

INVASIVE PESTS

**A THREAT TO THE WET TROPICS
WORLD HERITAGE AREA**



SEE
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& 15**

Invasive environmental weeds, feral animals and diseases threaten the rich biodiversity and the scenic beauty of the Wet Tropics. Environmental pests may also have major impacts on society, human health and the economy. Effective biosecurity aims to prevent potentially invasive pests from entering Australia and to identify and eradicate such pest outbreaks as early as possible to prevent further spread within the country.

Wet Tropics biodiversity

A living museum

The Wet Tropics bioregion has some of the oldest continuously surviving tropical rainforests on earth, mostly within the World Heritage Area. The ancient rainforests conserve an extraordinary diversity of plants including ferns, cycads and conifers which evolved over 200 million years ago. The Wet Tropics contains 16 of the 28 ancient lineages of primitive flowering plants, more than anywhere else in the world.

PHOTOS: CAIRNS BIRDWING, DAINTREE RIVER RINGTAIL POSSUM, GIANT TREEFROG (YELLOW MORPH), COMMON BLOSSOM BAT (MIKE TRENNERY), ATHERTON DELMA (TIM HAWKES), SPOTTED CATBIRD (DARYN STORCH), CYCAD (PETER FREEMAN), LICUALA PALM, EASTERN RAINBOWFISH (CAMPBELL CLARKE), BUNYA NUT (UNKNOWN)

Australia's richest biodiversity

The Wet Tropics has some of the most distinctive and irreplaceable plants and animals in the world.

The Wet Tropics bioregion has Australia's greatest diversity of animals and plants within an area of just 0.26% of the continent. Many plant and animal species in the Wet Tropics are endemic (found nowhere else in the world). The diverse vegetation communities are habitat to numerous rare and threatened species.

The Wet Tropics World Heritage Area contains over 2800 vascular plant species (over 25% are endemic) and at least 663 vertebrate animal species (over 10% are endemic). Invertebrate fauna is the richest in Australia and includes 230 butterfly species, 135 dung beetle species and 222 species of land snails.

The Wet Tropics bioregion contains:

30% of Australia's orchid species

37% of Australia's conifer species

58% of Australia's bat species

21% of Australia's reptile species

60% of Australia's butterfly species

42% of Australia's freshwater fish

30% of Australia's mammal species

21% of Australia's cycad species

40% of Australia's bird species

29% of Australia's frog species

65% of Australia's fern species

A hotspot for invasive pests

Why is the Wet Tropics a hotspot for invasive pests?

- The Wet Tropics has close geographical and climatic links to Papua New Guinea, Southeast Asia and some Pacific Islands. These areas have been the source of a range of exotic invasive pests.
- The tropical climate offers favourable growing conditions for exotic tropical plants and animals.
- There are a broad range of habitats offering varied temperatures and rainfall.
- The Wet Tropics has frequent cyclones, floods and droughts which can disrupt ecosystems and help spread weeds, diseases and, occasionally, feral animals such as tramp ants. For instance, cyclones can move weed seeds great distances via wind and water and destroy the rainforest canopy, allowing weeds to flourish.
- Development and population growth in the Wet Tropics creates increased pressure on environmental resources and increases ecosystem disturbance.
- People are increasingly moving machinery, plants and soil across the landscape.

How do environmental invasive pests come to the Wet Tropics?

International trade, agriculture and travel have increased movement of people, products and transport across the world. This has resulted in an accelerated spread of invasive pests across the globe. Many of these weeds, feral animals and diseases are spread unintentionally despite border controls and quarantine. However, many environmental pests have also been introduced to Australia intentionally and legally for purposes such as agriculture, horticulture and domestic use.

Intentional imports

- Plants imported for ornamental gardens, botanical collections, aquaria, medicinal herbs, pasture for grazing, horticulture or agroforestry.
- Animals imported for aquaria, pets, aquaculture and agriculture.
- Animals and diseases imported to control existing invasive pests.

