass is strongly allelopathic and hence growth and survival of native plants are affected. As it resists drought, biomass accumulates making fires fiercer which wipes out native plants that are not fire-tolerant. It can survive rapidly moving fires which do not harm the roots.

Uses : It is one of the most productive forage grasses. The seeds are a source of food for birds and the leaves provide nesting material for birds. It is generally planted to minimize erosion on slopes.

Management : Hand-pulling and grubbing are efficient methods. Spraying of glyphosate and atrazine is effective. Continuous grazing controls growth and spread.

Verbena brasiliensis Vell.

Native : South America

Family : Verbenaceae

Synonyms : *Verbena approximata* Briq.
V. chacensis Moldenke, *V. hansenii* Greene

Common names : Brazilian vervain, Gin case

Verbena brasiliensis is an ornamental herb introduced to various countries. It is a facultative wetland species and hence can be found both in wetland areas and in drier and upland areas. Propagation is mainly by seeds.

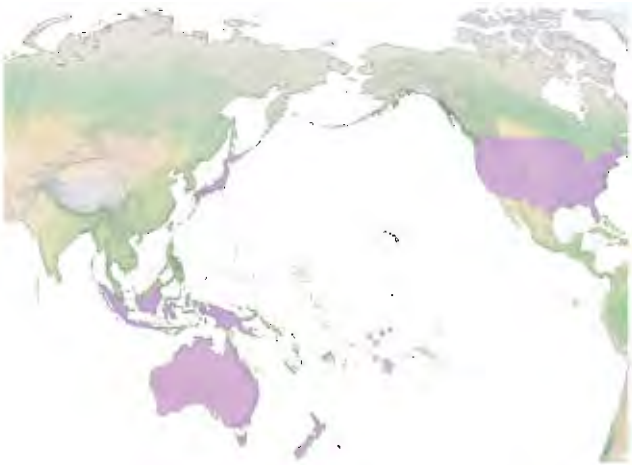
Description : Perennial herbs, to 2 m tall, stems hispid, quadrangular. Leaves simple, opposite, elliptic, 4 - 10 x 0.8 - 2.5 cm, serrate, hispid, veins adaxially with large bristles. Flowers bracteate, on terminal, loose spikes, 0.5 - 4.5 cm long, arranged in triads, bluish-purple. Fruit a schizocarp. Nutlets 2, brown, 1.2 - 1.9 mm long.

Habitat : Mainly found in wetlands, dry fields and arable land as a weedy species. It is also invasive along roadsides, in riverine areas and other disturbed sites.

Threat and damage : *Verbena* threatens the growth and survival of native plant species by overcrowding. The weed is a major problem in the United States.

Uses : Grown as a garden plant.

Management : Hand-pulling or digging out of seedlings and scattered plants. Most herbicides are effective in controlling the weed. Biological control is unknown.



Distribution : Australia, Cook Islands, Fiji, Hong Kong S.A.R., Indonesia, Japan, New Caledonia, New Zealand, Papua New Guinea, United States.

Verbena rigida Spreng.

Native : South America

Family : Verbenaceae

Synonyms : *Verbena scaberrima* Cham.
V. venosa Gillies & Hook.

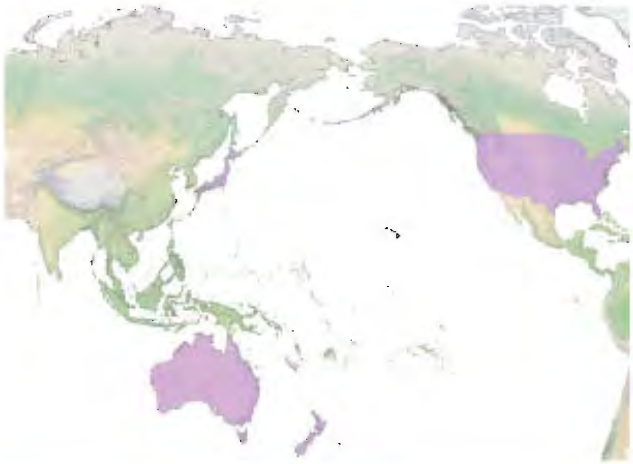
Common names : Creeping verbena, purple verbena, rigid verbena, sandpaper verbena

Verbena rigida is grown as ground cover and as an ornamental along roadsides and highway medians for its beautiful flowers. The long white rhizome helps the plant to spread and to form dense colonies.

Description : Perennial, tufted, rhizomatous subshrubs, 50-60 cm tall, spreading, forming colonies. Stem scabrous or hirsute. Leaves simple, rigid, oblong to oblong-lanceolate or oblanceolate, 7.5-10 x 1-2.5 cm, both surfaces scabrous to hispidulous, dark green, margins revolute, coarsely serrate, apex acute, base subcordate, clasping the stem. Flowers in short, dense, cylindrical spikes, 1-5 cm long, usually 3 in decussate, purple to magenta, glandular pubescent throughout; bracts lanceolate or subulate-lanceolate. Fruit a schizocarp, separated into four one-seeded segments at maturity. Seeds ca. 2 mm long.

Habitat: It can adapt to a wide range of habitats, from disturbed areas to natural forests. In Australia, it invades woodlands, riverbanks and grasslands. The plant is drought-tolerant and requires only low amounts of water for survival.

Threat and damage : The plant forms dense colonies on roadsides, vacant lands and natural forest fringes outcompeting native flora.



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

Uses : Used as an ornamental and for erosion control on riverbanks and slopes.

Management : Unknown.

Ziziphus mauritiana Lam.

Native : South Asia and East Africa

Family : Rhamnaceae

Synonyms : *Zyziphus jujuba* Lam.

Common names : Chinese apple, Indian cherry, Indian plum

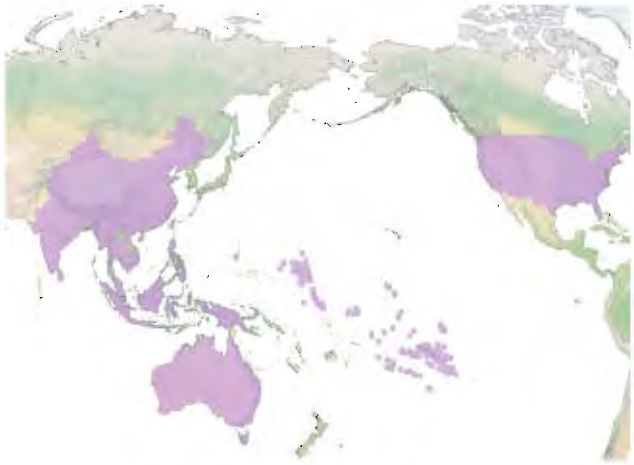
Ziziphus mauritiana, widely cultivated in the tropics, is used for culinary and medicinal purposes. In Australia and Fiji, the plant forms dense thickets posing a threat to ecosystems and the cattle industry. The seeds are dispersed by birds.

Description : Shrubs or small trees, young parts densely yellow-grey, tomentose, branchlets pilose, old branches purple-red, stipular spines two, one oblique, hook-like, recurved. Leaves simple, alternate, adaxially dark green, shiny, ovate or oblong-elliptic, rarely subrounded, 2.5 -6 x 1.5 - 4.5 cm, membraneous, abaxially yellow or grey-white tomentose, adaxially glabrous, 3 - nerved from base, veins conspicuously reticulate abaxially, impressed or prominent adaxially; base subrounded, slightly oblique, margin serrulate, apex rounded, rarely acute; petiole 5 - 13 mm, densely grey-yellow tomentose. Flowers greenish-yellow, subsessile or shortly pedunculate, in axillary dichotomous cymes; pedicel 2 - 4 mm, grey-yellow tomentose. Fruit a drupe, orange or red, turning black at maturity, oblong or globose, 10 - 12 mm, with a persistent tube at the base. Seeds reddish-brown, broad and compressed, 6 - 7 × 5 - 6 mm, shiny.

Habitat : It commonly grows along roadsides, in agricultural land, degraded forests, grasslands, flood plains and wasteland up to an elevation of 1 600 metres. Best growth is observed on sandy loam, neutral or slightly alkaline soil, lateritic soil and medium-black soils with good drainage. The plant can tolerate waterlogging as well as drought.

Threat and damage : As the plant is spiny, its dense growth obstructs the movement of animals and humans. It also outcompetes more desirable native pasture species.

Uses : The fruits are very nutritious and the leaves are used as fodder. The timber is used for house construction, making agricultural implements and for charcoal. The fruits are applied to cuts and ulcers to aid healing. The seed is a sedative and the root a purgative.



Distribution : Australia, Bangladesh, Bhutan, Cambodia, China, Cook Islands, Fiji, French Polynesia, Guam, India, Indonesia, Kiribati, Malaysia, Marshall Islands, Myanmar, Nepal, New Caledonia, Papua New Guinea, Philippines, Singapore, Sri Lanka, Thailand, United States, Viet Nam.

Management : Bulldozing can be used for removing large thickets and single plants can be removed by slashing and grubbing. Herbicides such as triclopyr or picloram in a herbicide-diesel mixture applied as bark spray are effective. Soil application of a picloram-triethanolamine mixture will control dense infestation. Biological control is unknown.

Glossary

Achene : Small, dry, thin-walled fruit, not splitting when ripe, and containing a single seed.

Actinomorphic (of flowers) **:** Regular, radially symmetric.

Acuminate : Tapering to a long tip.

Alien : Species that spread beyond their native range, not always harmful, or species introduced to a new range that establish themselves and spread.

Allelopathy : The inhibitory effect of one living plant upon another by the release of toxic substances.

Apomictic : A plant that reproduces or is reproduced by apomixis.

Areole : In Cactaceae, the spine-bearing cushion; extremely reduced branches that usually bear spines.

Arcuate : Curved like a bow.

Asexual : Sexless, without gender.

Asymmetric : With the two sides of the part or organ not equal.

Berry : An indehiscent simple fruit with one to many seeds immersed in a fleshy pulp.

Biennial : Taking two years from seedling stage to maturity, seed set and death.

Biological control : Control of the population of one organism as a result of natural predation or infection by another.

Biomass : The total weight or volume of either all the living organisms or of one species present at any one time in a community.

Bipinnate : Doubly pinnate, divided into pinnae bearing pinnules.

Bisexual : Having both sexes in the same flower, or in the same inflorescence.

Bract : A modified and specialized leaf in the inflorescence, standing below partial peduncles, pedicels or flowers.

Bracteole : A secondary bract, usually smaller than the bracts and always borne above them.

Branchlets : Small branch, the final division of the branching system.

Calyx : The outermost whorl of floral organs, often divided into sepals.

Campanulate : Bell-shaped.

Capsule : A dry dehiscent fruit composed of two or more united carpels, opening by valves, slits or pores.

Caryopsis : A small dry thin-walled fruit, with the single seed fused to the pericarp; a type of achene.

Caudice : The trunk of a palm or tree fern.

Cladophyll : A branch taking the form and function of a leaf.

Columella : Persistent central axis around which the fruit locules are arranged.

Cordate : Heart-shaped.

Coriaceous : Leathery, tough.

Corolla : The second whirl of floral organs, inside or above the calyx and outside the stamens, consisting of free petals or a joined tube and petal lobes.

Corolline : Resembling petals in texture.

Corona : An inner appendage to the corolla, shaped like a coronet, or a more or less interrupted outer appendage to the stamens.

Corymb : A more or less flat-topped, racemose (indeterminate) inflorescence in which the branches or the pedicels start from different points but all reach to about the same level.

Culm : Stem of a grass or sedge.

Cypsela : A type of dry fruit consisting of an achene with a closely adhering calyx.

Deciduous : Losing all the leaves for part of the year, seasonal, not evergreen.

Decumbent : Lying on the ground, but with the distal part upright.

Decurrent : Extending downwards from the base.

Dehiscent : Splitting into definite parts.

Deltoid stem : Shaped like an equilateral triangle.

Dimorphic : With two different shapes or forms.

Dioecious : With unisexual flowers, the male and female flowers on different plants; with male and female plants.

Disc : A flat plate-shaped object.

Drupe : A fleshy indehiscent fruit with the seed (s) enclosed in a stony endocarp.

Ecosystem : Within a specific area, the total of all living organisms and their interaction with each other and with their habitat and the environment.

Ellipsoid : A three-dimensional shape that is elliptic in the vertical plane.

Elliptic : Broadest at the middle with two equal rounded ends.

Endosperm : The tissue within the seed of a flowering plant that surrounds and nourishes the developing embryo.

Floret : A small flower.

Foliage : The leaves of plants.

Frond : Leaf of ferns or palms.

Frugivore : Fruit eater.

Glabrous : Smooth and without hairs, scales or other trichomes.

Head : Short dense inflorescence – capitulum.

Heliophytic : Any plant that grows best in direct sunlight.

Hirsute : With rather coarse stiff hairs.

Homogenous : Uniform, of one kind.

Hybridization : Cross-breeding of two different species.

Hypanthium : The flat or cup-shaped receptacle found in perigynous flowers.

Indusium : A flap of tissue that partially or completely covers each sorus in certain ferns.

Internode : The portion of an axis between two adjacent nodes.

Invasion : The expansion of a species into an area not previously occupied by it.

Lamina : Expanded part or blade of leaves or petals.

Lanceolate : Shaped like a lance-head.

Leaflet : One part of a compound leaf.

Lenticels : Corky eruptions on bark that allow gas exchange.

Lepidot : Clothed on the surface with small scales.

Ligule : A distal projection of the leaf sheath.

Mesic soil : A medium type of soil that drains well yet retains some water.

Monoecious : With the male and female parts in different flowers but on the same individual plant.

Native : A species, subspecies or lower taxon occurring within its natural range (past or present).

Oblanceolate : Narrowly obovate and tapering to a point at the apex.

Oblique (in leaves) **:** When the two sides of the leaf are unequal near the base.

Obtuse : Not pointed.

Orbicular : Flat with a circular outline.

Palmate : Diverging like the widely spread fingers of a hand.

Panicle : A repeatedly branched inflorescence.

Paraphysis (in pteridophytes) **:** Sterile hairs or filaments among the sporangia within a sorus.

