

Invasive Species

of St. Eustatius



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Introduction

“Invasive species” — it doesn’t sound very threatening, does it? But these invaders, large and small, have devastating effects on our islands’ environment.

They can change an entire habitat, placing our ecosystems at risk. They can crowd out or replace native species that are beneficial to a habitat. Many of our commercial, agricultural, and recreational activities are also at risk from invasive species. The impact of these ‘invasives’ damages human enterprise, such as fisheries and leaves a great toll on our local economy.

The purpose of this booklet is to explain what invasive species are, where they come from, how they spread and how we can prevent these to access the island of St. Eustatius. We will familiarize you with the invasive species that are currently on St. Eustatius and inform you about the threats they pose.



Hannah Madden

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Hannah Madden first visited St. Eustatius (Statia) in 2005, when she immediately fell in love with the island. Since moving there in 2006, Hannah has worked for nature conservation foundation, STENAPA (St. Eustatius National Parks), first as a National Park Ranger and now

Terrestrial Areas Manager. Her job has enabled her to become familiar with Statia's flora and fauna at close range, and she was inspired to create her own website that showcases the island's natural history. *"I am not a professional photographer, however I enjoy documenting the species of the island"*, she says. Hannah has a BSc in Environmental Studies and is at the time of writing undertaking an MSc in Biodiversity Conservation and Sustainable Development in the Caribbean with the University of the West Indies.



1

Native, endemic, alien and invasive species

The terms “native” and “invasive” can be confusing. Native species are those that exist naturally in a particular environment. “Invasive” species are plants and animals that easily exploit new environments. These species were brought to the island by ships, people, birds, wind and ocean currents or other means, moving rapidly into a new environment and vigorously competing with other plants or animals. Being away from the main predators in their country of origin, there are no species around that would naturally keep them under control.

Native or non-native species can be grouped into four categories: non-native and invasive; native and invasive; native and non-invasive; and non-native and non-invasive. The latter three are of little concern. After all, native species are part of the natural environment and mechanisms exist to keep native invasives in check in the long term. Non-native invasive species, also known as invasive exotic species or invasive alien species, however, present a problem. There are no feedback

Two examples of St. Eustatius’ native and endemic plants: *Statia Morning Glory* (top) and *Gonolobus aloiensis* (bottom). These plant only grow on St. Eustatius and nowhere else in the world. Protection of these unique species is crucial.

mechanisms to keep these plants and animals in check. As a result, they aggressively invade and degrade our native ecosystems, often resulting in long-term damage to wildlife and its habitat, soil, water quality, and sometimes even infrastructure.

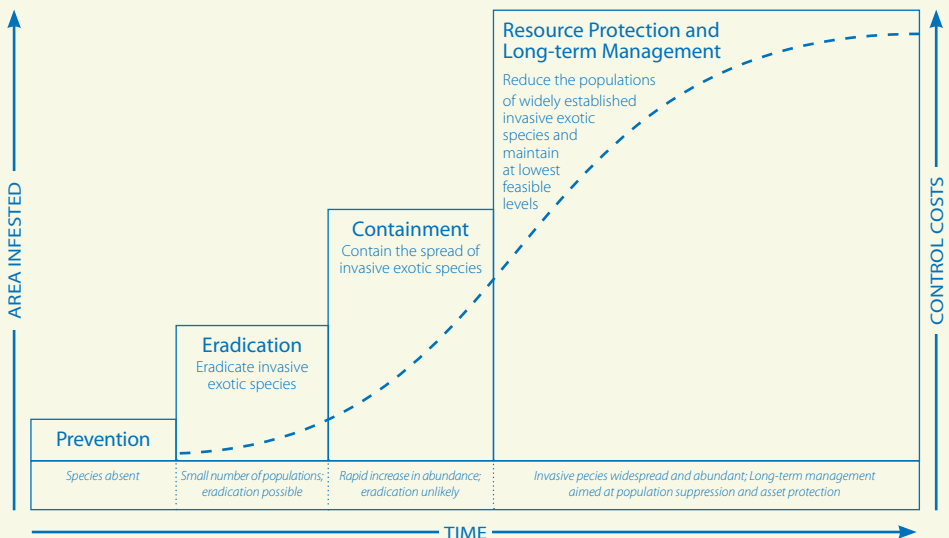
One example of an invasive species on St. Eustatius can be seen below. Mexican Creeper (*Antigonon leptopus*), known locally as Corallita, is an aggressive invader of disturbed habitats that was brought here by humans. This vine covers native vegetation, preventing further growth and causes the ecological communities to lose the diversity that once existed. Areas covered in Corallita have been changed for the worse by this non-native, invasive species.



