



# invasive alien species

## A Challenge to NEPAD

AFRICANS WORKING TOGETHER TO PROTECT LIFE AND LIVELIHOODS



# Why should we feel threatened by Invasive Alien Species?

**Invasive Alien Species (IAS) are already costing Africa a fortune every year – and these losses will grow rapidly unless these invasions are actively prevented and controlled.**



WORKERS CLEARING INVASIVE ALIENS

## WHAT IS AN INVASIVE ALIEN SPECIES?

An Alien Species is a species that has been introduced into an area outside of where it naturally occurs, either intentionally or accidentally, by humans. Many of these alien species are some of our most useful species, for example most of our crop plants, plantation trees, domestic animals and garden plants. However, a small proportion of alien species begin spreading unaided in the new areas to which they have been introduced, invariably with detrimental effects, and these we refer to as Invasive Alien Species or IAS for short.

## WHY DO INVASIVE ALIEN SPECIES BECOME SERIOUS PROBLEMS?

The basic reason that IAS become such serious problems is that, when introduced to a new area, they thrive because they are no longer controlled by the predators and pathogens (diseases) with which they have co-evolved within their natural range. They are then easily able to out-compete the indigenous species in the areas to which they have been introduced. Another reason that they often have negative effects is that the indigenous species they meet in their introduced range have not evolved any defences against the alien species. For example, animal populations suddenly exposed to an alien disease have no immunity to it and can be virtually wiped out.

## WHAT EFFECTS DO INVASIVE ALIEN SPECIES HAVE?

This brochure outlines just a few of the impacts of invasive plants, animals and microbes. Their effect on human welfare is disastrous: it is estimated that economic losses due to IAS already amount to almost 5% of the world economy, or some US\$1.4 trillion a year. That's about three times the GNP of all African countries.

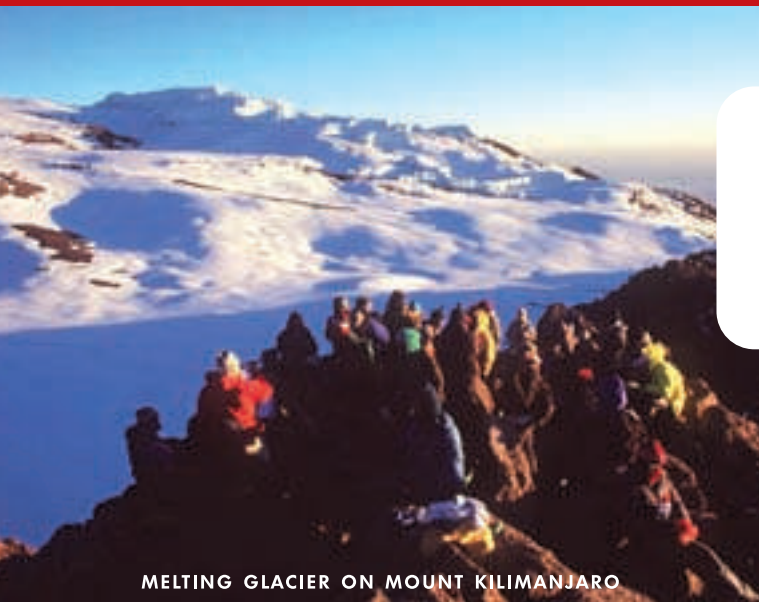
## WHY DOES THE INVASIVE ALIEN SPECIES PROBLEM GET WORSE EACH YEAR?

By their very nature, IAS continue to spread unless actively controlled – in South Africa, for example, it has been estimated that the area infested by invasive alien trees and shrubs, which already use up some 7% of the nation's precious water supplies, will double within fifteen years if left alone. Furthermore, globalization is leading to more alien species being moved around the planet than ever before.

## WILL CLIMATE CHANGE MAKE THE PROBLEM OF IAS WORSE?

Undoubtedly. IAS and climate change, together with habitat destruction, are set to form a lethal cocktail for the basic things on which we depend for survival – our so-called "life-support systems". Climate

change is set to radically alter natural systems, and IAS are far more likely to take advantage of the altered systems, such as through the melting of the glacier on Mount Kilimanjaro.