Paripinnate : Pinnate with an equal number of members on each side of the axis and no odd terminal one.

Pedicel : The stalk of a single flower.

Peduncle : The lower unbranched part or stalk, as distinct from the rachis (of an inflorescence).

Pentamerous : A flower with its constituent parts in multiples of five.

Perennial : Living for several to many years.

Perianth : Collective term for the calyx and corolla.

Petiole : The stalk of a leaf.

Pinna : The leaflet of a pinnate leaf.

Plumose : Feathery or feathered.

Pod : A dry dehiscent fruit with a firm outer layer enclosing a hollow centre with one or more seeds.

Polymorphic (of a taxon or organ)**:** With several variable forms.

Prickle : A sharp outgrowth from the epidermis.

Pubescent : Clothed with soft, rather short hairs.

Raceme : A centripetal inflorescence with lengthened axis and equally pedicellate flowers.

Rachilla : Axis of a spikelet.

Rachis : Part of the main axis distal to the petiole that bears the leaflets.

Rhizome : An underground stem, usually horizontal and elongated.

Riparian : Inhabiting, or situated on the bank of a river.

Ruderal : Growing in wastelands.

Samara : An indehiscent winged fruit, or winged parts of a dehiscing fruit.

Scabrid : Covered with small hard hairs or points and feeling rough.

Sepal : A single part of the outermost whorl of floral organs.

Serrate : With forward-pointing, sharp marginal teeth.

Sessile : Without a stalk.

Sorus : Structure bearing or containing groups of sporangia (of pteridophytes).

Spike : An inflorescence with sessile flowers on a usually elongate axis.

Spikelet : A cluster of one or more flowers each in the axil of one or a pair of bracts and subtended by two, rarely one, empty bracts.

Thyrse : A compact panicle, more or less spindle-shaped or ovate.

Tomentose : Densely matted with woolly hairs.

Trichome : An epidermal outgrowth of diverse form, structure and function but without vascular tissue.

Umbel : Inflorescence with branches arising from more or less the same point on a common peduncle.

Unisexual : Flowers having only male or female parts.

Vegetative : Non-sexual.

Vein : Strand of vascular tissue in a flat organ, often visible on the surface.

Xeric : Of dry areas.

Zygomorphic : With bilateral symmetry.

Selected references

Asia-Pacific Forest Invasive Species Network. 2009. Fact sheets of *Mimosa diplotricha, Parthenium hysterophorus, Lantana camara* and *Mikania micrantha,* India, Kerala Forest Research Institute.

Australian National Insect Collection (ANIC). 2004. http://www.ces.csiro.au/aicn

Beentje, H. 2010. The Kew plant glossary: an illustrated dictionary of plant terms. Kew, UK, Royal Botanic Gardens, 170 pp.

CABI Bioscience. 2005. Index Fungorum. www.indexfungorum.org

CAB International. 2010. Invasive species compendium. Available at http://www.cabi.org/isc/

DAISIE European Invasive Alien Species Gateway. Available at http://www.europe-aliens.org

eFloras. 2008. Available at http://www.efloras.org. St. Louis, USA, Missouri Botanical Garden and Cambridge, MA, Harvard University Herbaria.

Holm, L.G., Pancho, J.V., Herberger, J.P. & Plucknett, D.L. 1979. A geographical atlas of world weeds. New York, John Wiley & Sons, 391 pp.

ILDIS Co-ordinating Centre. 2010. International legume database & information service. University of Reading, UK, School of Plant Sciences, Available at http://www.ildis.org/

Invasive Species Specialist Group (ISSG). 2005. Global invasive species database (GISD). New Zealand, University of Auckland. Available at http://www.issg.org/database/welcome/

Mabberley, D.J. 1987. The Plant-Book: A portable dictionary of the higher plants, First edition, UK, Cambridge University Press, 707 pp.

Missouri Botanical Garden. 2008. Tropicos database. St. Louis, USA, Missouri Botanical Garden. Available at http://www.tropicos.org/

PIER. 2007. Pacific islands ecosystems at risk. USA, Institute of Pacific Islands Forestry. Available at http://www.hear.org/pier/

Randall, R.P. 2002. A global compendium of weeds. Australia, R.G. and F.J. Richardson, 906 pp.

Sankaran, K. V., Ellison, C. A. & Suresh, T. A. 2009. Major invasive alien weeds in India: Biology and control, India, Kerala Forest Research Institute & CABI Europe-UK, 38 pp.

Southeast Exotic Pest Plant Council (SE-EPPC). Bugwood Network, USA, The University of Georgia. Available at http://www.se-eppc.org/weeds.cfm.

The Plant List. 2010. Version 1. Available at http://www.theplantlist.org/

USDA-ARS. 2008. Germplasm resources information network (GRIN). Online database. Beltsville, USA, National germplasm resources laboratory. Available at http://www.ars-grin.gov

USDA-NRCS. 2008. The PLANTS Database. Baton Rouge, USA: National Plant Data Center. Available at http://plants.usda.gov/

Waterhouse, D.F. 1994. Biological control of weeds: Southeast Asian prospects. Canberra, Australian Centre for International Agricultural Research, 302 pp.

Weber, E. 2003. Invasive plant species of the world. A reference guide to environmental weeds. Wallingford, UK, CABI Publishing, 548 pp.

Wittenberg, R., Cock, M.J.W.(eds). 2001. Invasive alien species: A Toolkit of best prevention and management practices. Wallingford, UK, CAB International, 228 pp.

World Agroforestry Centre. 2002. Agroforestry database. Nairobi, Kenya, ICRAF. Available at http://www.worldagroforestrycentre.org/

Zheng, H., Wu, Y., Ding, J., Binion, D., Fu, W. & Reardon, R. 2006. Invasive plants established in the United States that are found in Asia and their associated natural enemies, Volume 2. Chinese Academy of Agricultural Sciences -Institute of Environment and Sustainable Development in Agriculture and USDA Forest Service - Forest Health Technology Enterprise Team, 175 pp.

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Bidens minuscula H. Lév. & Vaniot = *Bidens pilosa* (31)
Bidens montaubani Phil. = *Bidens pilosa* (31)
Bignonia leucoxylon L. = *Tabebuia heterophylla* (152)
Bignonia pentaphylla L. = *Tabebuia heterophylla* (152)
Bignonia tomentosa Thunb. = *Paulownia tomentosa* (118)
Bignonia tulipifera Schum. = *Spathodea campanulata* (148)
Bignonia tweedieana Lindl. = *Macfadyena unguis-cati* (96)
Bignonia unguis-cati L. = *Macfadyena unguis-cati* (96)

Bladhia crenata (Sims) H. Hara = *Ardisia crenata* (21)
Bladhia crenata var. *taquetii* H. Hara = *Ardisia crenata* (21)
Bladhia crispa var. *taquetii* (H. Lév.) Nakai = *Ardisia crenata* (21)
Bladhia elliptica (Thunb.) Nakai = *Ardisia elliptica* (22)
Bladhia kotoensis (Hayata) Nakai = *Ardisia elliptica* (22)
Bladhia kusukusensis (Hayata) Nakai = *Ardisia crenata* (21)
Bladhia lentiginosa (Ker Gawl.) Nakai = *Ardisia crenata* (21)
Bladhia lentiginosa f. hortensis Migo = *Ardisia crenata* (21)
Bladhia lentiginosa var. *lanceolata* Masam. = *Ardisia crenata* (21)
Bladhia lentiginosa var. *taquetii* Nakai = *Ardisia crenata* (21)
Bladhia lindleyana (D. Dietr.) Nakai = *Ardisia crenata* (21)
Bladhia punctata (Lindl.) Nakai = *Ardisia crenata* (21)
Bladhia squamulosa (C. Presl) Nakai = *Ardisia elliptica* (22)
Boberella peruviana (L.) E.H.L. Krause
= *Physalis peruviana* (119)
Boussingaultia cordata Spreng. = *Anredera cordifolia* (18)
Boussingaultia cordifolia (Moq.) Volkens
= *Anredera cordifolia* (18)
Boussingaultia cordifolia Ten. = *Anredera cordifolia* (18)
Boussingaultia gracilis f. *pseudobaselloides* Hauman
= *Anredera cordifolia* (18)
Boussingaultia gracilis Miers = *Anredera cordifolia* (18)
Boussingaultia gracilis var. *pseudobaselloides* (Hauman) L.H. Bailey = *Anredera cordifolia* (18)
Brassica amblyorhyncha Coustur. & Gand.
= *Brassica tournefortii* (33)
Brassica barrelieri subsp. *tournefortii* (Gouan) Malag.
= *Brassica tournefortii* (33)
Brassica mesopotamica (Spreng.) Bernh.
= *Brassica tournefortii* (33)
Brassica sisymbrioides (Fisch. ex DC.) Grossh.
= *Brassica tournefortii* (33)
Brassica stocksii Hook. f. & Thomson
= *Brassica tournefortii* (33)
Brassica tournefortii f. *dentata* O.E. Schulz
= *Brassica tournefortii* (33)
Brassica tournefortii var. *dasycarpa* O.E. Schulz
= *Brassica tournefortii* (33)
Brassica tournefortii var. *leiocarpa* Maire & Weiller
= *Brassica tournefortii* (33)
Brassica tournefortii var. *recurvata* Bornm.
= *Brassica tournefortii* (33)
Brassica tournefortii var. *sisymbrioides* Fisch.
= *Brassica tournefortii* (33)
Brassica tournefortii var. *sisymbrioides* Fisch. ex DC.
= *Brassica tournefortii* (33)
Brassicella cheiranthus sensu Adamson
= *Brassica tournefortii* (33)
Breea arvensis (L.) Less. = *Cirsium arvense* (56)
Breea dioica (Cass.) Less. = *Cirsium arvense* (56)
Breea ochrolepidia (Juz.) Soják = *Cirsium arvense* (56)
Breea praealta Less. = *Cirsium arvense* (56)
Bromopsis inermis (Leyss.) Holub = *Bromus inermis* (35)
Bromopsis inermis subsp. *australis* (Zherebina) Tzvelev
= *Bromus inermis* (35)
Bromopsis inermis subsp. *reimannii* (Asch. & Graebn.) Dostál
= *Bromus inermis* (35)
Bromopsis inermis var. *aristata* (Schur) Tzvelev
= *Bromus inermis* (35)
Bromopsis inermis var. *hirta* (Drobow) Tzvelev
= *Bromus inermis* (35)
Bromopsis inermis var. *malzevii* (Drobow) Tzvelev
= *Bromus inermis* (35)
Bromopsis inermis var. *pellita* (Beck) Tzvelev
= *Bromus inermis* (35)
Bromus abortiflorus St.-Amans = *Bromus tectorum* (37)
Bromus australis R.Br. = *Bromus tectorum* (37)
Bromus avenaceus Lam. = *Bromus tectorum* (37)
Bromus canescens Viv. = *Bromus rubens* (36)
Bromus dumetorum Lam. = *Bromus tectorum* (37)
Bromus erectus var. *laxus* (Hornem.) Heynh.
= *Bromus inermis* (35)
Bromus glabrescens Honda = *Bromus inermis* (35)
Bromus inermis f. *aristatus* (Schur) Fernald
= *Bromus inermis* (35)
Bromus inermis f. *aristatus* Drobow = *Bromus inermis* (35)
Bromus inermis f. *bulbiferus* J.W. Moore = *Bromus inermis* (35)
Bromus inermis f. *glabratus* Drobow = *Bromus inermis* (35)
Bromus inermis subsp. *australis* Zherebina = *Bromus inermis* (35)
Bromus inermis subsp. *inermis* = *Bromus inermis* (35)
Bromus inermis var. *aristatus* (Schur) Drobow
= *Bromus inermis* (35)
Bromus inermis var. *aristatus* (Schur) Fernald
= *Bromus inermis* (35)
Bromus inermis var. *aristatus* Schur = *Bromus inermis* (35)
Bromus inermis var. *contractus* Röhl. = *Bromus inermis* (35)
Bromus inermis var. *divaricatus* Rohlena = *Bromus inermis* (35)
Bromus inermis var. *flexuosus* Drobow = *Bromus inermis* (35)
Bromus inermis var. *grandiflora* Rupr. = *Bromus inermis* (35)
Bromus inermis var. *hirsutus* Celak. = *Bromus inermis* (35)
Bromus inermis var. *hirtus* Drobow = *Bromus inermis* (35)
Bromus inermis var. *inermis* = *Bromus inermis* (35)