Unintentional arrivals

- Feral animals such as toads, tramp ants and other insects that have hitched a ride on overseas shipping, transport and containers.
- Diseases, microorganisms and invertebrates carried on intentional imports.
- Imported foodstuffs and plant products which may carry contaminants or viable seeds and plant products.
- Diseases, invertebrates or plants moved by people, particularly from neighbouring countries.

AFRICAN TULIP: AN ORNAMENTAL PLANT WHICH HAS BECOME WEEDY (PHOTO: CAMPBELL CLARKE)



SIAM WEED: AN ACCIDENTAL ARRIVAL, ONE OF THE WORLD'S MOST INVASIVE WEEDS (PHOTO: STEPHEN MCKENNA, NAQS)



CANE TOAD: INTRODUCED TO CONTROL BEETLES AFFECTING SUGAR CANE (PHOTO: MIKE TRENNERY)



CABOMBA: AN AQUARIUM PLANT WHICH HAS BECOME WEEDY (PHOTO: WET TROPICS IMAGES)

Environmental impacts of invasive pests

Environmental invasive pests reduce and homogenise our native biodiversity. Overall, they cause the homogenisation of biodiversity. They replace our unique and locally distinct flora and fauna with the commonplace.

Many Wet Tropics plants and animals are endemic, highly specialised, rare or have restricted ranges. They have often evolved in isolated ecological niches with relatively little change over time. The large variety of ecosystems and ecological niches contributes to the rich biodiversity and irreplaceability of the Wet Tropics fauna and flora.

However, the specialisation of plants and animals also makes them more vulnerable to ecological disruption and competition from invasive species. Most invasive weeds and feral animals are generalists and have the capacity to disrupt intact ecosystems and out-compete native plants and animals.

- Weeds may disrupt and transform ecosystems, compete with and replace native plants, reduce food and shelter for native species, change fire regimes and create soil erosion. Those weeds that can invade or transform pristine habitat are particularly threatening to the biodiversity of the World Heritage Area.
- Feral animals may prey on native species compete for food and habitat, degrade habitat, erode soil, transmit weeds and disease, and cause changes in fire regimes.
- Diseases may kill individuals, species and, sometimes, entire families of plants and animals.



GAMBA GRASS CREATES HOT FIRES
(PHOTO: SAMANTHA SETTERFIELD)



REMOVAL OF A POND APPLE FOREST
(PHOTO: GEOFF ONUS)



OPWS RANGERS INSPECT FERAL PIG DAMAGE
(PHOTO: CAMPBELL CLARKE)



YELLOW CRAZY ANTS ATTACK THE LARVA OF A RHINOCEROS BEETLE (PHOTO: WET TROPICS IMAGES/DEB POPLER)

Impacts of invasive species are linked to other environmental stresses

Any decrease in the resilience of Wet Tropics ecosystems will significantly increase the potential for weed, feral animal and disease invasions. Ecosystems can be disrupted by clearing and fragmentation, altered water and fire regimes, changes to weather patterns, and events such as cyclones and droughts. For instance, cyclones and fires often provide opportunities for invasive weeds to become established in disturbed landscapes. Climate change has the potential to further disrupt ecosystems and make many of these impacts more severe.

Social and economic impacts of environmental invasive pests

Many environmental pests can have significant impacts on the economy and people's health and quality of life. The long term control of invasive pests imposes significant costs on landholders and the community. For example:

- Swarms of yellow crazy ants can affect the health and quality of life of local residents by spraying formic acid on the eyes and skin of people and pets. The ants can also affect agricultural yields of crops such as sugar cane.
- Newly arrived invasive rainforest weeds such as Koster's curse and miconia have the potential to invade farmlands and affect agriculture, causing significant costs to farmers.
- Feral pigs cause significant crop damage on sugar cane and banana farms.
- Feral dogs may cause significant death and injury to grazing animals or farmed poultry.
- Myrtle rust has the capacity to affect the growth of a broad range of eucalypts, melaleucas and other myrtaceous species in domestic gardens and nurseries.