MELTING GLACIER ON MOUNT KILIMANJARO

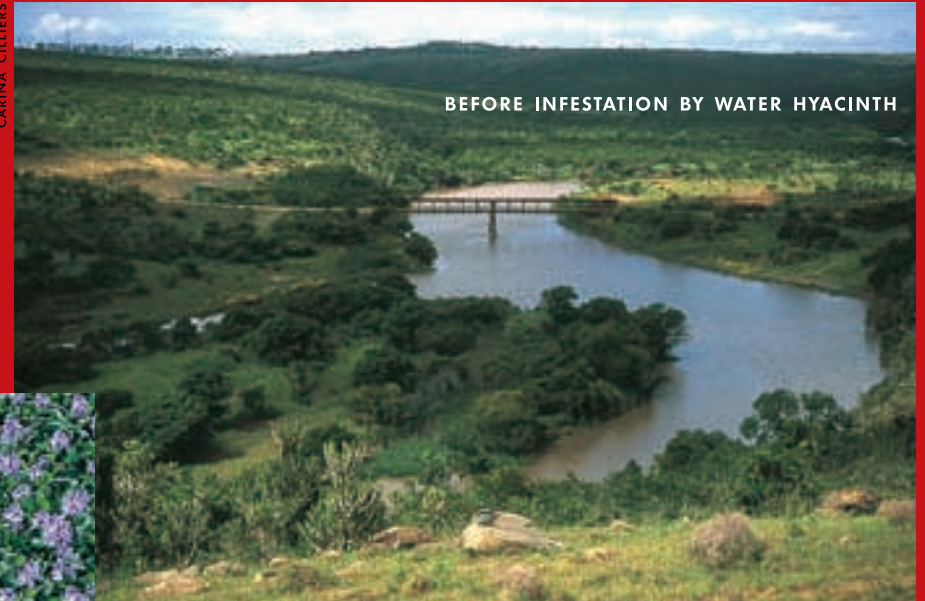
# Invasive Alien Species are a Global problem...

An all-too-familiar scene of water hyacinth (*Eichhornia crassipes*), a floating aquatic plant from tropical South America, choking an African river. This species is now invading waterbodies in Africa from Egypt to South Africa and from Senegal to Kenya. Dense mats of this species double the rate of water loss relative to an open water surface, wasting the continent's precious fresh-water resources.

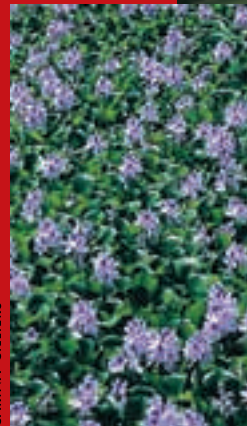
In addition, mats of this species become impenetrable, preventing fishing boats from leaving their harbours and clogging up irrigation canals and hydro-electric power plant intakes. Water hyacinth mats cut off sunlight penetration into our waterbodies, and the decomposition of organic matter from these mats depletes oxygen levels in the water, threatening entire aquatic ecosystems. The mats also provide fertile breeding sites for malarial mosquitoes and snails which spread bilharzia, thus impacting on human health.

At last, after hundreds of millions of dollars of investment against this super-weed, Africa is beginning to fight back.

CARINA CILLIERS



BEFORE INFESTATION BY WATER HYACINTH



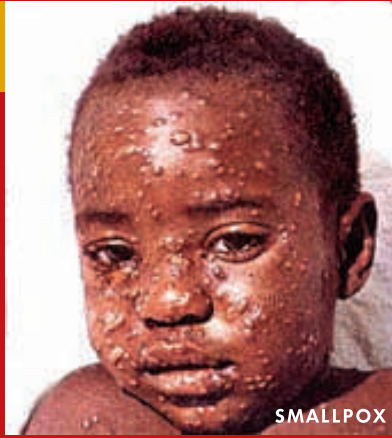
CARINA CILLIERS



AFTER INFESTATION BY WATER HYACINTH

CARINA CILLIERS

**...and only international co-operation will solve them.**



SMALLPOX

# Invasive Alien Species are a major (and rapidly increasing) human health problem

## INTRODUCED HUMAN DISEASES

Introduced human diseases such as smallpox have ravaged human populations throughout history, when they were first introduced to areas where they had previously been absent. This was one of the dominant trends in human health during the period of European colonialism. The trend continues today with “modern” diseases such as SARS, HIV/AIDS, and avian bird flu posing huge direct threats to humans, as well as indirect threats through increasing vulnerability to other opportunistic diseases.