Bromus inermis var. *latifolia* Podp. = *Bromus inermis* (35)
Bromus kerkeranus Sennen & Mauricio = *Bromus rubens* (36)
Bromus kunkelii (H. Scholz) H. Scholz = *Bromus rubens* (36)
Bromus longipilus Kumm. & Sendtn. = *Bromus tectorum* (37)
Bromus madritensis subsp. *kunkelii* H. Scholz
= *Bromus rubens* (36)
Bromus madritensis subsp. *rubens* (L.) Duvin
= *Bromus rubens* (36)
Bromus madritensis subsp. *rubens* (L.) Husn.
= *Bromus rubens* (36)
Bromus madritensis var. *caucasica* Hack. = *Bromus tectorum* (37)
Bromus madritensis var. *rubens* (L.) Husn. = *Bromus rubens* (36)
Bromus mairei Hack. ex Hand.-Mazz. = *Bromus tectorum* (37)
Bromus matritensis var. *purpurascens* (Delile) Post
= *Bromus rubens* (36)
Bromus nutans St.-Lag. = *Bromus tectorum* (37)
Bromus purpurascens Delile = *Bromus rubens* (36)
Bromus rubens f. *canescens* (Viv.) Coss. = *Bromus rubens* (36)
Bromus rubens f. *intermedius* Pamp. = *Bromus rubens* (36)
Bromus rubens var. *ambiguus* Maire = *Bromus rubens* (36)
Bromus rubens var. *borosii* Pénzes = *Bromus rubens* (36)
Bromus rubens var. *canescens* Coss. ex Bég. & Vacc.
= *Bromus rubens* (36)
Bromus rubens var. *eufasciculatus* Maire & Weiller
= *Bromus rubens* (36)
Bromus rubens var. *fallax* Maire = *Bromus rubens* (36)
Bromus rubens var. *fasciculatus* Mutel = *Bromus rubens* (36)
Bromus rubens var. *glabellus* Maire = *Bromus rubens* (36)
Bromus rubens var. *maximus* (Desf.) Fiori
= *Bromus rubens* (36)
Bromus rubens var. *villosulus* Maire = *Bromus rubens* (36)
Bromus scabriflorus Opiz = *Bromus tectorum* (37)
Bromus scoparius var. *rubens* (L.) St.-Amans
= *Bromus rubens* (36)
Bromus setaceus Buckley = *Bromus tectorum* (37)
Bromus sterilis f. *ponticus* (K. Koch) Kuntze
= *Bromus tectorum* (37)
Bromus sterilis var. *nudus* (Klett & Richt.) Kuntze
= *Bromus tectorum* (37)
Bromus sterilis var. *rubens* (L.) Kuntze = *Bromus rubens* (36)
Bromus sterilis var. *tectorum* (L.) Kuntze
= *Bromus tectorum* (37)
Bromus tectorum f. *coloratus* Jansen & Wacht.
= *Bromus tectorum* (37)
Bromus tectorum f. *glabratus* (Spenn.) H. St.John
= *Bromus tectorum* (37)
Bromus tectorum subsp. *abortiflorus* (St.-Amans) K. Richt.
= *Bromus tectorum* (37)
Bromus tectorum subsp. *longipilus* (Kumm. & Sendtn.) K.
Richt. = *Bromus tectorum* (37)
Bromus tectorum subsp. *lucidus* Sales
= *Bromus tectorum* (37)
Bromus tectorum var. *anisantha* Hack.
= *Bromus tectorum* (37)
Bromus tectorum var. *australis* (St.-Amans) Godr.
= *Bromus tectorum* (37)
Bromus tectorum var. *floridus* Gremli = *Bromus tectorum* (37)
Bromus tectorum var. *glaber* Coss. & Germ.
= *Bromus tectorum* (37)
Bromus tectorum var. *glabratus* Spenn.
= *Bromus tectorum* (37)
Bromus tectorum var. *hirsutus* Regel = *Bromus tectorum* (37)
Bryonia acerifolia D. Dietr. = *Coccinia grandis* (61)
Bryonia alceifolia Willd. = *Coccinia grandis* (61)
Bryonia barbata Buch.-Ham. ex Cogn.
= *Coccinia grandis* (61)
Bryonia grandis L. = *Coccinia grandis* (61)
Buddleja davidii var. *alba* Rehder & E.H. Wilson
= *Buddleja davidii* (39)
Buddleja davidii var. *superba* (de Corte) Rehder & E.H.
Wilson = *Buddleja davidii* (39)
Buddleja davidii var. *veitchiana* (Veitch) Rehder & Bailey
= *Buddleja davidii* (39)
Buddleja variabilis Hemsley = *Buddleja davidii* (39)
Buddleja variabilis var. *superba* Veitch = *Buddleja davidii* (39)
Buddleja variabilis var. *veitchiana* Veitch = *Buddleja davidii* (39)
Buddleja variabilis var. *wilsonii* E.H. Wilson
= *Buddleja davidii* (39)
Buphthalmum procumbens Desf. ex Steud.
= *Sphagneticola trilobata* (150)
Buphthalmum repens Lam. = *Sphagneticola trilobata* (150)
Buphthalmum strigosum Spreng. = *Sphagneticola trilobata* (150)
Cacalia mentrasto Vell. = *Ageratum conyzoides* (10)
Cactus strictus Haw. = *Opuntia stricta* (114)
Caelestina microcarpa Benth. ex Oerst.
= *Ageratum conyzoides* (10)
Caesalpinia benguetensis Elmer = *Caesalpinia decapetala* (41)
Caesalpinia decapetala var. *japonica* (Siebold & Zucc.) H. Ohashi
= *Caesalpinia decapetala* (41)
Caesalpinia decapetala var. *pubescens* (Tang & F.T. Wang)
P.C. Huang = *Caesalpinia decapetala* (41)
Caesalpinia ferox Hassk. = *Caesalpinia decapetala* (41)

Caesalpinia horrida A. Rich. = *Caesalpinia decapetala* (41)
Caesalpinia japonica Siebold & Zucc.
= *Caesalpinia decapetala* (41)
Caesalpinia sepiaria Roxb. = *Caesalpinia decapetala* (41)
Caesalpinia sepiaria var. *auricoma* Trimen
= *Caesalpinia decapetala* (41)
Caesalpinia sepiaria var. *japonica* (Siebold & Zucc.) Gagnep.
= *Caesalpinia decapetala* (41)
Caesalpinia sepiaria var. *japonica* (Siebold & Zucc.) Hand.-Mazz.
= *Caesalpinia decapetala* (41)
Caesalpinia sepiaria var. *japonica* (Siebold & Zucc.) Makino
= *Caesalpinia decapetala* (41)
Caesalpinia sepiaria var. *pubescens* Tang & F.T. Wang
= *Caesalpinia decapetala* (41)
Camphora vera Raf. = *Cinnamomum camphora* (54)
Camphora camphora (L.) H. Karst.
= *Cinnamomum camphora* (54)
Camphora hahnemannii Lukman.
= *Cinnamomum camphora* (54)
Camphora hippocratei Lukman.
= *Cinnamomum camphora* (54)
Camphora officinarum Bauh. = *Cinnamomum camphora* (54)
Camphora officinarum Nees = *Cinnamomum camphora* (54)
Camphora officinarum var. *glaucescens* A. Braun
= *Cinnamomum camphora* (54)
Camphorina camphora (L.) Farw.
= *Cinnamomum camphora* (54)
Canna achiras Gill. = *Canna indica* (43)
Canna amabilis T. Koyama & Nob. Tanaka
= *Canna indica* (43)
Canna ascendens Ciciar. = *Canna indica* (43)
Canna aurantiaca Roscoe = *Canna indica* (43)
Canna aureovittata Lodd. = *Canna indica* (43)
Canna bidentata Bertol. = *Canna indica* (43)
Canna bifida Roem. & Schult. = *Canna indica* (43)
Canna brasiliensis Roscoe ex Spreng. = *Canna indica* (43)
Canna carnea Roscoe = *Canna indica* (43)
Canna cearensis Huber = *Canna indica* (43)
Canna cinnabarina Bouché = *Canna indica* (43)
Canna coccinea f. *flaviflora* Chodat & Hassl.
= *Canna indica* (43)
Canna coccinea Mill. = *Canna indica* (43)
Canna coccinea Roscoe = *Canna indica* (43)
Canna coccinea var. *bicolor* Kraenzl. = *Canna indica* (43)
Canna coccinea var. *concolor* Regel = *Canna indica* (43)
Canna coccinea var. *floribunda* (Bouché) Regel
= *Canna indica* (43)
Canna coccinea var. *limbata* Regel = *Canna indica* (43)
Canna commutata Bouché = *Canna indica* (43)
Canna compacta Roscoe = *Canna indica* (43)
Canna concinna Bouché = *Canna indica* (43)
Canna crocea Lag. ex Rchb. = *Canna indica* (43)
Canna crocea Roem. & Schult. = *Canna indica* (43)
Canna densiflora Bouché = *Canna indica* (43)
Canna densifolia Bouché = *Canna indica* (43)
Canna discolor Lindl. = *Canna indica* (43)
Caprifolium hallianum Hort. = *Lonicera japonica* (95)
Caprifolium japonicum (Thunb.) Dum. Cours.
= *Lonicera japonica* (95)
Caprifolium roseum Lam. = *Lonicera japonica* (95)
Cardiospermum barbicaule Baker
= *Cardiospermum grandiflorum* (44)
Cardiospermum coluteoides Kunth
= *Cardiospermum grandiflorum* (44)
Cardiospermum duarteanum Cambess.
= *Cardiospermum grandiflorum* (44)
Cardiospermum elegans Kunth
= *Cardiospermum grandiflorum* (44)
Cardiospermum grandiflorum f. *elegans* (Kunth) Radlk.
= *Cardiospermum grandiflorum* (44)
Cardiospermum grandiflorum f. *hirsutum* (Willd.) Radlk.
= *Cardiospermum grandiflorum* (44)
Cardiospermum grandiflorum var. *hirsutum* Hiern
= *Cardiospermum grandiflorum* (44)
Cardiospermum hirsutum Willd.
= *Cardiospermum grandiflorum* (44)
Cardiospermum hispidum Kunth
= *Cardiospermum grandiflorum* (44)
Cardiospermum inflatum Vell.
= *Cardiospermum grandiflorum* (44)
Cardiospermum macrophyllum Kunth
= *Cardiospermum grandiflorum* (44)
Cardiospermum pilosum Vell.
= *Cardiospermum grandiflorum* (44)
Cardiospermum velutinum Hook. & Arn.
= *Cardiospermum grandiflorum* (44)
Cardiospermum vesicarum Humb.
= *Cardiospermum grandiflorum* (44)
Carduus armenus Boiss. = *Carduus nutans* (45)
Carduus arvensis (L.) Robson = *Cirsium arvense* (56)
Carduus attenuatus Klokov = *Carduus nutans* (45)

Carduus coloratus Tamamsch. = *Carduus nutans* (45)
Carduus haemorrhoidalis Auct. ex DC. = *Cirsium arvense* (56)
Carduus kondratjukii Gorl. = *Carduus nutans* (45)
Carduus leiophyllus Petrovic = *Carduus nutans* (45)
Carduus macrocephalus Desf. = *Carduus nutans* (45)
Carduus macrocephalus var. *kabylicus* Maire
= *Carduus nutans* (45)
Carduus macrolepis Peterm. = *Carduus nutans* (45)
Carduus neglectus Steud. = *Cirsium arvense* (56)
Carduus numidicus var. *porpinquus* Batt.
= *Carduus nutans* (45)
Carduus nutans subsp. *leiophyllus* (Petrovic) Stoj. & Stef.
= *Carduus nutans* (45)
Carduus nutans subsp. *macrocephalus* (Desf.) Gugler
= *Carduus nutans* (45)
Carduus nutans subsp. *macrocephalus* (Desf.) K. Richt.
= *Carduus nutans* (45)
Carduus nutans subsp. *macrolepis* (Peterm.) Kazmi
= *Carduus nutans* (45)
Carduus nutans subsp. *sporadum* (Halácsy) Rech. f.
= *Carduus nutans* (45)
Carduus nutans var. *armenus* Boiss. = *Carduus nutans* (45)
Carduus nutans var. *atlanticus* (Pomel) Batt.
= *Carduus nutans* (45)
Carduus nutans var. *brachycentros* Hausskn.
= *Carduus nutans* (45)
Carduus nutans var. *leiophyllus* (Petrovic) Arènes
= *Carduus nutans* (45)
Carduus nutans var. *longispinus* Moris = *Carduus nutans* (45)
Carduus nutans var. *macrocephalus* (Desf.)
= *Carduus nutans* (45)
Carduus nutans var. *songaricus* C. Winkl. ex O. Fedtsch. &
B. Fedtsch = *Carduus nutans* (45)
Carduus nutans var. *vestitus* (Hallier) B. Boivin
= *Carduus nutans* (45)
Carduus phyllolepis Willk. = *Carduus nutans* (45)
Carduus propinquus Pomel ex Batt. & Trab.
= *Carduus nutans* (45)
Carduus schischkinii Tamamsch. = *Carduus nutans* (45)
Carduus serratuloides Neck. = *Cirsium arvense* (56)
Carduus setosus Bab. = *Cirsium arvense* (56)
Carduus songoricus (C. Winkl. ex C. Winkl.) Tamamsch.
= *Carduus nutans* (45)
Carduus thoermeri subsp. *armenus* (Boiss.) Kazmi
= *Carduus nutans* (45)
Carelia conyzoides (L.) Kuntze = *Ageratum conyzoides* (10)
Carelia houstoniana (Mill.) Kuntze
= *Ageratum houstonianum* (12)
Casuarina littorea var. *souderi* (Fosberg) Fosberg & Sachet
= *Casuarina equisetifolia* (47)
Casuarina africana Lour. = *Casuarina equisetifolia* (47)
Casuarina brunoniana Miq. = *Casuarina equisetifolia* (47)
Casuarina equisetifolia var. *souderi* Fosberg
= *Casuarina equisetifolia* (47)
Casuarina excelsa Dehnh. ex Miq.
= *Casuarina equisetifolia* (47)
Casuarina indica Pers. = *Casuarina equisetifolia* (47)
Casuarina lateriflora Poir. = *Casuarina equisetifolia* (47)
Casuarina litorea L. ex Fosberg & Sachet
= *Casuarina equisetifolia* (47)
Casuarina littorea Oken = *Casuarina equisetifolia* (47)
Casuarina mertensiana Rupr. ex Miq.
= *Casuarina equisetifolia* (47)
Casuarina repens Hoffmanns. = *Casuarina equisetifolia* (47)
Casuarina truncata Willd. = *Casuarina equisetifolia* (47)
Cedrela brachystachya (C.DC.) C.DC. = *Cedrela odorata* (49)
Cedrela brownii Loefl. ex Kuntze = *Cedrela odorata* (49)
Cedrela caldasana C.DC. = *Cedrela odorata* (49)
Cedrela cedro Loefl. = *Cedrela odorata* (49)
Cedrela cubensis Bisse = *Cedrela odorata* (49)
Cedrela glaziovii C.DC. = *Cedrela odorata* (49)
Cedrela guianensis A. Juss. = *Cedrela odorata* (49)
Cedrela hassleri (C.DC.) C.DC. = *Cedrela odorata* (49)
Cedrela huberi Ducke = *Cedrela odorata* (49)
Cedrela imparipinnata C.DC. = *Cedrela odorata* (49)
Cedrela longipes S.F. Blake = *Cedrela odorata* (49)
Cedrela mexicana M. Roem. = *Cedrela odorata* (49)
Cedrela mexicana var. *puberula* C.DC. = *Cedrela odorata* (49)
Cedrela mourae C.DC. = *Cedrela odorata* (49)
Cedrela occidentalis C.DC. & Rose = *Cedrela odorata* (49)
Cedrela odorata var. *xerogeiton* Rizzini & Heringer
= *Cedrela odorata* (49)
Cedrela palustris Handro = *Cedrela odorata* (49)
Cedrela paraguariensis Mart. = *Cedrela odorata* (49)
Cedrela paraguariensis var. *brachystachya* C.DC.
= *Cedrela odorata* (49)
Cedrela paraguariensis var. *hassleri* C.DC.
= *Cedrela odorata* (49)
Cedrela paraguariensis var. *multijuga* C.DC.
= *Cedrela odorata* (49)
Cedrela rotunda S.F. Blake = *Cedrela odorata* (49)
Cedrela sintenisii C.DC. = *Cedrela odorata* (49)