THUNBERGIA GRANDIFLORA
INFESTATIONS, TUBERS
AND FLOWERS (MATT BIRCH, CRC)



Prevention and early detection

Biosecurity refers to the protection of the economy, environment and human health from the negative impacts associated with entry, establishment or spread of exotic pests, diseases and weeds. This incorporates quarantine measures to prevent the entry and spread of exotic pests. There are five key principles involved in biosecurity: surveillance, detection, diagnostics, preparedness and rapid response.

The costs of prevention are far less than the subsequent ongoing costs for eradication or control, and far less than the cost of environmental impacts. It is very important to target potentially invasive species already identified in areas close to our borders or in countries known to be a source of invasive species.

Biosecurity Queensland works with the Australian Government to detect any new arrivals of invasive species. The North Australia Quarantine Strategy (NAQS) identifies potential threats and the likely avenues for their introduction to northern Australia, including the Wet Tropics. Both the Australian and Queensland governments publicise lists of potentially invasive species to look out for.

Examples of weeds on our doorstep

Two serious environmental weeds present in Papua New Guinea, but not yet known to be in Australia, are spiked pepper and sourgrass. Spiked pepper, in particular, poses a significant threat to ecosystems within the Wet Tropics World Heritage Area. Sourgrass has the potential to become invasive across a broad swathe of northern Australia's savannah ecosystems, affecting both the environment and the pastoral industry.

Examples of feral animal pests on our doorstep

Some animal species which are currently established in nearby Papua New Guinea have the potential to be significant threats to the Wet Tropics environment and other areas of Australia. For example:

- The Asian black-spined toad would have similar impacts to the cane toad. It has poison glands, enjoys a varied diet and is a prolific breeder.
- The climbing perch (pictured) has been found in the Torres Strait Islands. It is an aggressive and noxious fish that can move across land. (PHOTO: DAF)
- The walking catfish is a voracious predatory freshwater fish, established in Papua New Guinea, and is listed as one of the world's 100 worst alien invasive species.
- A recently detected insect invader is the erythrina gall wasp which was found in the Torres Strait Islands in 2013 and affects plants of the Erythrina genus.
- The old world screwworm fly is an insect parasite of warm-blooded animals found in the areas of Papua New Guinea that border Torres Strait. It threatens livestock, as well as native animals and human health.



DAMAGE DONE BY THE ERYTHRINA GALL WASP
(PHOTO: SALLY COWAN, NAQS)



ASIAN BLACK-SPINED TOAD
(PHOTO: LOKIONLY)



SOURGRASS
(PHOTO: BARBARA WATERHOUSE, NAQS)

SPIKED PEPPER
(PHOTO: STEPHEN MCKENNA, NAQS)

Early eradication of new incursions

Early eradication of newly arrived pests requires rapid detection and a swift response. Rapid detection requires ongoing surveillance by people skilled in identification. It also relies on education of landholders and the community about what to look out for. Swift response requires immediate funding and the capacity to deal with biosecurity emergencies. Success is not always guaranteed, but has been achieved for the oriental fruit fly. Electric ants have now almost been eradicated in the Wet Tropics.

In practice, early eradication has proved to be the most effective and efficient way to achieve success. Early eradication requires a commitment to maintain the capacity to detect and eradicate pests, as well as a willingness to promote high quality research and community education and participation.

There are two major eradication programs currently underway in the Wet Tropics.

Four tropical weeds

The Four Tropical Weeds program began in 2002 and is funded under national cost-sharing arrangements. The program aims to eradicate outbreaks of limnocharis, mikania vine, Koster's curse and three miconia species. Infestations of these weeds have only been found in the Wet Tropics, but are recognised as a threat throughout Australia. The program has had some success in delimiting and controlling five of these weeds. However, seed banks can survive many years and monitoring and surveillance must continue into the future—up to 16 years to ensure eradication of *Miconia calvescens*, for example. Unfortunately, Koster's curse is no longer considered eradicable after another large outbreak was found in dense forests in 2015.