## ASIAN TIGER MOSQUITO



MOSQUITOES BREED IN WATER PUDDLES IN USED CAR TYRES

## ASIAN TIGER MOSQUITO

The Asian tiger mosquito (*Aedes albopictus*) is indigenous to the Indo-Pacific region where it is a major vector for a range of human diseases. In recent decades it has been spread throughout the world, including to North and South America and Africa. The global trade in used car tyres is a pathway for this recent spread – the mosquito

being able to live and breed in the puddles of water that form in these tyres. Introduced mosquitoes are now spreading deadly diseases such as yellow fever, malaria and dengue fever to areas that never before had them, thus increasing human suffering on a global scale.



BLACK RAT

## BLACK RAT

The black rat (*Rattus rattus*), which originates in South-east Asia, has been spread by humans throughout the world, so that today it is probably the most widespread mammal species on the planet. Not only do rats now eat about a third of Africa's total grain crop each year, but they are also having serious impacts on human health. The bubonic plague

that caused some of the most disastrous epidemics in human history, such as the “Black Death” that swept from Asia through Europe several times during the 1300s, killing between 20% and 50% of the human populations, is spread by fleas from these invasive rats.

# Invasive Alien Species degrade our forests and rangelands

## TRIFFID WEED

The triffid weed (*Chromolaena odorata*), a scrambling shrub from tropical South America, is now invading moist areas in west, central and southern Africa as well as most of tropical Asia. It is one of the world's worst weeds, with major impacts

on food security and wild fires. Many invasive alien plants change the frequency or intensity of an area's fire cycle. This devastates native communities and often causes huge economic losses. Invariably it is the poor who suffer the most.

## MESQUITE

Mesquite (*Prosopis*) species have been widely introduced into the more arid areas of Africa for fuelwood and as shade and fodder trees. Unfortunately, they have proven to be highly invasive from South Africa to the Sudan and have rapidly spread to form dense, often impenetrable, thickets. They deplete scarce groundwater resources, out-compete native fodder plants and are even thought to poison

livestock when these are forced to feed on nothing else. In northern Kenya the situation has got so bad that a local community even tried to sue the United Nations Food and Agriculture Organization (FAO) for its part in promoting the introduction of *Prosopis* into their rangelands. Worse still, climate change looks set to aggravate severely the impacts of *Prosopis* species.

## NASSELLA TUSSOCK

Grasses pose some of the biggest challenges among invasive alien species. Unpalatable grasses such as Nassella tussock (*Stipa trichotoma*) can threaten livestock and game, while others have impacts on fire regimes, water security, biological diversity and human allergies. And they are extremely difficult to control.

IAN & SUSAN MACDONALD



FIRE IN TRIFFID WEED BURNING INTO PLANTATION

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MESQUITE

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NASSELLA TUSSOCK



TRIFFID WEED

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FOOT AND MOUTH DISEASE OUTBREAK IN THE UK

TIM CUFF - APEX

# Invasive Alien Species reduce food security

## INTRODUCED LIVESTOCK DISEASES

The threat posed to food security by IAS is nowhere better illustrated than in the examples posed by introduced livestock diseases. The recent outbreak of Foot and Mouth Disease in the United Kingdom caused tens of thousands of livestock to be slaughtered and incinerated. This outbreak effectively shut down the British livestock industry, costing the British economy billions of US dollars (not least through reductions in international

tourism which fell off markedly in the period following this tragic and highly publicised disease outbreak). In Africa we have a host of introduced livestock diseases, such as rinderpest, bovine brucellosis and bovine tuberculosis, that cost the continent millions of dollars each year in terms of lost production and expenditure on control programmes. And, as always, it is the poor who are most vulnerable.

## VARROA MITES

Varroa mites (*Varroa jacobsoni* and *V. destructor*) were probably brought into South Africa from Asia by the inadvertent introduction of some of these tiny mites with illegally smuggled queen bees. These introduced mites not only threaten honey production but so reduce the efficiency of the bees in infested hives that this impedes pollination. Aside from the impact on agriculture, this will also threaten indigenous plant species. This is just a single example of how the illegal movement of organisms around the world can result in massive IAS problems.

## JOINTED CACTUS

The jointed cactus (*Opuntia aurantiaca*), here shown with several of its spiny stem sections stuck to a person's leg, is one of many cactus plants from South and Central America that have invaded African rangelands. Many of them have gone on to invade tens of thousands of square kilometres. It is only through the introduction of biological control agents that we have prevented the destruction of Africa's savanna and semi-arid rangelands by these invaders.