Plants and animals that have always existed on St. Eustatius and its geographic region include bromeliads (for example *Bromelia pinguin*) and the Lesser Antillean Iguana (*Iguana delicatissima*).

Some plants and animals are endemic. This means that they can only be found on a specific island or region (such as the Caribbean) and nowhere else in the world. Statia Morning Glory (*Ipomoea spheophylla*) is an example of one of St. Eustatius' endemic plants. Alien invasive species are considered to be main direct drivers of biodiversity loss on our island, hence the need to try to prevent them from entering at all.

The invasion curve and strategic goals



2

How do invasive species
get into St. Eustatius?



Invasive species are primarily spread by human activities, often unintentionally. People, and the goods we use, travel around the world very quickly, and they often carry uninvited species with them.

Invasive species can enter an island by being hidden in airplane cargo as seeds, eggs or even juveniles. Ships can also carry aquatic organisms in their ballast water. Insects can get into wood, shipping palettes and crates that are shipped around the world.

Some species are brought in by residents as ornamental plants for their homes, gardens, or even to enhance their food supply. The seeds of these plants can escape into the wild and become invasive. Other invasive species are intentionally or accidentally released pets, such as monkeys.

Invasive species can also come to islands naturally, for example on ocean currents or winds after a hurricane, or even in the faeces of migratory birds. An example of this is the Green Iguana (*Iguana iguana*), which believed to have drifted to some Caribbean islands on logs following the passage of hurricanes Luis and Marilyn in 1995. However this species was also brought to other islands in the Lesser Antilles in the 17th Century as a food source.

All these species were brought to the island, either by airplanes, ships, people, birds, wind or ocean currents, moving rapidly into a new environment where they have no natural predators or competitors to keep them under control.

Invasive species can enter St. Eustatius via human transportation as well as natural occurrences.

3

Why do invasive species pose such a threat?

Invasive species cause harm to wildlife in many ways. When a new and aggressive species is introduced into an ecosystem, it might not have any natural predators or controls. It can breed and spread quickly, taking over an area. Native wildlife may not have evolved defenses against the invader or they cannot compete with a species that has no predators.

The direct threats of invasive species:

- preying on native species
- out-competing native species for food or other resources
- causing or carrying disease
- preventing native species from reproducing or killing their young

The indirect threats of invasive species:

- **Changing food webs:** Invasive species can change the food web in an ecosystem by destroying or replacing native food sources. The invasive species may provide little to no food value for wildlife.
- **Decreasing biodiversity:** Invasive species can alter the abundance or diversity of species that are an important habitat for native wildlife. Aggressive plant species like kudzu in the United States, can quickly replace a diverse ecosystem with a monoculture of just kudzu.



The giant African land snail (*Achatina fulica*) is native to East Africa, but it has been widely introduced to other parts of the world through the pet trade, as a food resource, and by accidental introduction. It is thought that the giant African land snail arrived to St. Eustatius via cargo shipments.

- Altering ecosystem conditions: Some invasive species are capable of changing the conditions in an ecosystem, such as changing soil chemistry or the intensity of wildfires.
- loss of species: hybridization can be a serious threat to endangered species. This phenomenon occurs when closely related species interbreed, resulting in sterile individuals (unable to reproduce). Over time this will lead to extirpation of the particular species in its original habitat.

4

Pests, threatened and endangered species

Pests

Unwanted plants and animals that repeatedly cause serious damage to property, crops and livelihoods, to the point where people become frustrated with their presence, are referred to as pests (Figure 3).

Threatened and Endangered Species

Threatened plants and animals are species that are most likely to become endangered, especially if the conditions in which they exist continue to decrease. In the Caribbean, some species of sea turtle, iguana and cactus plants are threatened.

Plants and animals become endangered when only a few individuals remain in the wild, or when there is a risk of all individuals dying off in one particular area. This is generally due to habitat loss, disease, or other related factors. Nonetheless, invasive species are regarded as a leading factor affecting plants and animals and play a big role in causing them to become endangered.

Note:

While iguanas might be considered a pest by some farmers, it should be noted that they are a native species threatened with extinction. Some ways of preventing iguanas from eating crops include fencing off the area or asking STENAPA to safely relocate iguanas.



5

Invasive species on St. Eustatius and their impact

Brown Rats

The brown rat (*Rattus norvegicus*) originates from northern China and Mongolia. It has spread to all continents except the Polar Regions. The brown rat is now the dominant rat in Europe, North America and the Caribbean region.