Cedrela velloziana M. Roem. = *Cedrela odorata* (49)
Cedrela whitfordii S.F. Blake = *Cedrela odorata* (49)
Cedrela yucatana S.F. Blake = *Cedrela odorata* (49)
Cedrus odorata Mill. = *Cedrela odorata* (49)
Cephalandra grandis Kurz = *Coccinia grandis* (61)
Cephalandra moghadd (Asch.) Broun & Massey
= *Coccinia grandis* (61)
Cephalandra schimperi Naudin = *Coccinia grandis* (61)
Cephalocereus strictus (Willd.) Borg = *Opuntia stricta* (114)
Cephalonoplos arvense (L.) Fourr. = *Cirsium arvense* (56)
Cephalonoplos arvensis (L.) Fourr. = *Cirsium arvense* (56)
Cephalonoplos ochrolepidium (Juz.) Juz.
= *Cirsium arvense* (56)
Cereus mollis Pfeiff. = *Opuntia stricta* (114)
Cereus nigricans Pfeiff. = *Opuntia stricta* (114)
Cereus strictus (Willd.) DC. = *Opuntia stricta* (114)
Cestrum campestre Griseb. = *Cestrum parqui* (51)
Cestrum foetidissimum Jacq. = *Cestrum parqui* (51)
Cestrum glaucescens Sendtn. = *Cestrum parqui* (51)
Cestrum jamaicense var. *parqui* Lam. = *Cestrum parqui* (51)
Cestrum parqui f. *heterophyllum* Kuntze
= *Cestrum parqui* (51)
Cestrum parqui var. *glabriusculum* Kuntze
= *Cestrum parqui* (51)
Cestrum parqui var. *longiflorum* Francey
= *Cestrum parqui* (51)
Cestrum parqui var. *macrocalyx* Francey
= *Cestrum parqui* (51)
Cestrum parqui var. *oranense* Scolnik = *Cestrum parqui* (51)
Chrysocoma maculata Vell. = *Ageratum conyzoides* (10)
Cinnamomum camphora (L.) Siebold
= *Cinnamomum camphora* (54)
Cinnamomum camphora f. *linaloolifera* (Y. Fujita) Sugim.
= *Cinnamomum camphora* (54)
Cinnamomum camphora f. *parvifolia* Miq.
= *Cinnamomum camphora* (54)
Cinnamomum camphora var. *cyclophyllum* Nakai
= *Cinnamomum camphora* (54)
Cinnamomum camphora var. *glaucescens* (A. Br.) Meisn.
= *Cinnamomum camphora* (54)
Cinnamomum camphora var. *hosyo* (Hatus.) J.C. Liao
= *Cinnamomum camphora* (54)
Cinnamomum camphora var. *linaloolifera* Y. Fujita
= *Cinnamomum camphora* (54)
Cinnamomum camphora var. *rotundifolia* Makino
= *Cinnamomum camphora* (54)
Cinnamomum camphoriferum St.-Lag.
= *Cinnamomum camphora* (54)
Cinnamomum officinarum Nees ex Steud.
= *Cinnamomum camphora* (54)
Cirsium albicans Willk. = *Cirsium arvense* (56)
Cirsium argenteum Peyer ex Vest = *Cirsium arvense* (56)
Cirsium arvense f. *albiflorum* (E.L. Rand & Redfield)
R. Hoffm. = *Cirsium arvense* (56)
Cirsium arvense f. *incanum* (Beck) Gajic
= *Cirsium arvense* (56)
Cirsium arvense f. *rubricaule* Lepage = *Cirsium arvense* (56)
Cirsium arvense subsp. *incanum* (S.G. Gmel.) Iljin
= *Cirsium arvense* (56)
Cirsium arvense subsp. *setosum* (Willd.) Iljin
= *Cirsium arvense* (56)
Cirsium arvense subsp. *vestitum* (Wimm. & Grab.) Petr.
= *Cirsium arvense* (56)
Cirsium arvense var. *argenteum* (Peyer ex Vest) Fiori
= *Cirsium arvense* (56)
Cirsium arvense var. *horridum* Wimm. & Grab.
= *Cirsium arvense* (56)
Cirsium arvense var. *incanum* Ledeb. = *Cirsium arvense* (56)
Cirsium arvense var. *integrifolium* Wimm. & Grab.
= *Cirsium arvense* (56)
Cirsium arvense var. *mite* Wimm. & Grab.
= *Cirsium arvense* (56)
Cirsium arvense var. *vestitum* Wimm. & Grab.
= *Cirsium arvense* (56)
Cirsium dioicum Cass. = *Cirsium arvense* (56)
Citharexylum bahamense Millsp. ex Britton
= *Citharexylum spinosum* (58)
Citharexylum broadwayi O.E. Schulz ex Urb.
= *Citharexylum spinosum* (58)
Citharexylum coriaceum Desf. = *Citharexylum spinosum* L. (58)
Citharexylum fruticosum f. *bahamense* (Millsp. ex Britton)
Moldenke = *Citharexylum spinosum* (58)
Citharexylum fruticosum f. *subserratum* (Sw.) Moldenke
= *Citharexylum spinosum* (58)
Citharexylum fruticosum f. *subvillosum* (Moldenke) Moldenke
= *Citharexylum spinosum* (58)
Citharexylum fruticosum var. *brittonii* Moldenke
= *Citharexylum spinosum* (58)
Citharexylum fruticosum var. *smallii* Moldenke
= *Citharexylum spinosum* (58)
Citharexylum fruticosum var. *subserratum* (Sw.) Moldenke
= *Citharexylum spinosum* (58)

Citharexylum fruticosum var. *subvillosum* Moldenke
= *Citharexylum spinosum* (58)
Citharexylum fruticosum var. *villosum* (Jacq.) O.E. Schulz
= *Citharexylum spinosum* (58)
Citharexylum hybridum Moldenke
= *Citharexylum spinosum* (58)
Citharexylum laevigatum Hostm. ex Griseb.
= *Citharexylum spinosum* (58)
Citharexylum molle Salisb. = *Citharexylum spinosum* L. (58)
Citharexylum pentandrum Vent.
= *Citharexylum spinosum* (58)
Citharexylum polystachyum Turcz.
= *Citharexylum spinosum* (58)
Citharexylum pulverulentum Pers.
= *Citharexylum spinosum* (58)
Citharexylum quadrangulare Jacq.
= *Citharexylum spinosum* (58)
Citharexylum spinosum f. *brittonii* (Moldenke) I.E. Méndez
= *Citharexylum spinosum* (58)
Citharexylum spinosum f. *smallii* (Moldenke) I.E. Méndez
= *Citharexylum spinosum* (58)
Citharexylum spinosum f. *subserratum* (Sw.) I.E. Méndez
= *Citharexylum spinosum* (58)
Citharexylum spinosum f. *subvillosum* (Moldenke) I.E. Méndez = *Citharexylum spinosum* (58)
Citharexylum spinosum f. *villosum* (Jacq.) I.E. Méndez
= *Citharexylum spinosum* (58)
Citharexylum subserratum Sw.
= *Citharexylum spinosum* (58)
Citharexylum surrectum Griseb.
= *Citharexylum spinosum* (58)
Citharexylum teres Jacq. = *Citharexylum spinosum* (58)
Clematis bannatica Schur = *Clematis vitalba* (59)
Clematis bellojocensis Gand. = *Clematis vitalba* (59)
Clematis crenata Jord. = *Clematis vitalba* (59)
Clematis dumosa Gand. = *Clematis vitalba* (59)
Clematis dumosa Salisb. = *Clematis vitalba* (59)
Clematis odontophylla Gand. = *Clematis vitalba* (59)
Clematis pilosa Dulac = *Clematis vitalba* (59)
Clematis scandens Borkh. = *Clematis vitalba* (59)
Clematis sepium Lam. = *Clematis vitalba* (59)
Clematis taurica Besser ex Nyman = *Clematis vitalba* (59)
Clematis transiens Gand. = *Clematis vitalba* (59)
Clematis vitalba var. *angustiloba* Schur
= *Clematis vitalba* (59)
Clematis vitalba var. *angustisecta* Gremli
= *Clematis vitalba* (59)
Clematis vitalba var. *bannatica* Wierzb. ex Rchb.
= *Clematis vitalba* (59)
Clematis vitalba var. *cordata* Schur = *Clematis vitalba* (59)
Clematis vitalba var. *integra* DC. = *Clematis vitalba* (59)
Clematis vitalba var. *simplicifolia* Godet
= *Clematis vitalba* (59)
Clematis vitalba var. *syriaca* Boiss. = *Clematis vitalba* (59)
Clematis vitalba var. *timbali* Drabble = *Clematis vitalba* (59)
Clematitis vitalba (L.) Moench = *Clematis vitalba* (59)
Clidemia crenata DC. = *Clidemia hirta* (60)
Clidemia elegans (Aubl.) D. Don = *Clidemia hirta* (60)
Clidemia hirta var. *elegans* (Aubl.) Griseb.
= *Clidemia hirta* (60)
Clypeola alliacea Crantz = *Alliaria petiolata* (13)
Coccinia cordifolia Cogn. = *Coccinia grandis* (61)
Coccinia grandis var. *wightiana* (M. Roem.) Greb.
= *Coccinia grandis* (61)
Coccinia helenae Buscal. & Muschl. = *Coccinia grandis* (61)
Coccinia loureiriana M. Roem. = *Coccinia grandis* (61)
Coccinia moghadd (J.F. Gmel.) Asch. = *Coccinia grandis* (61)
Coccinia moimoi M. Roem. = *Coccinia grandis* (61)
Coccinia palmatisecta Kotschy = *Coccinia grandis* (61)
Coccinia schimperi Naudin = *Coccinia grandis* (61)
Coccinia wightiana M. Roem. = *Coccinia grandis* (61)
Coincya tournefortii (Gouan) Alcaraz *et al.*
= *Brassica tournefortii* (33)
Complaya trilobata (L.) Strother
= *Sphagneticola trilobata* (150)
Consolea bahamana (Britton & Rose) A. Berger
= *Opuntia stricta* (114)
Convolvulus bufalinus Lour. = *Merremia peltata* (102)
Convolvulus crispatulus Wall. = *Merremia peltata* (102)
Convolvulus peltatus L. = *Merremia peltata* (102)
Corallaria parvifolia Rumph. = *Adenanthera pavonina* (7)
Corculum leptopus Stuntz = *Antigonon leptopus* (20)
Coronilla haussknechtii Boiss. = *Securigera varia* (143)
Coronilla hirta Boiss. = *Securigera varia* (143)
Coronilla varia L. = *Securigera varia* (143)
Coronilla varia subsp. *hirta* (Boiss.) Rech. f.
= *Securigera varia* (143)
Cortaderia atacamensis (Phil.) Pilg. = *Cortaderia jubata* (62)
Crucifera alliaria E.H.L. Krause = *Alliaria petiolata* (13)
Cryptostegia grandiflora var. *tulearensis* Costantin & Gallaud
= *Cryptostegia grandiflora* (64)