VARROA MITES  
ATTACKING HONEYBEES

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JOINTED CACTUS

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# Invasive Alien Species harm every type of environment

## LANTANA

Lantana (*Lantana camara*) is invading the savannas and forest edges of virtually every Sub-Saharan African country. It is widespread throughout the warmer parts of the world and is considered one of the world's worst weeds. The "species" is not in fact an indigenous species anywhere in the world: instead it is a complex of human-made hybrids – created by horticulturists in a number of different European countries in the 18th and 19th centuries from plants collected in the West Indies and South America and then introduced from Europe to "their colonies" in Africa and elsewhere in the developing world in the 19th century. It now smothers millions of square kilometres of African rangelands, degrading pastures and poisoning livestock.

## COMMON CARP

The common carp (*Cyprinus carpio*) has invaded waterbodies throughout Africa, and more particularly in the more temperate regions. The carp is having a severe impact on many aquatic plants and animals indigenous to Africa as it

muddies the water in which it feeds, changing the ecology of these waterbodies, and is a major vector for introduced fish parasites. Although it is a useful source of protein, its costs almost certainly outweigh its benefits.

## EUROPEAN GREEN CRAB

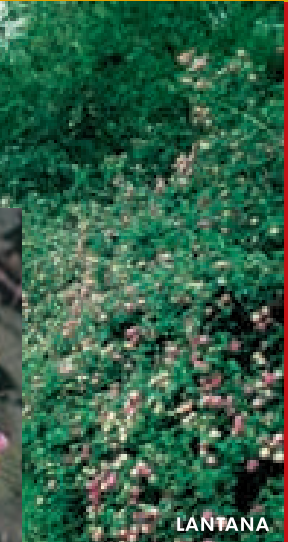
One of the major routes for marine organisms to be moved around the planet by humans is in ships' ballast water. This is pumped into a ship's ballast tanks when they are empty and then often travels vast distances to another port where it is discharged into the harbour so that the ship can take on additional cargo. The many marine organisms that are able to survive in the ships' tanks often go on to establish invasive populations in the areas where they are discharged.

The European green crab (*Carcinus maenas*) is one such species that is increasingly posing a serious threat to life in Africa's coastal waters, as it preys on indigenous animals.

Nowhere on Earth is safe from invasions – they affect our seas, lakes, rivers, forests, woodlands, grasslands, semi-arid lands and even our deserts.



IAN & SUSAN MACDONALD



LANTANA

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COMMON CARP

DEAN IMPSON



EUROPEAN GREEN CRAB

T. HUSPENI

BROWN TREE SNAKE



U.S. GEOLOGICAL SURVEY; TOM FRITTS/GORDON RODDA

MATTHEW YODER - DEPT. OF ENTOMOLOGY, TEXAS A&amp;M UNIVERSITY

## Many Invasive Alien Species are associated with trade and aid

### BROWN TREE SNAKE

The brown tree snake (*Boiga irregularis*) is native to Papua New Guinea and was introduced to the Pacific island of Guam in about 1950, possibly in some military equipment brought to the island. Since its arrival it has wreaked havoc on this island, being responsible for the extinction of 12 of the island's 14 land birds amongst other effects. It has built up to such huge numbers on this island (reaching densities in excess of 5000 snakes per square kilometre) that it now bites significant numbers

of people every year and, by climbing into electricity transmission boxes, causes power failures on the island every 4 to 5 days on average. It has been found stowing away in containers and even climbs into the undercarriage of airplanes and has been found alive in the wheel wells of such airplanes on their arrival in Hawaii. An enormous international effort is being mounted to try to stop this extremely dangerous IAS from reaching other susceptible areas, including Africa.

### SOUTH AMERICAN FIRE ANT

Ants are some of the easiest animals to introduce by accident into an area, and once established they are some of the most difficult invasive animals to get rid of. The South American fire ant (*Solenopsis invicta*) became established in the southern USA in about 1940, following its introduction in dry ships' ballast to the port of Mobile, Alabama. Despite an intensive chemical control programme, which cost over US\$200 million over the following 30 years, this species is still spreading northwards and westwards in the USA. The species has a sting capable of killing people, and has become a public health problem as well as posing a serious threat to tourism, agriculture and biological diversity.