Yellow crazy ant eradication

Yellow crazy ants were first found in the Wet Tropics in 2001 and now cover about 800 hectares in areas south of Cairns, as well as 30 hectares in Kuranda. Funding of eradication programs to date has been sporadic. The Wet Tropics Management Authority is currently treating the infestations with a \$2M funding grant through the Australian Government, supplemented by support from the Green Army Program. Eradication is still considered feasible with sufficient funds and resources.



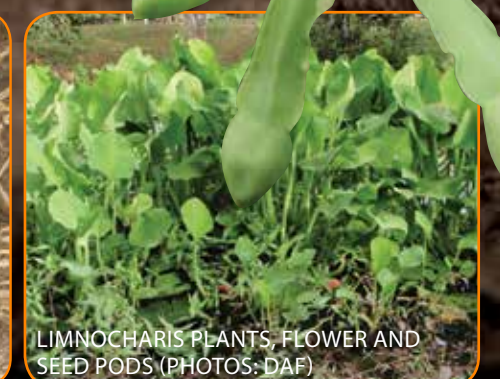
YELLOW CRAZY ANT
(PHOTO: JURGEN FREUND)



MICONIA RACEMOSA FRUIT
(PHOTO: TRAVIS SYDES)



ELECTRIC ANTS AND 5 CENT COIN
(PHOTO: DAF)



LIMNOCHARIS PLANTS, FLOWER AND SEED PODS (PHOTOS: DAF)

Weeds: some high priorities

The number of known weeds in the Wet Tropics bioregion has grown rapidly over the past 50 years to over 500 species. About 200 new weed species have been identified in the past decade. Some recent arrivals have already demonstrated their invasive potential in the Wet Tropics. They can invade, disrupt and transform a variety of ecosystems. They include the four tropical weeds (see page 7) and Siam weed which is on the Northern Australia Quarantine Strategy (NAQS) target list.

Weeds, agriculture and horticulture

Many of our worst environmental weeds have been imported and grown for agriculture, horticulture and forestry. These include a range of pasture grasses and fodder such as olive hymenachne, para grass, guinea grass, aleman grass and leucaena. Horticultural plants such as coffee, guava species and pond apple have also become significant weed problems. Similarly, ornamental trees such as harungana and African tulip and ornamental vines such as thunbergias have spread rapidly in the natural environment. There have also been weedy outbreaks of exotic commercial timber species such as East Indian mahogany and white teak.

Sleeper weeds

The Wet Tropics has numerous 'sleeper' weeds that could still have serious impacts if they become better established in the natural environment. Sometimes the spread and impact of a weed can escalate when there is significant disturbance from a cyclone or a drought that allows it to thrive in a more favourable environment.

There are several thousand potential new invasive weeds which are grown as ornamentals or are weeds in urban areas in Australia which have the potential to 'jump the fence'. Human movement of these species within Australia is usually unconstrained and they are generally exempt from formal risk assessment processes. There is a need for greater efforts to help detect and manage risks of invasive species already within Australia.

WATER LETTUCE (PHOTO: MATT BIRCH, CRC)



SIAM WEED ERADICATION
(PHOTO: JACK HARGREAVES, QPWS)



REMOVING TURBINA VINE
(PHOTO: GEOFF ONUS)



POND APPLE
(PHOTO: BIOTROPICA AUSTRALIA)



CANDYLEAF OR STEVIA
(PHOTO: GEOFF ONUS)



BRILLANTAISIA
(PHOTO: MATT BIRCH, CRC)



KUDZU VINE (PHOTO: MATT BIRCH, CRC)



MICONIA FLOWERS (PHOTO: DAF)



YELLOW ALLAMANDA
(PHOTO: BIOTROPICA AUSTRALIA)



STRAWBERRY GUAVA
(PHOTO: SUSAN LAURANCE)



ARROWHEAD VINE
(PHOTO: CAMPBELL CLARKE)

Feral animals : some high priorities

Vertebrate pests

Most feral animals found in the Wet Tropics are common throughout Queensland and northern Australia—feral pigs, dogs, cattle, cane toads, cats, rats and Indian mynas. Feral deer, rabbits, goats and foxes are also emerging as pests in the area. Two species of tilapia, a highly invasive fish, have spread rapidly since their introduction in 1989 and, unfortunately, it seems they are still being deliberately introduced into additional Wet Tropics waterways.