Cucumis pavel Kostel. = *Coccinia grandis* (61)
Cucurbita dioica Roxb. ex Wight & Arn. = *Coccinia grandis* (61)
Cuscuta elatior Choisy = *Cuscuta reflexa* (66)
Cuscuta grandiflora Wall. = *Cuscuta reflexa* (66)
Cuscuta hookeri Sweet = *Cuscuta reflexa* (66)
Cuscuta megalantha Steud. = *Cuscuta reflexa* (66)
Cuscuta verrucosa Sweet = *Cuscuta reflexa* (66)
Cyathea australis (R. Br.) Domin var. *pallida* (F.M. Bailey) Domin = *Cyathea cooperi* (67)
Cyathea australis. (R. Br.) Domin var. *cervicalis* (F.M. Bailey) Domin = *Cyathea cooperi* (67)
Cyathea brownii Domin var. *cooperi* (Hook. ex F. Muell.) Domin = *Cyathea cooperi* (67)
Cynodon donax (L.) Raspail = *Arundo donax* (25)
Delairea scandens Lem. = *Delairea odorata* (70)
Desmanthus salinarum (Vahl) Steud. = *Prosopis juliflora* (126)
Dolichandra unguis-cati (L.) Lohmann = *Macfadyena unguis-cati* (96)
Dolichos capensis Thunb. = *Dipogon lignosus* (71)
Dolichos gibbosus Thunb. = *Dipogon lignosus* (71)
Dolichos hirsutus Thunb. = *Pueraria montana var. lobata* (133)
Dolichos lignosus L. = *Dipogon lignosus* (71)
Dolichos lobatus Willd. = *Pueraria montana var. lobata* (133)
Donax arundinaceus P. Beauv. = *Arundo donax* (25)
Donax bengalensis (Retz.) P. Beauv. = *Arundo donax* (25)
Donax bifarius (Retz.) Spreng. = *Arundo donax* (25)
Donax sativa (Lam.) J. Presl = *Arundo donax* (25)
Doxantha unguis-cati (L.) Miers = *Macfadyena unguis-cati* (96)
Echetrosis pentasperma Phil. = *Parthenium hysterophorus* (115)
Echtrus mexicanus (L.) Nieuwl. = *Argemone mexicana* (23)
Echtrus trivialis Lour. = *Argemone mexicana* (23)
Elaeagnus argyi H. Lev. = *Elaeagnus umbellata* (72)
Elaeagnus crispa var. *coreana* (H. Lev.) H. Lev. = *Elaeagnus umbellata* (72)
Elaeagnus crispa var. *praematura* Koidz. = *Elaeagnus umbellata* (72)
Elaeagnus longipes var. *crispa* (Thunb.) Maxim. = *Elaeagnus umbellata* (72)
Elaeagnus padifolia K. Koch = *Elaeagnus umbellata* (72)
Elaeagnus praematura (Koidz.) Araki = *Elaeagnus umbellata* (72)
Elaeagnus umbellata f. *nakaiana* (Araki) H. Ohba = *Elaeagnus umbellata* (72)
Elaeagnus umbellata var. *nakaiana* Araki = *Elaeagnus umbellata* (72)
Ephemerum bicolor Moench = *Tradescantia spathacea* (154)
Ephemerum discolor Moench = *Tradescantia spathacea* (154)
Eruca erecta Lag. = *Brassica tournefortii* (33)
Erucastrum minutiflorum Pau & Font Quer = *Brassica tournefortii* (33)
Erucastrum tournefortii (Gouan) Link = *Brassica tournefortii* (33)
Erysimum alliaceum Salisb. = *Alliaria petiolata* (13)
Erysimum alliaria L. = *Alliaria petiolata* (13)
Erysimum cordifolium Pall. = *Alliaria petiolata* (13)
Esquirolia sinensis H. Lev. = *Ligustrum lucidum* (91)
Eugenia arechavaletae Herter = *Eugenia uniflora* (74)
Eugenia costata Cambess. = *Eugenia uniflora* (74)
Eugenia dasyblasta (O. Berg) Nied. = *Eugenia uniflora* (74)
Eugenia decidua Merr. = *Eugenia uniflora* (74)
Eugenia ferruginea Sieber ex C. Presl = *Psidium cattleianum* (128)
Eugenia indica Nicheli = *Eugenia uniflora* (74)
Eugenia lacustris Barb. Rodr. = *Eugenia uniflora* (74)
Eugenia michelii Lam. = *Eugenia uniflora* (74)
Eugenia microphylla Barb. Rodr. = *Eugenia uniflora* (74)
Eugenia myrtifolia Salisb. = *Eugenia uniflora* (74)
Eugenia oblongifolia (O. Berg) Arechav. = *Eugenia uniflora* (74)
Eugenia oblongifolia (O. Berg) Mattos = *Eugenia uniflora* (74)
Eugenia oxygona Koidz. = *Psidium cattleianum* (128)
Eugenia strigosa (O. Berg) Arechav. = *Eugenia uniflora* (74)
Eugenia uniflora var. *atropurpurea* Mattos = *Eugenia uniflora* (74)
Eugenia urceolata Cordem. = *Psidium cattleianum* (128)
Eugenia willdenowii (Spreng.) DC. = *Eugenia uniflora* (74)
Eugenia zeylanica Willd. = *Eugenia uniflora* (74)
Eupatorium adenophora Spreng. = *Ageratina adenophora* (9)
Eupatorium adenophorum Spreng. = *Ageratina adenophora* (9)
Eupatorium adenophorum var. *peruvianum* Hieron. = *Ageratina adenophora* (9)
Eupatorium brachiatum Sw. ex Wikstr. = *Chromolaena odorata* (52)
Eupatorium clematitis DC. = *Chromolaena odorata* (52)
Eupatorium conyzoides f. *angustiflorum* Cuatrec. = *Chromolaena odorata* (52)
Eupatorium conyzoides f. *glabratum* Hassl. = *Chromolaena odorata* (52)

Eupatorium conyzoides Vahl. = *Chromolaena odorata* (52)
Eupatorium conyzoides var. *angustiflorum* Cuatrec.
= *Chromolaena odorata* (52)
Eupatorium conyzoides var. *floribunda* (Kunth) Hieron.
= *Chromolaena odorata* (52)
Eupatorium conyzoides var. *glabrescens* Steetz
= *Chromolaena odorata* (52)
Eupatorium conyzoides var. *heterolepis* Griseb.
= *Chromolaena odorata* (52)
Eupatorium conyzoides var. *incanum* Baker
= *Chromolaena odorata* (52)
Eupatorium conyzoides var. *paucidentatum* Baker
= *Chromolaena odorata* (52)
Eupatorium conyzoides var. *pauciflorum* Baker
= *Chromolaena odorata* (52)
Eupatorium conyzoides var. *phyllocephalum* Sch. Bip. ex
Baker = *Chromolaena odorata* (52)
Eupatorium conyzoides var. *scaberulum* Hassl.
= *Chromolaena odorata* (52)
Eupatorium conyzoides var. *tambillense* Hieron.
= *Chromolaena odorata* (52)
Eupatorium denticulatum Vahl = *Mikania micrantha* (105)
Eupatorium dichotomum Sch. Bip.
= *Chromolaena odorata* (52)
Eupatorium divergens Less. = *Chromolaena odorata* (52)
Eupatorium floribundum Kunth = *Chromolaena odorata* (52)
Eupatorium glandulosum Michx. = *Ageratina adenophora* (9)
Eupatorium graciliflorum DC. = *Chromolaena odorata* (52)
Eupatorium incisum Rich. = *Chromolaena odorata* (52)
Eupatorium klattii Millsp. = *Chromolaena odorata* (52)
Eupatorium odoratum f. *scandens* Kuntze
= *Chromolaena odorata* (52)
Eupatorium odoratum L. = *Chromolaena odorata* (52)
Eupatorium odoratum var. *brachiatum* (Sw. ex Wikstr.) DC.
= *Chromolaena odorata* (52)
Eupatorium odoratum var. *cubense* DC.
= *Chromolaena odorata* (52)
Eupatorium odoratum var. *mallotophyllum* B.L. Rob.
= *Chromolaena odorata* (52)
Eupatorium orinocense (Kunth) M. Gómez
= *Mikania micrantha* (105)
Eupatorium orinocense var. *batataefolium* (DC.) M. Gómez
= *Mikania micrantha* (105)
Eupatorium orinocense var. *tamoides* (DC.) M. Gómez
= *Mikania micrantha* (105)
Eupatorium paleaceum Sessé & Moc.
= *Ageratum conyzoides* (10)
Eupatorium pasadenense Parish = *Ageratina adenophora* (9)
Eupatorium trapezoideum Kunth = *Ageratina adenophora* (9)
Fallopia japonica (Houtt.) Ronse Decr.
= *Polygonum cuspidatum* (123)
Fallopia japonica var. *compacta* (Hook. f.) J.P. Bailey
= *Polygonum cuspidatum* (123)
Fallopia japonica var. *compacta* J. Bailey
= *Polygonum cuspidatum* (123)
Fallopia japonica var. *hachidyoensis* (Makino) Yonek. &
H. Ohashi = *Polygonum cuspidatum* (123)
Fallopia japonica var. *uzenensis* (Honda) Yonek. &
H. Ohashi = *Polygonum cuspidatum* (123)
Farnesia odora Gasp. = *Acacia farnesiana* (2)
Farnesiana odora Gasp. = *Acacia farnesiana* (2)
Gaertnera indica J.F. Gmel. = *Hiptage benghalensis* (82)
Gaertnera obtusifolia (DC.) Roxb.
= *Hiptage benghalensis* (82)
Gaertnera racemosa Vahl = *Hiptage benghalensis* (82)
Gamochilus speciosus T. Lestib.
= *Hedychium gardnerianum* (80)
Gandasulium peregrinum (N.E. Br.) Kuntze
= *Hedychium flavescens* (79)
Gigantochloa auriculata (Kurz) Kurz = *Bambusa vulgaris* (29)
Guaiava pyrigormis Gaertn. = *Psidium guajava* (129)
Guajava cattleiana (Afzel. ex Sabine) Kuntze
= *Psidium cattleianum* (128)
Guajava obovata (Mart. ex DC.) Kuntze
= *Psidium cattleianum* (128)
Guajava pumila (Vahl) Kuntze = *Psidium guajava* (129)
Guajava pyrifera (L.) Kuntze = *Psidium guajava* (129)
Guanabanus palustris M. Gómez = *Annona glabra* (16)
Gunnera chilensis Lam. = *Gunnera tinctoria* (77)
Gunnera chilensis var. *meyeri* L.E. Moro
= *Gunnera tinctoria* (77)
Gunnera chilensis var. *valdiviensis* L.E. Moro
= *Gunnera tinctoria* (77)
Gynerium jubatum Lemoine ex Carrière
= *Cortaderia jubata* (62)
Handroanthus pentaphyllus (L.) Mattos
= *Tabebuia heterophylla* (152)
Hedera chrysocarpa Walsh = *Hedera helix* (78)
Hedera helix f. *arborescens* (Lodd. ex Loudon) C.K. Schneid.
= *Hedera helix* (78)
Hedera helix f. *minima* (Hibberd) Tobler = *Hedera helix* (78)

Hedera helix var. *conglomerata* (Haage & Schmidt) G. Nicholson = *Hedera helix* (78)
Hedera helix var. *crenata* Hibberd = *Hedera helix* (78)
Hedera helix var. *digitata* Bosse = *Hedera helix* (78)
Hedera helix var. *donerailensis* G. Nicholson = *Hedera helix* (78)
Hedera helix var. *minima* Hibberd = *Hedera helix* (78)
Hedera helix var. *pedata* Hibberd = *Hedera helix* (78)
Hedera helix var. *poetica* Weston = *Hedera helix* (78)
Hedera helix var. *tricolor* Hibberd ex Rehder = *Hedera helix* (78)
Hedychium coronarium var. *flavescens* (Carey ex Roscoe) Baker = *Hedychium flavescens* (79)
Hedychium coronarium var. *subditum* (Turrill) Naik = *Hedychium flavescens* (79)
Hedychium emeiense Z.Y. Zhu = *Hedychium flavescens* (79)
Hedychium gardnerianum var. *pallidum* (Regel) Baker = *Hedychium gardnerianum* (80)
Hedychium pallidum Regel = *Hedychium gardnerianum* (80)
Hedychium panzhuum Z.Y. Zhu = *Hedychium flavescens* (79)
Hedychium subditum Turrill = *Hedychium flavescens* (79)
Hesperis alliaria (L.) Lam. = *Alliaria petiolata* (13)
Hibiscus abelmoschus (L.) Karsten = *Abelmoschus moschatus* (1)
Hibiscus abelmoschus L. = *Abelmoschus moschatus* (1)
Hibiscus abelmoschus var. *betulifolius* Mast. = *Abelmoschus moschatus* (1)
Hibiscus abelmoschus var. *genuinus* Hochr. = *Abelmoschus moschatus* (1)
Hibiscus amambayensis Krapov. & Fryxell = *Abelmoschus moschatus* (1)
Hibiscus cardiophyllus Baill. = *Abelmoschus moschatus* (1)
Hibiscus chinensis Roxb. = *Abelmoschus moschatus* (1)
Hibiscus ciliaris C. Presl = *Abelmoschus moschatus* (1)
Hibiscus collinsianus Nutt. ex Torr. & A. Gray = *Abelmoschus moschatus* (1)
Hibiscus cucurbitaceus A. St.-Hil. = *Abelmoschus moschatus* (1)
Hibiscus cucurbitaceus var. *acuminatus* Hassl. = *Abelmoschus moschatus* (1)
Hibiscus flavescens Cav. = *Abelmoschus moschatus* (1)
Hiptage benghalensis (L.) Kurz f. *cochinchinensis* Pierre = *Hiptage benghalensis* (82)
Hiptage benghalensis (L.) Kurz f. *latifolia* Nied. = *Hiptage benghalensis* (82)
Hiptage benghalensis (L.) Kurz f. *macroptera* (Merr.) Nied. = *Hiptage benghalensis* (82)
Hiptage benghalensis (L.) Kurz f. *typica* Nied. = *Hiptage benghalensis* (82)
Hiptage javanica Blume = *Hiptage benghalensis* (82)
Hiptage macroptera Merr. = *Hiptage benghalensis* (82)
Hiptage madablota Gaertn. = *Hiptage benghalensis* (82)
Hiptage malaiensis Nied. = *Hiptage benghalensis* (82)
Hiptage obtusifolia DC. = *Hiptage benghalensis* (82)
Hiptage pinnata Elmer = *Hiptage benghalensis* (82)
Hiptage teysmannii Arènes = *Hiptage benghalensis* (82)
Hypericum deidesheimense Sch. Bip. ex Trevir. = *Hypericum perforatum* (83)
Hypericum marylandicum Biroli ex Colla = *Hypericum perforatum* (83)
Hypericum mixtum Des Moul. = *Hypericum perforatum* (83)
Hypericum perforatum var. *albiflorum* Choisy = *Hypericum perforatum* (83)
Hypericum perforatum var. *alpinum* Parl. = *Hypericum perforatum* (83)
Hypericum perforatum var. *anomalum* Frid. = *Hypericum perforatum* (83)
Hypericum perforatum var. *microphyllum* H. Lév. = *Hypericum perforatum* (83)
Hypericum vulgare Bubani = *Hypericum perforatum* (83)
Impatiens macrochila Lindl. = *Impatiens glandulifera* (84)
Impatiens roylei Walp. = *Impatiens glandulifera* (84)
Imperata angolensis Fritsch = *Imperata cylindrica* (85)
Imperata arundinacea Cirillo = *Imperata cylindrica* (85)
Imperata arundinacea var. *africana* Andersson = *Imperata cylindrica* (85)
Imperata arundinacea var. *europaea* Andersson = *Imperata cylindrica* (85)
Imperata arundinacea var. *glabrescens* Buse = *Imperata cylindrica* (85)
Imperata arundinacea var. *indica* Andersson = *Imperata cylindrica* (85)
Imperata arundinacea var. *koenigii* (Retz.) Benth. = *Imperata cylindrica* (85)
Imperata arundinacea var. *latifolia* Hook. f. = *Imperata cylindrica* (85)
Imperata arundinacea var. *pedicellata* (Steud.) Debeaux = *Imperata cylindrica* (85)
Imperata cylindrica (L.) P. Beauv. = *Imperata cylindrica* (85)
Imperata cylindrica f. *pallida* Honda = *Imperata cylindrica* (85)