### LARGER GRAIN BORER

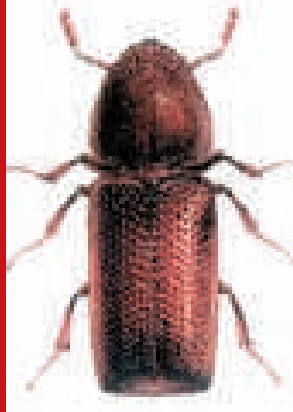
This little beetle from Central and South America destroys huge quantities of stored maize and dried cassava, two of Africa's main staple foods. Known as the larger grain borer (*Prostephanus truncates*), this serious agricultural pest was apparently first introduced to eastern Africa in an aid shipment of maize in the late 1970s. Within 20 years this extremely damaging IAS had spread throughout

the continent and now destroys up to 70% of stored dried cassava and a wide range of other stored crops, including cereals, pulses, cocoa and coffee beans. This example illustrates the crucial importance of maintaining high levels of technical competence in the fields of IAS prevention and management if this problem is to be contained.



SOUTH AMERICAN FIRE ANT

LARGER GRAIN BORER



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FIRE ANT STINGS





# Invasive Alien Species affect the way the ecosystems they invade function

## CAULERPA SEAWEED

The Caulerpa seaweed (*Caulerpa taxifolia*) dominates the sea-beds it invades, forming dense stands which exclude indigenous sea life. This species, which is widespread in tropical seas off west and east Africa, suddenly began invading the northern Mediterranean in about 1984. Currently it covers huge areas in this vicinity and has

been recorded also in the seas off North Africa, Australia and North America. The species completely alters the functioning of the marine ecosystems it invades causing massive reductions in the diversity and abundance of other indigenous sea life including fishes. Its impact on the fishing industry is likely to be catastrophic.



CAULERPA SEAWEED

WESTERN CAPE NATURE CONSERVATION BOARD

JEAN-MICHEL COTTALORDA

## LARGE-MOUTH BASS

The large-mouth bass (*Micropterus salmoides*) has been introduced throughout the world from its North American home range by anglers who favour it for sport fishing. Unfortunately, it is a voracious predator and has had very damaging effects on native fish species and other aquatic animals.



LARGE-MOUTH BASS

## INDIAN HOUSE CROW

Hitch-hiking its way around Africa on passing ships, the Indian house crow (*Corvus splendens*) has now established colonies in coastal towns from Egypt to Cape Town. It forms huge flocks that roost and breed in tall trees inside urban areas. It out-competes

local birds, preys on them and other indigenous animals, plundering crops and orchards and threatening human health by spreading disease organisms and polluting water sources.



COLIN RYALL

## CLEARING ALIEN VEGETATION



# We can contain Invasive Alien Species,

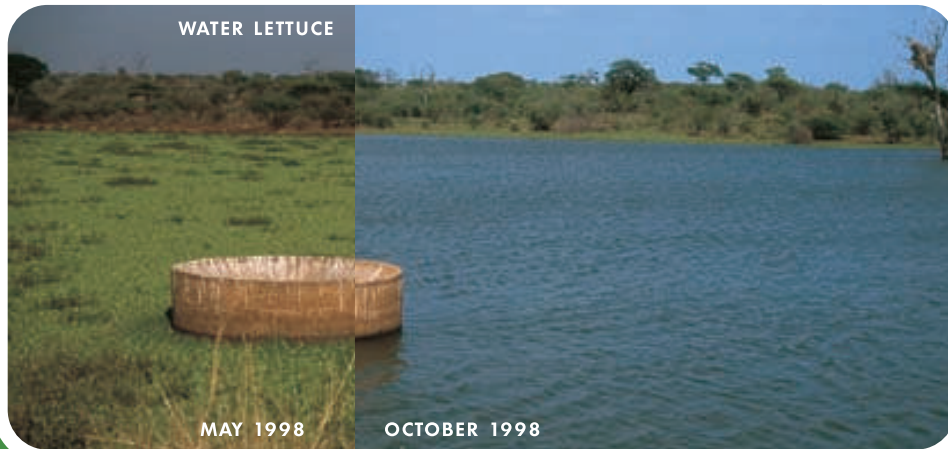
## WORKING FOR WATER

South Africa's Working for Water programme provides employment and training to over 20 000 previously unemployed women and men, in a labour-intensive clearing of invasive alien plants. These plants have a severe impact on water security, biological diversity, the

productive use of land, the intensity of fires, erosion and much more. Left alone, the impacts of the invasions will intensify, with devastating consequences from economic, ecological, social and political perspectives.