Although the number of vertebrate pest species (28) has remained stable for several years, their population numbers, distribution and range of ecological impacts are often poorly understood. It has been estimated that there are about 27,000 feral pigs in the Wet Tropics bioregion. Apart from the feral pig, no estimates of feral animal numbers or population trends have been undertaken within the bioregion. However, anecdotal evidence suggests that the populations of some have increased markedly in recent years.

FERAL CATTLE (PHOTO: BRUCE JENNISON)



FERAL PIG (PHOTO: CHRIS ROACH, QPWS)



SPOTTED TILAPIA (PHOTO: BRENDAN EBNER)



CHITAL AND RUSA DEER GRAZE UNDER POND APPLE (PHOTO : MATT BIRCH, CRC)

Hybrid animals

New hybrid animals may increase the threat of some feral animal species. For instance, graziers are breeding more drought-resistant and heat-tolerant varieties of cattle and goats. These could create hardier feral populations if they escape into the wild.

Hybrids of domestic and wild cats, such as savannah cats and Bengal cats, are bred as pets overseas, as are coyote and wolf crosses with dogs. These hybrids would have the capacity to significantly increase the body size of feral populations in Australia. The *Environment Protection and Biodiversity Conservation Act 1999* now specifies that live animal specimens (including hybrids) cannot be imported into Australia unless explicitly listed as allowed. Only one horse hybrid is explicitly allowed on the import list. Savannah cats have never been imported into Australia and are explicitly banned for environmental reasons. Bengal cats have been imported into Australia since 1996 and may be allowed as an exception to the general policy.

Invertebrate pests

A range of invertebrate species are recognised as potential threats to the integrity of the Wet Tropics forests as well as having broader socioeconomic impacts. Yellow crazy ants, electric ants and Asian honey bees have all been discovered in the Wet Tropics since 2000. Yellow crazy ants can have severe impacts on native animals and plants, as well as agriculture, and human health and quality of life. Asian honey bees compete with and displace native bees and European honey bees. They have the potential to carry the exotic varroa mite, a threat to the honey industry. Palm leaf beetles, papaya fruit fly and spiralling whitefly can all have an adverse impact on native plants as well as agricultural and horticultural species.

There is no comprehensive analysis of introduced insects, spiders, snails, earthworms, nematodes and other invertebrate pests, nor a proper understanding of their impacts. These groups of organisms also have the potential to cause harm to native species and to disrupt natural ecosystems.

ASIAN HONEY BEE NEST (PHOTO: DAF)



ASIAN HONEY BEE NEST (PHOTO: DAF)



SECOND GENERATION SAVANNAH CAT, 9KG (PHOTO: GALAWEBDESIGN)



YELLOW CRAZY ANTS (PHOTO: WET TROPICS IMAGES/ ANNA ROGERS)

Diseases: some high priorities

Diseases have the potential to devastate individual species, or suites of species, particularly when first introduced. Initial catastrophic declines may be followed by chronic population depression or local extinction. Compared to the more visible weeds and feral animals, little is known about introduced pathogens which may affect the World Heritage Area. It is generally difficult to detect pathogenic microorganisms and to learn how they spread disease.

There is a real possibility that diseases of agricultural and horticultural crops may spread to related rainforest species. For example, native bananas may be vulnerable. Similarly, diseases of domestic and feral animals can easily be transmitted to native species with potentially devastating impacts.

Three diseases that are known to be a threat to Wet Tropics ecosystems include phytophthora, frog chytrid fungus and the recently arrived myrtle rust.

Myrtle rust

Myrtle rust is a fungal disease that affects plants in the Myrtaceae family. There are over 200 individual Myrtaceae species in the Wet Tropics. Some myrtaceous plant genera are represented in great abundance, for example, eucalypts, melaleucas and lillypillies (syzygiums). Some species are valued for being rare, endemic or endangered. Cedar Bay cherry, broad-leaved paperbark and many Rhodamnia and

Rhodomyrtus species are among those that are particularly susceptible.