Imperata cylindrica subsp. *koenigii* (Retz.) Tzvelev
= *Imperata cylindrica* (85)
Imperata cylindrica var. *africana* (Andersson) C.E. Hubb.
= *Imperata cylindrica* (85)
Imperata cylindrica var. *europaea* (Andersson) Asch. & Graebn.
= *Imperata cylindrica* (85)
Imperata cylindrica var. *genuina* A. Camus
= *Imperata cylindrica* (85)
Imperata cylindrica var. *koenigii* (Retz.) Pilg.
= *Imperata cylindrica* (85)
Imperata cylindrica var. *latifolia* (Hook. f.) C.E. Hubb .
= *Imperata cylindrica* (85)
Imperata cylindrica var. *major* (Nees) C.E. Hubb.
= *Imperata cylindrica* (85)
Imperata cylindrica var. *parviflora* Batt. & Trab.
= *Imperata cylindrica* (85)
Imperata cylindrica var. *pedicellata* (Steud.) Debeaux
= *Imperata cylindrica* (85)
Imperata cylindrica var. *thunbergii* (Retz.) T. Durand & Schinz
= *Imperata cylindrica* (85)
Imperata dinteri Pilg. = *Imperata cylindrica* (85)
Imperata filifolia Nees ex Steud. = *Imperata cylindrica* (85)
Imperata klaga Jungh. = *Saccharum spontaneum* (139)
Imperata koenigii (Retz.) P. Beauv. = *Imperata cylindrica* (85)
Imperata koenigii var. *major* Nees = *Imperata cylindrica* (85)
Imperata laguroides (Pourr.) J. Roux
= *Imperata cylindrica* (85)
Imperata spontanea (L.) P. Beauv.
= *Saccharum spontaneum* (139)
Imperata spontanea (L.) P. Beauv. ex Roem. & Schult.
= *Saccharum spontaneum* (139)
Ipomoea bufalina Choisy = *Merremia peltata* (102)
Ipomoea nymphaefolia Blume = *Merremia peltata* (102)
Ipomoea peltata L. = *Merremia peltata* (102)
Karlea berchemioides Pierre = *Maesopsis eminii* (97)
Kleinia alata G. Mey. = *Mikania micrantha* (105)
Lantana aculeata L. = *Lantana camara* (87)
Lantana camara var. *rosea* Mosty ex Mattoon
= *Lantana camara* (87)
Lantana antillana Raf. = *Lantana camara* (87)
Lantana arida var. *sargentii* Moldenke = *Lantana camara* (87)
Lantana asperata Vis. = *Lantana camara* (87)
Lantana camara f. *albiflora* Moldenke = *Lantana camara* (87)
Lantana camara f. *caffertyi* I.E. Méndez = *Lantana camara* (87)
Lantana camara f. *macrantha* (Loes.) Moldenke
= *Lantana camara* (87)
Lantana camara f. *multiflora* (Otto & A. Dietr.) Moldenke
= *Lantana camara* (87)
Lantana camara f. *nana* (Moldenke) Moldenke
= *Lantana camara* (87)
Lantana camara f. *portoricensis* (Moldenke) I.E. Méndez
= *Lantana camara* (87)
Lantana camara f. *rosea* (Mosty ex Mattoon) Moldenke
= *Lantana camara* (87)
Lantana camara f. *rubelloflavescens* Moldenke
= *Lantana camara* (87)
Lantana camara f. *rubra* (Mosty ex Mattoon) Moldenke
= *Lantana camara* (87)
Lantana camara f. *sanguinea* (Medik.) Moldenke
= *Lantana camara* (87)
Lantana camara f. *ternata* (Moldenke) Moldenke
= *Lantana camara* (87)
Lantana camara var. *crocea* L.H. Bailey
= *Lantana camara* (87)
Lantana camara var. *flava* (Medik.) Moldenke
= *Lantana camara* (87)
Lantana camara var. *macrantha* Loes. = *Lantana camara* (87)
Lantana camara var. *moritziana* (Otto & A. Dietr.) López-Pal.
= *Lantana camara* (87)
Lantana camara var. *multiflora* Otto & A. Dietr.
= *Lantana camara* (87)
Lantana camara var. *nana* Moldenke = *Lantana camara* (87)
Lantana camara var. *parvifolia* Moldenke
= *Lantana camara* (87)
Lantana camara var. *rubra* Mosty ex Mattoon
= *Lantana camara* (87)
Lantana camara var. *sanguinea* (Medik.) L.H. Bailey
= *Lantana camara* (87)
Lantana camara var. *ternata* Moldenke
= *Lantana camara* (87)
Laurus camphora L. = *Cinnamomum camphora* (54)
Leleba vulgaris (Schrad. ex J.C. Wendl.) Nakai
= *Bambusa vulgaris* (29)
Leleba vulgaris var. *striata* (Lindl.) Nakai
= *Bambusa vulgaris* (29)
Leucaena glabra Benth. = *Leucaena leucocephala* (89)
Leucaena glauca Benth. = *Leucaena leucocephala* (89)
Leucoxylon acuminata Raf. = *Tabebuia heterophylla* (152)
Leucoxylon riparia Raf. = *Tabebuia heterophylla* (152)
Ligustrum calleryanum Decne. = *Ligustrum sinense* (94)
Ligustrum ceylanicum Decne. = *Ligustrum robustum* (92)

Ligustrum compactum var. *latifolium* W.C. Cheng
= *Ligustrum lucidum* (91)
Ligustrum esquirolii H. Lév. = *Ligustrum lucidum* (91)
Ligustrum lucidum f. *latifolium* (W.C. Cheng) P.S. Hsu
= *Ligustrum lucidum* (91)
Ligustrum lucidum var. *alivonii* Rehder = *Ligustrum lucidum* (91)
Ligustrum lucidum var. *aureomarginatum* Rehder
= *Ligustrum lucidum* (91)
Ligustrum lucidum var. *esquirolii* H. Lév. = *Ligustrum lucidum* (91)
Ligustrum lucidum var. *tricolor* Rehder = *Ligustrum lucidum* (91)
Ligustrum lucidum var. *xideense* J.L. Liu = *Ligustrum lucidum* (91)
Ligustrum magnoliifolium Dippel = *Ligustrum lucidum* (91)
Ligustrum microcarpum Kaneh. & Sasaki
= *Ligustrum sinense* (94)
Ligustrum neilgherrence Decne. = *Ligustrum robustum* (92)
Ligustrum robustum Sensu Thw. = *Ligustrum robustum* (92)
Ligustrum roxburghii Blume = *Ligustrum lucidum* (91)
Ligustrum sinense Lour. var. *multiflorum* Bowles
= *Ligustrum sinense* (94)
Ligustrum sinense Lour. var. *villosum* (May) Rehder
= *Ligustrum sinense* (94)
Ligustrum sinense var. *stauntonii* (DC.) Rehder
= *Ligustrum sinense* (94)
Ligustrum stauntonii DC. = *Ligustrum sinense* (94)
Ligustrum villosum May = *Ligustrum sinense* (94)
Ligustrum walkeri Decne. = *Ligustrum robustum* (92)
Ligustrum wallichii Vis. = *Ligustrum lucidum* (91)
Lonicera brachypoda DC. = *Lonicera japonica* (95)
Lonicera flexuosa Thun. = *Lonicera japonica* (95)
Lonicera japonica var. *chinensis* (P.W. Wats.) Baker
= *Lonicera japonica* (95)
Luma arechavaletae (Herter) Herter = *Eugenia uniflora* (74)
Luma costata (Cambess.) Herter = *Eugenia uniflora* (74)
Luma dasyblasta (O. Berg) Herter = *Eugenia uniflora* (74)
Luma strigosa (O. Berg) Herter = *Eugenia uniflora* (74)
Maesopsis berchemioides (Pierre) A. Chev.
= *Maesopsis eminii* (97)
Malvastrum carpinifolium (L. f.) A. Gray = *Sida acuta* (144)
Malvinda carpinifolia (L. f.) Medik. = *Sida acuta* (144)
Malvinda carpinifolia (L. f.) Moench = *Sida acuta* (144)
Melaleuca leucadendra var. *angustifolia* L. f.
= *Melaleuca quinquenervia* (99)
Melaleuca leucadendra var. *coriacea* (Poir.) Cheel
= *Melaleuca quinquenervia* (99)
Melaleuca maidenii R.T. Baker
= *Melaleuca quinquenervia* (99)
Melaleuca smithii R.T. Baker = *Melaleuca quinquenervia* (99)
Melaleuca viridiflora var. *rubriflora* Pancher ex Brongn. & Gris
= *Melaleuca quinquenervia* (99)
Melastoma calvescens Schrank & Mart. ex DC.
= *Miconia calvescens* (103)
Melastoma elegans Aubl. = *Clidemia hirta* (60)
Melastoma hirtum L. = *Clidemia hirta* (60)
Melastoma mandioccana Raddi = *Miconia calvescens* (103)
Melia azedarach var. *intermedia* (Makino) Makino
= *Melia azedarach* (101)
Melia azedarach var. *subtripinnata* Miq.
= *Melia azedarach* (101)
Melia azedarach var. *toosendan* (Siebold & Zucc.) Makino
= *Melia azedarach* (101)
Melia japonica var. *semperflorens* Makino
= *Melia azedarach* (101)
Melia toosendan Siebold & Zucc. = *Melia azedarach* (101)
Merremia borneensis Merr. = *Merremia peltata* (102)
Merremia bufalina Merr. & Rendle = *Merremia peltata* (102)
Merremia elmeri Merr. = *Merremia peltata* (102)
Metrosideros quinquenervia Cav.
= *Melaleuca quinquenervia* (99)
Mezoneuron benguetense (Elmer) Elmer
= *Caesalpinia decapetala* (41)
Miconia arborea Pav. ex Triana = *Miconia calvescens* (103)
Miconia magnifica Triana
= *Miconia calvescens* (103)
Miconia velutina L. Linden & Rodigas
= *Miconia calvescens* (103)
Mikania alata (G. Mey.) DC. = *Mikania micrantha* (105)
Mikania denticulata (Vahl) Willd. = *Mikania micrantha* (105)
Mikania micrantha (Hieron.) B.L. Rob.
= *Mikania micrantha* (105)
Mikania micrantha f. *hirsuta* (Hieron.) B.L. Rob.
= *Mikania micrantha* (105)
Mikania orinocensis Kunth = *Mikania micrantha* (105)
Mikania scandens var. *hirsuta* Hieron.
= *Mikania micrantha* (105)
Mikania scandens var. *subcymosa* (Gardner) Baker
= *Mikania micrantha* (105)
Mikania scandens var. *umbellifera* (Gardner) Baker
= *Mikania micrantha* (105)
Mikania scandens var. *villosa* Hieron. = *Mikania micrantha* (105)
Mikania sinuata Rusby = *Mikania micrantha* (105)
Mikania subcrenata Hook. & Arn. = *Mikania micrantha* (105)
Mimosa acicularis Poir. = *Acacia farnesiana* (2)

Mimosa asperata var. *pigra* Willd. = *Mimosa pigra* (109)
Mimosa brasiliensis Niederl. = *Mimosa pigra* (109)
Mimosa canescens Willd. = *Mimosa pigra* (109)
Mimosa ciliata Willd. = *Mimosa pigra* (109)
Mimosa farnesiana L. = *Acacia farnesiana* (2)
Mimosa glauca Koenig ex Roxb. = *Leucaena leucocephala* (89)
Mimosa glauca sensu L. = *Leucaena leucocephala* (89)
Mimosa hispida Willd. = *Mimosa pigra* (109)
Mimosa hispidula Kunth = *Mimosa pudica* (111)
Mimosa indica Poir. = *Acacia farnesiana* (2)
Mimosa invisa C. Martius = *Mimosa diplotricha* var. *diplotricha* (107)
Mimosa invisa var. *inermis* (Adelb.) Gilli
= *Mimosa diplotricha* var. *diplotricha* (107)
Mimosa juliflora Krause = *Prosopis juliflora* (126)
Mimosa juliflora Sw. = *Prosopis juliflora* (126)
Mimosa leucocephala Lam. = *Leucaena leucocephala* (89)
Mimosa leucophala Lam . = *Leucaena leucocephala* (89)
Mimosa melanoxylon (R. Br.) Poir. = *Acacia melanoxylon* (5)
Mimosa melanoxylum Poir. = *Acacia melanoxylon* (5)
Mimosa pedunculata (Willd.) Poir. = *Acacia farnesiana* (2)
Mimosa piliflora Sw. = *Prosopis juliflora* (126)
Mimosa polycantha Willd. = *Mimosa pigra* (109)
Mimosa procumbens Schumach. & Thonn. = *Mimosa pigra* (109)
Mimosa procumbens Sessé & Moc. = *Mimosa pigra* (109)
Mimosa pudica L. var. *tetranda* (Willd.) DC.
= *Mimosa pudica* (111)
Mimosa pudica L. var. *unijuga* (Duch. & Walp.) Griseb
= *Mimosa pudica* (111)
Mimosa salinarum Vahl = *Prosopis juliflora* (126)
Mimosa suaveolens Salisb. = *Acacia farnesiana* (2)
Mimosa tetranda Humb. & Bonpl. ex Willd.
= *Mimosa pudica* (111)
Mimosa unijuga Duch. & Walp. = *Mimosa pudica* (111)
Molina racemosa Cav. = *Hiptage benghalensis* (82)
Momordica bicolor Blume = *Coccinia grandis* (61)
Monogynella reflexa (Roxb.) Holub. = *Cuscuta reflexa* (66)
Morongia pilosa Standl. = *Mimosa diplotricha* var. *diplotricha* (107)
Myrica faya Aiton = *Morella faya* (113)
Myrtus brasiliana L. = *Eugenia uniflora* (74)
Myrtus brasiliana var. *diversifolia* Kuntze = *Eugenia uniflora* (74)
Myrtus brasiliana var. *lanceolata* Kuntze = *Eugenia uniflora* (74)
Myrtus brasiliana var. *lucida* (O. Berg) Kuntze
= *Eugenia uniflora* (74)
Myrtus guajava (L.) Kuntze = *Psidium guajava* (129)
Myrtus guajava var. *pyrifera* (L.) Kuntze
= *Psidium guajava* (129)
Myrtus willdenowii Spreng. = *Eugenia uniflora* (74)
Nastus thouarsii (Kunth) Raspail = *Bambusa vulgaris* (29)
Nastus viviparus Raspail = *Bambusa vulgaris* (29)
Neltuma bakeri Britton & Rose = *Prosopis juliflora* (126)
Neltuma constricta (Sarg.) Britton & Rose
= *Prosopis glandulosa* (124)
Neltuma glandulosa (Torr.) Britton & Rose
= *Prosopis glandulosa* (124)
Neltuma juliflora (Sw.) Raf. = *Prosopis juliflora* (126)
Neltuma neomexicana Britton & Rose
= *Prosopis glandulosa* (124)
Neltuma occidentalis Britton & Rose = *Prosopis juliflora* (126)
Neltuma pallescens Britton & Rose = *Prosopis juliflora* (126)
Nintooa japonica (Thunb.) Sweet = *Lonicera japonica* (95)
Ocotea japonica (Garsault) Thell.
= *Cinnamomum camphora* (54)
Olea clavata G. Don = *Ligustrum lucidum* (91)
Olea consanguinea Hance = *Ligustrum sinense* (94)
Olea robusta (Roxb.) Sweet = *Ligustrum robustum* (92)
Olea walpersiana Hance = *Ligustrum sinense* (94)
Operculina bufalina Hall. f. = *Merremia peltata* (102)
Opuntia airampo Phil. = *Opuntia stricta* (114)
Opuntia anahuacensis Griffiths = *Opuntia stricta* (114)
Opuntia atrocapensis Small = *Opuntia stricta* (114)
Opuntia bartramii Raf. = *Opuntia stricta* (114)
Opuntia bentonii Griffiths = *Opuntia stricta* (114)
Opuntia cyanella Griffiths = *Opuntia stricta* (114)
Opuntia dillenii (KerGawl.) Haw. = *Opuntia stricta* (114)
Opuntia gilvoalba Griffiths = *Opuntia stricta* (114)
Opuntia gomei Griffiths = *Opuntia stricta* (114)
Opuntia horrid Salm-Dyck ex DC. = *Opuntia stricta* (114)
Opuntia humilis (Haw.) Haw. = *Opuntia stricta* (114)
Opuntia inermis (DC.) DC. = *Opuntia stricta* (114)
Opuntia keyensis Britton ex Small = *Opuntia stricta* (114)
Opuntia laxiflora Griffiths = *Opuntia stricta* (114)
Opuntia longiclada Griffiths = *Opuntia stricta* (114)
Opuntia macrarthra Gibbes = *Opuntia stricta* (114)
Opuntia magnifica Small = *Opuntia stricta* (114)
Opuntia maritime Raf. = *Opuntia stricta* (114)
Opuntia nitens Small = *Opuntia stricta* (114)
Opuntia parva A. Berger = *Opuntia stricta* (114)
Oxytenanthera auriculata (Kurz) Prain
= *Bambusa vulgaris* (29)
Pachyrrhizus thunbergianus Siebold & Zuccarini
= *Pueraria montana var. lobata* (133)
Panicum gongylodes Jacq. = *Urochloa maxima* (157)