SALVINIA MOLESTA



WATER LETTUCE

MAY 1998

OCTOBER 1998

## SALVINIA MOLESTA

The floating alien fern (*Salvinia molesta*) from South America forms dense mats in Mauritania. In order to control water fern, carefully screened insect predators from its native range were introduced, in this case a weevil (*Cyrtobagous salviniae*). Within a few months these had bred up and their feeding activities had resulted in the mats being destroyed. This is a classic example of successful biological control, a procedure which has been successfully employed to control invasive alien species throughout Africa and the rest of the world.

A second example is that of the water lettuce (*Pistia stratiotes*), shown before and after biological control in the insert on the left.



CAPACITY BUILDING

## CAPACITY BUILDING IN IAS MANAGEMENT

Building the necessary capacity, both institutional and human resource capacity, is crucial if alien invasions are to be effectively prevented or managed. The Global Invasive Species Programme (GISP) and the Global Environment Facility (GEF), through the United Nations Environment Programme (UNEP), are working together to help build this capacity globally. The NEPAD programme on Invasive Alien Species will have a strong focus on capacity building throughout Africa.

# and the returns on investment are high...

The solutions to the problems posed by IAS are relatively straight-forward:

- Prevent new invasions.
- Quickly detect new invasions.
- Identify existing invasions.
- Prioritize these for management.
- Apply systematic management.
- Monitor and adapt management.
- Educate people about the problem.
- Hold people accountable for the problem.

## BIO-SECURITY

In order to prevent new alien species from invading a country, it is essential that there be effective screening of incoming goods and baggage at all international airports, harbours and borders. Here

trained sniffer dogs check incoming luggage for alien organisms in New Zealand, which probably has the most advanced bio-security system in the world. NEPAD's new programme on preventing alien invasions focuses on airports as entry points.

## EDUCATION

Educating the general population about the significance of invasive alien species is an essential step in any successful national programme. Here school children "learn through doing" by becoming actively involved in a programme to rid their school ground of invasive alien plants.

## POM POM WEED

The pom pom weed (*Campuloclinium macrocephalum*) illustrates how essential it is to act rapidly if invasive alien species are to be effectively controlled. When first detected invading limited areas within South Africa in the 1980s, no action was taken against the species, and within 20 years it had spread so extensively that eradication was no longer an option. This weed (which overruns grasslands, with severe

consequences for livestock farming and conservation) will now have to be biologically controlled if there is to be any chance of bringing its population down to a reasonable size. This is in stark contrast to the successful pre-emptive control programme that was waged recently against the SARS epidemic. In all cases, a pre-emptive approach to the management of invasive alien species yields huge dividends.

...but it requires every nation to act NOW!



SNIFFER DOG



EDUCATION



POM POM WEED

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# No African nation need fight the problem of alien invasions alone

## THE NEW PROGRAMME FOR AFRICA'S DEVELOPMENT (NEPAD)

NEPAD is a collaborative effort by African countries to drive optimal development across the continent. The NEPAD programme on Invasive Alien Species has three initial focal areas:

- Helping African nations to prevent new invasions by improving their screening and surveillance procedures at airports.
- Launching a continent-wide pilot campaign to control alien aquatic weeds.
- Launching a pilot programme to assist African nations to combat invasive alien plants that threaten productive land - agriculture, grazing lands and forests.

[Greater detail can be found in the publication, *"Development of an Action Plan for the Environmental Initiative of NEPAD – Programme Area 3: Prevention, Control and Management of Invasive Alien Species"*, produced by the United Nations Environment Programme, and from specific pamphlets on the focal areas.]

A growing number of useful publications on invasive alien species by the Global Invasive Species Programme and other organizations is available.



## WHO TO CONTACT FOR HELP WITH INFORMATION ON INVASIVE ALIEN SPECIES

South Africa is the focal point for the NEPAD programme on invasive alien species, leading a multi-country task team working in conjunction with the United Nations Environment Programme, and supported by the Global Invasive Species Programme (GISP) and its partners.

Please contact Ms Rejoice Mabudafhasi, Deputy Minister of Environmental Affairs and Tourism, care of Dr Guy Preston at [gpreston@mweb.co.za](mailto:gpreston@mweb.co.za) or

TELEPHONE: +27 21 441 2700 · FAX: +27 21 425 7880  
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NATIONAL BOTANICAL INSTITUTE



IUCN  
The World Conservation Union

[ Invasive Species ]  
Specialist Group



The Nature Conservancy  
SAVING THE LAST GREAT PLACES ON EARTH