Myrtle rust was first detected in a northern New South Wales nursery in 2010 and is now widespread in eastern Queensland, including the Wet Tropics. Myrtle rust spreads easily through windblown spores and eradication is not considered possible.

Myrtle rust particularly affects new growth such as seedlings, leaf flushes and fruiting bodies. It may cause plant death. The long term impacts on myrtaceous plants and forest ecosystems remains uncertain. It is important to restrict and monitor imports of myrtaceous plants and plant materials to prevent any further strains of myrtle rust arriving in Australia—mixing of different strains could cause more virulent outbreaks.



MYRTLE RUST ON IRON MALLETWOOD FRUIT
(PHOTO: GEOFF PEGG)



MYRTLE RUST ON MALANDA
IRONWOOD (PHOTO: GEOFF PEGG)



MYRTLE RUST ON BEACH CHERRY
(PHOTO: DAF)

Phytophthora (forest dieback)

The Australian government has listed forest dieback, caused by phytophthora, as a 'key threatening process'. Phytophthora, commonly referred to as a root-rot fungus, is a soil-borne organism which is spread by the movement of soil and water. Where it is highly virulent, phytophthora will kill all plant species rooted in the soil. Less deadly outbreaks may only affect particularly vulnerable plant species. Severe outbreaks of forest dieback may also be triggered or made worse when phytophthora is combined with other stresses on vegetation such as drought or previous logging activities.

Phytophthora was first detected in the Garrawalt and Koombooloomba areas in the 1970s. It has generally been associated with wet notophyll vine forests on acid volcanic soils above 700m. These forests make up about 14% of the World Heritage Area. Over 200 patches of rainforest dieback have now been located, mainly in the Tully Falls, Mount Lewis, Koombooloomba and Kirrama areas. At least five species of phytophthora have been found at dieback sites in the Wet Tropics. Severe forest dieback may also be triggered by mixing of more than one phytophthora species.

MYRTLE RUST ON TRISTANIOPSIS EXILIFLORA
(PHOTO: GEOFF PEGG)



FOREST DIEBACK CAUSED BY PHYTOPHTHORA
(PHOTO: STUART WORBOYS)

Frog chytrid fungus

Chytridiomycosis is a frog disease caused by the chytrid fungus. The spores of the fungus grow inside the outer layers of the frog's skin, resulting in keratin damage. The pathogen then attacks the nervous system. Spores of the chytrid fungus are transported in water and wet soil. The fungus appears to be more virulent at lower temperatures.

Frog chytrid fungus has been identified as a primary cause of massive mortality of stream-dwelling frogs in the Wet Tropics bioregion. Eight species of frogs in the Wet Tropics experienced severe population declines during the 1980s and 1990s. These locally endemic frog species, which were once distributed widely and in high numbers, vanished from altitudes above 300m within a very short period of time.

Three of these frog species were thought to be extinct. However, a population of one of the missing species, the armoured mistfrog, was rediscovered in 2008 outside its former known range in an open-forest habitat that provides warmer conditions less suitable for the development of the disease. Another four species have suffered extensive declines and are no longer able to be found in their former high-altitude habitats. One Tableland species also suffered population declines.

Infection of amphibians with chytrid fungus resulting in chytridiomycosis has been listed nationally as a key threatening process. A Recovery Plan has been developed for stream-dwelling rainforest frogs and a National Threat Abatement Plan has been developed for chytridiomycosis.



IMPACTS OF CHYTRID FUNGUS
(PHOTOS: DEBORAH PERGOLOTTI)

How you can help

Community education, awareness and participation are vital to help prevent the introduction of new invasive species and their spread in the Wet Tropics. Current funding and pest management programs cannot manage without the help of landholders and the community. Here are a few things you can do to help.