Panicum hirsutissimum Steud. = *Urochloa maxima* (157)
Panicum jumentorum Pers. = *Urochloa maxima* (157)
Panicum laeve Lam. = *Urochloa maxima* (157)
Panicum maximum Jacq. = *Urochloa maxima* (157)
Panicum maximum var. *coloratum* C.T. White
= *Urochloa maxima* (157)
Panicum maximum var. *gongylodes* (Jacq.) Döll
= *Urochloa maxima* (157)
Panicum maximum var. *pubiglume* K. Schum.
= *Urochloa maxima* (157)
Panicum maximum var. *trichoglume* Robyns
= *Urochloa maxima* (157)
Panicum polygamum var. *gongylodes* (Jacq.) E. Fourn.
= *Urochloa maxima* (157)
Panicum trichocondylum Steud. = *Urochloa maxima* (157)
Panke acaulis Molina = *Gunnera tinctoria* (77)
Panke caulescens J.F. Gmel. = *Gunnera tinctoria* (77)
Panke chilensis (Lam.) Oerst. = *Gunnera tinctoria* (77)
Panke tinctoria Molina = *Gunnera tinctoria* (77)
Papaver mexicanum (L.) E.H.L.Krause
= *Argemone mexicana* (23)
Paraserianthes falcataria (L.) I.C. Nielsen
= *Falcataria moluccana* (75)
Paraserianthes falcataria subsp. *falcataria* (L.) I.C. Nielsen
= *Falcataria moluccana* (75)
Paraserianthes falcataria subsp. *fulva* (Lane-Poole) I.C. Nielsen
= *Falcataria moluccana* (75)
Parthenium glomeratum Rollins
= *Parthenium hysterophorus* (115)
Parthenium lobatum Buckley = *Parthenium hysterophorus* (115)
Passiflora mixta L.f. = *Passiflora tarminiana* (117)
Passiflora mollissima (Kunth) L.H.Bailey
= *Passiflora tarminiana* (117)
Paulownia imperialis Siebold & Zucc.
= *Paulownia tomentosa* (118)
Paulownia tomentosa (Thunb.) Britton
= *Paulownia tomentosa* (118)
Pennisetum clandestinum Hoechst. ex Chiov
= *Cenchrus clandestinus* (50)
Pennisetum inclusum Pilg. = *Cenchrus clandestinus* (50)
Persea camphora (L.) Spreng. = *Cinnamomum camphora* (54)
Phillyrea indica Lour. = *Ligustrum sinense* (94)
Phillyrea paniculata Roxb. = *Ligustrum lucidum* (91)
Phillyrea robusta Roxb.
= *Ligustrum robustum* (92)
Phyllostachys striata (Lodd. ex Lindl.) Nakai
= *Bambusa vulgaris* (29)
Physalis chenopodifolia Lam. = *Physalis peruviana* (119)
Physalis esculenta Salisb. = *Physalis peruviana* (119)
Physalis latifolia Lam. = *Physalis peruviana* (119)
Physalis peruviana var. *latifolia* (Lam.) Dunal
= *Physalis peruviana* (119)
Physalis puberula Fernald = *Physalis peruviana* (119)
Physalis tomentosa Medik. = *Physalis peruviana* (119)
Pinus lemoniana Benth. = *Pinus pinaster* (120)
Pinus maritima Lam. = *Pinus pinaster* (120)
Pinus maritima var. *major* Loisel. = *Pinus pinaster* (120)
Pinus maritima var. *minor* Loisel. = *Pinus pinaster* (120)
Pinus nigrescens Ten. = *Pinus pinaster* (120)
Pinus pinaster var. *acutisquama* Boiss. = *Pinus pinaster* (120)
Pinus pinaster var. *lemoniana* (Benth.) Loudon
= *Pinus pinaster* (120)
Pinus pinaster var. *minor* (Loisel.) Carrière
= *Pinus pinaster* (120)
Pinus pinaster var. *pendula* J. Nelson = *Pinus pinaster* (120)
Pinus syrtica Thore = *Pinus pinaster* (120)
Piper aduncifolium Trel. = *Piper aduncum* (121)
Piper aduncum var. *laevifolium* C. DC. = *Piper aduncum* (121)
Piper anguillaespicum Trel. = *Piper aduncum* (121)
Piper cardenasii Trel. = *Piper aduncum* (121)
Piper celtidifolium Kunth = *Piper aduncum* (121)
Piper cuatrecasasii Trel. = *Piper aduncum* (121)
Piper cumbricola Trel. = *Piper aduncum* (121)
Piper cumbricola var. *montevagum* Trel.
= *Piper aduncum* (121)
Piper disparispicum Trel. = *Piper aduncum* (121)
Piper elongatifolium Trel. = *Piper aduncum* (121)
Piper elongatum Vahl = *Piper aduncum* (121)
Piper elongatum var. *elongatum* = *Piper aduncum* (121)
Piper elongatum var. *laevifolium* (C. DC.) Trel.
= *Piper aduncum* (121)
Piper elongatum var. *pampayacusum* Trel.
= *Piper aduncum* (121)
Piper fatoanum C. DC. = *Piper aduncum* (121)
Piper flavescens (C. DC.) Trel. = *Piper aduncum* (121)
Piper guanaianum C. DC. = *Piper aduncum* (121)
Pithecellobium acuminatum M.E. Jones
= *Acacia farnesiana* (2)
Pithecellobium minutum M.E. Jones = *Acacia farnesiana* (2)
Pleuropterus cuspidatus (Siebold & Zucc.) H. Gross
= *Polygonum cuspidatum* (123)

Plinia pedunculata L. f. = *Eugenia uniflora* (74)
Plinia rubra L. = *Eugenia uniflora* (74)
Plinia tetrapetala L. = *Eugenia uniflora* (74)
Polygonum reynoutria Makino = *Polygonum cuspidatum* (123)
Popanax farnesiana (L.) Raf. = *Acacia farnesiana* (2)
Prosopis bracteolata DC. = *Prosopis juliflora* (126)
Prosopis chilensis var. *glandulosa* (Torr.) Standl.
= *Prosopis glandulosa* (124)
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= *Pueraria montana* var. *lobata* (133)
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Marina Khaytarova; Top Tropicals.com
Tracey Slotta, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Acacia farnesiana
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Nickrent, D. L., www.phytoimages.siu.edu
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Acacia mearnsii
Forest & Kim Starr, Starr Environmental, Bugwood.org (5412711, 5414590)
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Acacia melanoxylon
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Adenanthera pavonina
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Sasidharan, N., Kerala Forest Research Institute, India

Ageratina adenophora
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
John M. Randall, The Nature Conservancy, Bugwood. org (5391816)
Julia Scher, USDA APHIS PPQ, Bugwood. org (5376294)

Ageratum conyzoides
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
http://en.wikipedia.org
Joseph DeFrank, Weed Scientist, University of Hawaii, Department of Tropical Plant and Soil Science

Ageratum houstonianum
Forest & Kim Starr, Starr Environmental, Bugwood.org (5418782)
Sasidharan, N., Kerala Forest Research Institute, India

Alliaria petiolata
Chris Evans, Illinois Wildlife Action Plan, Bugwood.org (UGA 1378075, UGA 1378076,1330039)
David Cappaert, Michigan State University, Bugwood.org (UGA 2146038)
Ken Chamberlain, The Ohio State University, Bugwood.org (1557469)

Ambrosia artemisiifolia
James H. Miller & Ted Bodner, Southern Weed Science Society, Bugwood.org (UGA 1120008)
Kevin C. Nixon, www. PlantSystematics.org Ohio State Weed Lab Archive, The Ohio State University, Bugwood.org (1559044)
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Annona glabra
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Sasidharan, N., Kerala Forest Research Institute, India
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Anredera cordifolia
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Antigonon leptopus
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Gerald D. Carr, University of Hawaii Botany Dept.
Patricia M. Ciesla, Forest Health Management International, Bugwood.org (UGA 5176091)
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Ardisia crenata
Ann Murray, University of Florida, Bugwood.org (5349035)
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Nickrent, D.L., www.phytoimages.siu.edu
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Ardisia elliptica
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Top Tropicals.com

Argemone mexicana
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Patricia M. Ciesla, Forest Health Management International, Bugwood.org (5176097)
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)
Suresh, T.A., Kerala Forest Research Institute, India

Arundo donax
David J. Moorhead, University of Georgia, Bugwood.org (UGA 2132033)

Steve Hurst, USDA NRCS PLANTS Database, Bugwood.org (UGA 5306068)
Suresh, T.A., Kerala Forest Research Institute, India

Asparagus densiflorus
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Bambusa vulgaris
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Berberis thunbergii
James H. Miller, USDA Forest Service, Bugwood.org (5421937, 5379541)
Leslie J. Mehrhoff, University of Connecticut, Bugwood.org (5457036)
Richard Old, XID Services, Inc., Bugwood.org (UGA 5228018)
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Bidens pilosa
Richard Old, XID Services, Inc., Bugwood.org (UGA 5374295, UGA 5228036, UGA 5228037)
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)
Suresh, T.A., Kerala Forest Research Institute, India

Brassica tournefortii
Bonnie Million, National Park Service, Bugwood.org (5405653)
http://commons.wikimedia.org
James M. Andre, CalPhotos. 2012. Regents of the University of California, Berkeley. Accessed on April 4, 2012
Joseph M. DiTomaso, University of California - Davis, Bugwood.org (5374664, 5374668)
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Bromus inermis
Richard Old, XID Services, Inc., Bugwood.org (UGA 5228063)
Ohio State Weed Lab Archive, The Ohio State University, Bugwood.org (1550012)
Ken Chamberlain, The Ohio State University, Bugwood.org (1550016)
http://en.wikipedia.org

Bromus rubens
John M. Randall, The Nature Conservancy, Bugwood.org (5391955, 5391953)
Richard Old, XID Services, Inc., Bugwood.org (UGA 5228071)

Bromus tectorum
Steve Dewey, Utah State University, Bugwood.org (UGA 1459086)
Chris Evans, Illinois Wildlife Action Plan, Bugwood.org (UGA 2149079)
Jan Samanek, State Phytosanitary Administration, Bugwood.org (5444124)
Leslie J. Mehrhoff, University of Connecticut, Bugwood.org (5449005)
John M. Randall, The Nature Conservancy, Bugwood.org (5341060)

Buddleja davidii
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Robert Vidéki, Doronicum Kft., Bugwood.org (5398002)
John Ruter, University of Georgia, Bugwood.org (1581722)
Leslie J. Mehrhoff, University of Connecticut, Bugwood.org (5452006)

Caesalpinia decapetala
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Canna indica
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Cardiospermum grandiflorum
www.iewf.org

Carduus nutans
Mary Ellen (Mel) Harte, Bugwood.org (UGA 1358314)
Dan Tenaglia, Missouriplants.com, Bugwood.org (1237112)
Steve Dewey, Utah State University, Bugwood.org (UGA 1459778, UGA 1459784)
Ken Chamberlain, The Ohio State University, Bugwood.org (1560074)
Howard F. Schwartz, Colorado State University, Bugwood.org (5364521)
Norman E. Rees, USDA Agricultural Research Service (Retd.), Bugwood.org (UGA 0023077)

Casuarina equisetifolia
Amy Ferriter, State of Idaho, Bugwood.org (UGA 1461051)
John M. Randall, The Nature Conservancy, Bugwood.org (UGA 5392010)
Christina Southwick, USDA APHIS PPQ CPHST, Bugwood.org (5463792)
Steve Hurst, USDA, NRCS, 2012, PLANTS Database, Bugwood.org (UGA 5306089)
Ravindran,V. P., Kerala Forest Research Institute, India
Forest & Kim Starr, Starr Environmental, Bugwood.org (UGA 5286024)

Dan Clark, USDI National Park Service, Bugwood.org (UGA 5281019)

Cedrela odorata

Lawrence M. Kelly, www. PlantSystematics.org

Steve Hurst, USDA, NRCS. 2012. The PLANTS Database (http://plants.usda.gov)

Zoya Akulova, CalPhotos. 2012. Regents of the University of California, Berkeley. Accessed on December 15, 2012

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Cenchrus clandestinus

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

USDA APHIS PPQ Archive, USDA APHIS PPQ, Bugwood.org (UGA 0015003)

Cestrum parqui

Zoya Akulova, CalPhotos. 2007. Regents of the University of California, Berkeley. Accessed on December 15, 2012

http://www.iewf.org

Chromolaena odorata

Tracey Slotta, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Suresh, T.A., Kerala Forest Research Institute, India

Cinnamomum camphora

http://en.wikipedia.org

Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Cirsium arvense

Steve Dewey, Utah State University, Bugwood.org (UGA 1459760)

Ken Chamberlain, The Ohio State University, Bugwood.org (1553264)

Leslie J. Mehrhoff, University of Connecticut, Bugwood.org (UGA 5270081)

Jan Samanek, State Phytosanitary Administration, Bugwood.org (5385914)

Bonsak Hammeraas, Bioforsk - Norwegian Institute for Agricultural and Environmental Research, Bugwood.org (5417146)

Citharexylum spinosum

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Sasidharan, N., Kerala Forest Research Institute, India

Clematis vitalba

Jan Samanek, State Phytosanitary Administration, Bugwood.org (5371316)

Robert Vidéki, Doronicum Kft., Bugwood.org (5398444, 5396251)

Jose Hernandez., USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Clidemia hirta

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Suresh, T.A., Kerala Forest Research Institute, India

Coccinia grandis

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

http://en.wikipedia.org

Cortaderia jubata

John M. Randall, The Nature Conservancy, Bugwood.org (5392081)

Joseph M. DiTomaso, University of California - Davis, Bugwood.org (5387231, 5387232)

D. Walters and C. Southwick, CPHST, Bugwood.org (5471964)

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Neal Kramer, CalPhotos. 2012. Regents of the University of California, Berkeley. Accessed on December 15, 2012

Cryptostegia grandiflora

Forest & Kim Starr, Starr Environmental, Bugwood.org (5421583)

Top Tropicals.com

Dan Clark, USDI National Park Service, Bugwood.org (UGA 1486018)

Cuscuta reflexa

Sasidharan, N., Kerala Forest Research Institute, India

Cyathea cooperi

http://commons.wikimedia.org

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Dalbergia sissoo

Sasidharan, N., Kerala Forest Research Institute, India

http://commons.wikimedia.org

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Delairea odorata

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Dipogon lignosus

http://commons.wikimedia.org

www.weedbusters.org.nz

Anthony Valois, Santa Monica Mountains National Recreation Area

Elaeagnus umbellata

James R. Allison, Georgia Department of Natural Resources, Bugwood.org (UGA 0001060)

Nancy Loewenstein, Auburn University, Bugwood.org (UGA 5306027)

Pennsylvania Department of Conservation and Natural Resources - Forestry Archive, Bugwood.org (UGA 5022010)
Steve Hurst, USDA, NRCS, PLANTS Database, Bugwood.org (UGA 5307041)
Chris Evans, Illinois Wildlife Action Plan, Bugwood.org (UGA 2188032)

Eugenia uniflora

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Falcataria moluccana

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
J. B. Friday, University of Hawaii, Hawaii Forestry Extension, Forestry and Agroforestry Trees in Hawaii

Gunnera tinctoria

http://en.wikipedia.org
Dennis Stevenson, www.phytoimages.siu.edu

Hedera helix

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Jan Samanek, State Phytosanitary Administration, Bugwood.org (5342010)
Steve Hurst, USDA, NRCS, PLANTS Database, Bugwood.org (5307052)

Hedychium flavescens

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Hedychium gardnerianum

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Hiptage benghalensis

Gerald D. Carr, University of Hawaii Botany Department; Top Tropicals.com
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Hypericum perforatum

Ohio State Weed Lab Archive, The Ohio State University, Bugwood.org (1559296)
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)
David Cappaert, Michigan State University, Bugwood.org (UGA 2187026)
Steve Dewey, Utah State University, Bugwood.org (UGA 1459528)
John Cardina, The Ohio State University, Bugwood.org (1559299)
Ken Chamberlain, The Ohio State University, Bugwood.org (1559309)

Impatiens glandulifera

Rob Routledge, Sault College, Bugwood.org (5474033)
Leslie J. Mehrhoff, University of Connecticut, Bugwood.org (5452862)
Barbara Tokarska-Guzik, University of Silesia, Bugwood.org (UGA 2138019)
Jan Samanek, State Phytosanitary Administration, Bugwood.org (UGA 5256029)

Imperata cylindrica

Jeffrey W. Lotz, Florida Department of Agriculture and Consumer Services, Bugwood.org (UGA 0908094)
Chris Evans, Illinois Wildlife Action Plan, Bugwood.org (UGA 2131097)
Mark Atwater, Weed Control Unlimited, Inc., Bugwood.org (UGA 2132091)
Wilson Faircloth, USDA Agricultural Research Service, Bugwood.org (UGA 1237047)
Tracey Slotta, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Lantana camara

Richard Old, XID Services, Inc., Bugwood.org (UGA 5237089)
Suresh, T.A., Kerala Forest Research Institute, India
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Leucaena leucocephala

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Suresh, T.A., Kerala Forest Research Institute, India

Ligustrum lucidum

Karan A. Rawlins, University of Georgia, Bugwood.org (5403696)
Rebekah D. Wallace, University of Georgia, Bugwood.org (5423332)
James H. Miller, USDA Forest Service, Bugwood.org (UGA 2307084, UGA 2307087)
Steve Hurst, USDA, NRCS, PLANTS Database, Bugwood.org (UGA 5307089)

Ligustrum robustum

Ye Jianfei, Institute of Botany, Chinese Acadamy of Sciences
Vijayasankar Raman, University of Mississippi
www.plantwise.org

Ligustrum sinense

Ronald F. Billings, Texas Forest Service, Bugwood.org (UGA 5005004)
Chris Evans, Illinois Wildlife Action Plan, Bugwood.org (UGA 2128044, UGA 2188053)
James H. Miller, USDA Forest Service, Bugwood.org (UGA 2307079)

Lonicera japonica
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Chuck Bargeron, University of Georgia, Bugwood.org (UGA 1150068)
Ken Chamberlain, The Ohio State University, Bugwood.org (1556336)
Macfadyena unguis-cati
Forest & Kim Starr, Starr Environmental, Bugwood.org (5418796)
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)
Pedro Acevedo-Rodriguez, Courtesy of Smithsonian Institution, Plant Image Collection
Maesopsis eminii
Suresh, T.A., Kerala Forest Research Institute, India
Melaleuca quinquenervia
Forest & Kim Starr, Starr Environmental, Bugwood.org (UGA 5160099)
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Julia Scher, USDA APHIS PPQ, Bugwood.org (5376518)
Melia azedarach
James H. Miller, USDA Forest Service, Bugwood.org (UGA 0016023)
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Steve Hurst, USDA, NRCS, PLANTS Database, Bugwood.org (UGA 5308012)
Merremia peltata
Matthew J.W. Cock, CABI
Miconia calvescens
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Mikania micrantha
Suresh, T.A., Kerala Forest Research Institute, India
Julia Scher, USDA APHIS PPQ, Bugwood.org (5376538)
Mimosa diplotricha* var. *diplotricha
Sasidharan, N., Kerala Forest Research Institute, India
Suresh, T.A., Kerala Forest Research Institute, India
Julia Scher, USDA APHIS PPQ, Bugwood.org (5376545)
Mimosa pigra
Fabian A. Michelangeli and Robbin Moran, www. PlantSystematics.org
Mimosa pudica
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Suresh, T.A., Kerala Forest Research Institute, India
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)
Morella faya
Forest & Kim Starr, Starr Environmental, Bugwood.org (5414601)
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Opuntia stricta
Joe Shaw, http://opuntiads.com
Dan Clark, USDI National Park Service, Bugwood.org (UGA 5281069)
Parthenium hysterophorus
Suresh, T.A., Kerala Forest Research Institute, India
Passiflora tarminiana
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Paulownia tomentosa
http://en.wikipedia.org
James H. Miller, USDA Forest Service, Bugwood.org (UGA 2307023, UGA 2307025)
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)
Leslie J. Mehrhoff, University of Connecticut, Bugwood.org (5453532)
Physalis peruviana
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Pinus pinaster
http://en.wikipedia.org
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Piper aduncum
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Pittosporum undulatum
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Polygonum cuspidatum
James H. Miller, USDA Forest Service, Bugwood.org (5379552)
Jan Samanek, State Phytosanitary Administration, (UGA 5205091)
Richard Old, XID Services, Inc., Bugwood.org (UGA 5242062)
Prosopis glandulosa
http://commons.wikimedia.org/wiki
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Nickrent, D. L., www.phytoimages.siu.edu

Prosopis juliflora
Suresh, T.A., Kerala Forest Research Institute, India
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)
Sasidharan, N., Kerala Forest Research Institute, India

Psidium cattleianum
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Psidium guajava
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Suresh, T.A., Kerala Forest Research Institute, India

Pteridium aquilinum
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Robert Vidéki, Doronicum Kft., Bugwood.org (5398842, 5398925)
Dave Powell, USDA Forest Service, Bugwood.org (0976097)

Pueraria montana* var. *lobata
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
James H. Miller & Ted Bodner, Southern Weed Science Society, Bugwood.org (UGA 0016129)
Steve Hurst, USDA, NRCS, PLANTS Database, Bugwood.org (UGA 5308065)

Rhamnus alaternus
http://en.wikipedia.org/wiki

Robinia pseudoacacia
Robert Vidéki, Doronicum Kft., Bugwood.org (5395922, 5396594)
Leslie J. Mehrhoff, University of Connecticut, Bugwood.org (UGA 5274043)
John Cardina, The Ohio State University, Bugwood.org (1557136)
Paul Wray, Iowa State University, Bugwood.org (UGA 0008220)
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Rubus discolor
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Rubus niveus
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Saccharum spontaneum
Julia Scher, USDA APHIS PPQ, Bugwood.org (UGA 1195029)
Suresh, T.A., Kerala Forest Research Institute, India

Salix cinerea
http://commons.wikimedia.org
Robert Vidéki, Doronicum Kft., Bugwood.org (5395909, 5396130)

Schinus terebinthifolius
Amy Ferriter, State of Idaho, Bugwood.org (UGA 1461043, UGA 1461044)
Dan Clark, USDI National Park Service, Bugwood.org (UGA 5281058)
Steve Hurst, USDA, NRCS, PLANTS Database, Bugwood.org (UGA 5308091)

Securigera varia
Dan Tenaglia, Missouriplants.com, Bugwood.org (UGA 2308074)
Richard Old, XID Services, Inc., Bugwood.org (UGA 5231059)
Steve Hurst, USDA, NRCS, PLANTS Database, Bugwood.org (UGA 5307020)

Sida acuta
Jose Hernandez, USDA, NRCS. 2012. The PLANTS Database (http://plants.usda.gov)
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Sujanapal, P., Kerala Forest Research Institute, India

Solanum mauritianum
Sujanapal, P., Kerala Forest Research Institute, India

Spathodea campanulata
Sasidharan, N., Kerala Forest Research Institute, India
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Sphagneticola trilobata
Suresh, T.A., Kerala Forest Research Institute, India
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Tabebuia heterophylla
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Tamarix ramosissima
Steve Dewey, Utah State University, Bugwood.org (UGA 1624020)
Bonnie Million, National Park Service, Bugwood.org (5405736, 5405637)

Tradescantia spathacea
Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii
Dennis Stevenson, 2005. www.PlantSystematics.org

Ulex europaeus

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Urochloa maxima

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Steve Hurst, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Verbena brasiliensis

Alva Chance, Wildflowers of Texas

Verbena rigida

Sasidharan, N., Kerala Forest Research Institute, India

Jerry A. Payne, USDA Agricultural Research Service, Bugwood.org (UGA 2514027)

Jose Hernandez, USDA, NRCS, 2012, The PLANTS Database (http://plants.usda.gov)

Ziziphus mauritiana

http://en.wikipedia.org

Gerald D. Carr, University of Hawaii Botany Dept.

Forest and Kim Starr, US Geological Survey (USGS), Makawao, Hawaii

Invasive alien plants constitute a little recognized, but very substantial, threat to forests in Asia and the Pacific. Their negative impacts can be widespread in nature, encompassing social, economic and environmental aspects. This publication – the first-ever collation of invasive alien plants threatening the forests of the Asia-Pacific region – identifies the native regions, current distributions, habitats, threats and damage associated with 111 species of invasive alien plants.

The publication will enhance awareness of potential invasive threats to forests and help to quickly identify invasive plants so that strategies to eradicate or manage them can be efficiently developed. It should be a valuable tool in thwarting new incursions into countries which are currently free of particular undesirable invasive alien plants. The publication also aims to identify knowledge gaps regarding invasive alien plants and promote attempts to fill these. In all these contexts, the book will be of immense value to foresters, quarantine officials, policy-makers, researchers, students and others who are interested in safeguarding the health and vitality of the region's forests.

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