Arrive clean, leave clean

- Wash vehicles, boats and trailers and make sure machinery is clean—some plants can grow from tiny segments as well as seeds.
- Make sure garden waste is disposed of responsibly at council transfer stations.
- Don't dump garden waste in natural areas or on roadsides, waterways and vacant lots.
- When moving soil, make sure it does not contain invasive species such as tramp ants or weed seeds.
- Make sure that stock fodder, mulch materials and hay from other sources do not contain weeds.
- Drive only on established and designated tracks—weed seeds can become lodged in vehicle tyres and radiators.
- When camping, clean your clothing, shoes and camping gear before leaving—weed seeds can attach to clothing and gear.
- Don't import new plants, seeds or other plant products without following appropriate customs and biosecurity procedures.
- Don't release exotic aquarium fish and water plants into the natural environment.
- Don't move invasive pest fish and water plants from one waterway to another—they can easily become established in new catchments and move large distances downstream or upstream.

SINGAPORE DAISY (PHOTO: CAMPBELL CLARKE)



PIG TRAP (PHOTO: MIKE KEATING)

Identify and learn about invasive pests

- Be alert for any new invasive species on your property or other areas you are familiar with.
- Learn to identify weeds, feral animals and diseases in your area (see more information on page 16).
- Educate yourself and your neighbours about preventing the spread of invasive pests, particularly if you live in or visit infested areas.
- Report any suspected invasive pests to Biosecurity Queensland (see page 16 for contact details).

Look after your property

- Control invasive pests on your own property where possible.
- Control the spread of crop and pasture species which can become invasive environmental weeds.
- Try to control weeds before they flower and seed.
- Talk to your neighbours about managing invasive pests together—a coordinated approach works best.
- Minimise disturbance to the natural environment.
- Grow native plants or non-invasive exotic varieties for your garden.
- Revegetate disturbed areas.



INSPECTING FOR YELLOW CRAZY ANTS (PHOTO: WET TROPICS IMAGES/ANNA ROGERS)

What researchers are doing

Researchers studying environmental invasive species focus on a broad range of ecological and management issues. These include:

- The biology and invasiveness of selected individual pest species, focusing on new incursions.
- The control of weeds, feral animals and diseases using chemical, biological and physical controls.
- The effects of climate change on the impacts and distributions of invasive pests.
- The impacts of invasive pests on different terrestrial and aquatic ecosystems.
- Pathways and mechanisms for the spread of invasive pests.
- The role of the community in weed introduction, dispersal, prevention and control.
- Detection and monitoring of invasive species using techniques such as aerial photography, satellite imagery, and environmental DNA in aquatic ecosystems and soils.



COFFEE ERADICATION TEAM (PHOTO: TABLELANDS NATIONAL PARK VOLUNTEERS)



BOOT CLEANING AFTER WEED ERADICATION (PHOTO: MATT BIRCH, CRC)

Invasive pests have been called by their common names in this brochure. Below is a list of their taxonomic names:

Weeds

African tulip (*Spathodea campanulata*), arrowhead vine (*Syngonium podophyllum*), aleman grass (*Echinochloa polystachya*), brillantaisia (*Brillantaisia lamium*), cabomba (*Cabomba caroliniana*), candyleaf (*Stevia ovata*), coffee (*Coffea arabica*), East Indian mahogany (*Chukrasia velutina*), fringed spider flower (*Cleome rutidosperma*), gamba grass (*Andropogon gayanus*), glush weed (*Hygrophila costata*), guava species (*Psidium guajava* & *P. cattleianum*), guinea grass (*Megathyrsus maximus*), harungana (*Harungana madagascariensis*), Koster's curse (*Clidemia hirta*), kudzu vine (*Pueraria montana* var. *lobata*), leucaena (*Leucaena leucocephala*), limnocharis (*Limnocharis flava*), miconia (*Miconia calvenscens*), miconia species (*M. calvenscens*, *M. racemosa* and *M. nervosa*), mikania vine (*Mikania micrantha*), olive hymenachne (*Hymenachne amplexicaulis*), para grass (*Urochloa mutica*), pond apple (*Annona glabra*), Siam weed (*Chromolaena odorata*), sourgrass (*Digitaria insularis*) spiked pepper (*Piper aduncum*), strawberry guava (*Psidium cattleianum*), thunbergia species (*Thunbergia grandiflora*, *T. alata* et al.), turbinia vine (*Turbinia corymbosa*) water lettuce (*Pistia stratiotes*), white teak (*Gmelina arborea*), yellow allamanda (*Allamanda cathartica*).

Animals (vertebrates)

Asian black-spined toad (*Duttaphrynus melanostictus*), Bengal cat (*Felis catus* × *Prionailurus bengalensis*), cane toad (*Rhinella marina*), cat (*Felis catus*), cattle (*Bos taurus*), chital deer (*Axis axis*), climbing perch (*Anabas testudineus*), coyote (*Canis latrans*), dog (*Canis lupus familiaris*), fox (*Vulpes vulpes*), goat (*Capra hircus*), Indian myna (*Acridotheres tristis*), Mozambique tilapia (*Oreochromis mossambicus*), pig (*Sus scrofa*), rabbit (*Oryctolagus cuniculus*), rat (*Rattus rattus*), rusa deer (*Cervus timorensis*), savannah cat (*Felis catus* × *Leptailurus serval*), spotted tilapia or spotted mangrove cichlid (*Tilapia mariae*), walking catfish (*Clarias batrachus*), wolf (*Canis lupus lupus*).

Animals (invertebrates)

Asian honey bee (*Apis cerana*), electric ant (*Wasmannia auropunctata*), erythrina gall wasp (*Quadrastichus erythrinae*), old-world screw-worm fly (*Chrysomya bezziana*), oriental fruit fly (*Bactrocera dorsalis*), palm leaf beetle (*Brontispa longissima*), spiralling whitefly (*Aleurodicus dispersus*), yellow crazy ant (*Anoplolepis gracilipes*).

Diseases

Chytrid fungus (*Batrachochytrium dendrobatidis*), myrtle rust (*Puccinia psidii*), phytophthora (*Phytophthora cinnamomi*), phythophtora species (*P. cinnamomi*, *P. heveae*, *P. katsurae*, *P. palmivora* et al.).



Who to contact if you suspect a new invasive pest

- Biosecurity Queensland: 13 25 23
Biosecurity Queensland are the experts in identifying suspected new invasive animals, plants and diseases.
- The Australian Department of Agriculture and Water Resources: 1800 900 090
You can contact DAWR about national biosecurity concerns and breaches.
- The Queensland National Parks and Wildlife Service: 13 QGOV (13 74 68)
QPWS is responsible for management of invasive pests on national parks.
- Local council pest management teams can help to identify invasive pests.
- Join Weed Spotters' Network Queensland: (07) 3896 9323

More information

- Queensland Department of Agriculture and Fisheries: www.daf.qld.gov.au/biosecurity
- Department of National Parks, Sport and Racing:
www.npsr.qld.gov.au/managing/pest-plants-animals
- Weeds of National Significance: www.weeds.org.au/WoNS
- Invasive Species Council: www.invasives.org.au
- Department of the Environment: www.environment.gov.au/biodiversity/invasive-species
- Australian Department of Agriculture and Water Resources: www.agriculture.gov.au/biosecurity
- Wet Tropics Management Authority: www.wettropics.gov.au/conserving
- Local government pest management plans detail local pests and declarations for particular plant and animal pests within their areas.

FRONT COVER PHOTOS: FERAL PIG (CHRIS ROACH, QPWS), GLUSH WEED (MATT BIRCH, CRC), KOSTER'S CURSE (DAF), MICONIA (DAF AND CHRIS ROACH, QPWS), MYRTLE RUST ON RHODAMNIA AUGUSTIFOLIA (DAF), SPOTTED TILAPIA (BRENDAN EBNER), YELLOW CRAZY ANT (JURGEN FREUND) BACK COVER PHOTOS: NAQS STAFF WITH SPIKED PEPPER (ANTHONY RICE, NAQS), TRAMP ANT AND ELECTRIC ANT STALLS (DAF), GLUSH WEED, FRINGED SPIDER FLOWER AND OLIVE HYMENACHNE (MATT BIRCH, CRC).