These small grey, sometimes brown, rodents now live nearly anywhere humans inhabit. They mainly live underground in burrows or under old containers, vehicles and debris around peoples' homes. At just 11 weeks, females can produce an average of eight young, usually in underground nests.

Although they mainly have poor eyesight, they primarily feed at night. Their diet normally consists of young chicks, mice, birds, lizards, eggs, fruits and vegetation. They have also been documented stealing eggs from Red-billed Tropicbirds (*Phaethon aethereus*), a pelagic seabird that lays just one egg per year and nests on St. Eustatius. Therefore the control of rats is extremely important to ensure the future success of this native seabird.



Infra-red camera equipment installed by the St. Eustatius National Parks foundation shows images of rats entering Red-billed Tropicbird nests to eat their eggs.

Brown rats are a serious pest that pose a threat to human health. Rats are hosts of many dangerous diseases, including salmonella, and they have the ability to cause severe damage to crops and property. Their saliva is known to carry bacterium which, if bitten, can cause rat fever. Brown rats can also cause severe damage to utility and communication companies, mainly by chewing on cables. Proper housekeeping and disposal methods eliminate the number of rats that can survive in and around homes and residential areas.

Residents are encouraged to prevent any access to food by rats. Brown rats can also be controlled by the use of rodenticides (poison), or traps. Contact the St. Eustatius Health Department to learn more about this pest.



Corallita

Corallita (*Antigonon leptopus*) is a vine that was brought to the island as an ornamental but has spread uncontrollably across parts of the island since the 1970s. Native vegetation is overgrown with this species, and fences around private houses can be torn down by the weight of the vine, allowing roaming animals to enter and destroy vegetation within yards. Large trees are killed by the vine which overgrows and chokes them. A very common sight on St. Eustatius is the coverage of vegetation in the southern parts of the Cultuurvlakte, extending east of the Quill and elsewhere by Corallita. In some places, this plant entirely smothers vegetation, resulting in die-off of the undergrowth.

Corallita grows fast over tree crowns, blocking the sunlight from reaching the leaf surface and hampering the growth of the plants themselves as well as the understory plants. Many beautiful and often valuable wild fruit trees are overgrown and no longer bear fruit. Although various countries have put the species on their list of pests, no proper control methods have been found so far. There are no initiatives for control management of Corallita in the Caribbean.



Lionfish

Lionfish (*Pterois volitans*) are native to the Indo-Pacific region. Lionfish have red and white stripes and reach between 11-15 inches, and they have sharp fins which are capable of delivering venom from specialized glands. These animals mainly live around coral and patch reefs.

Lionfish are considered a serious threat. Known to be voracious predators, they feed on many local fish species which graze on coral reefs to control algal growth. The venomous spines are dangerous to humans and can result in serious bodily reactions to the stings. Due to their ability to deposit large numbers of eggs this species forms a serious threat over time.

An increase in lionfish is likely to cause a decline in the popularity of Statia's coral reefs among locals and tourists. Lionfish were introduced to the Atlantic Ocean in 1992 after a hurricane damaged a marine aquarium in Florida. Since then, they have spread throughout the Caribbean. In 2010, St. Eustatius reported its first case of lionfish. Fishermen, divers and other beach users are encouraged to report the location of any sightings of this dangerous predator to the National Parks Office (tel: 318 2884).



Sea grass

Halophila stipulacea is listed as one of the 100 worst invasives in the Mediterranean. The spread of this sea grass species, which is indigenous to the Red Sea and parts of the Indian Ocean, has been extensive, spanning from the Suez Canal in the Mediterranean Sea in 1869 to the Eastern Caribbean by 2002. *H. stipulacea* forms monocultures as well as multispecies assemblages throughout its native and extended range and can be found exposed at low tides down to depths of 50m, making it one of the deeper living sea grass species. It is a successful invader thanks to its tolerance to low and high light intensity, wide salinity range, adaptability to sediment quality, and rapid vegetative expansion.

H. stipulacea is said to impact biodiversity and give rise to socio-economic losses, however little is known of its effects in the Caribbean. *H. stipulacea* was first documented in the Caribbean in Grenada in 2002, then in Dominica and St. Lucia in 2007. In these locations it grows predominantly as mono-specific stands, though occasionally mixing with native sea grass *Syringodium filiforme* at the bed margins.



Yellow Brittle Star

The yellow brittle star, *Ophiothela mirabilis*, was previously restricted to Pacific waters, but growing populations have established themselves at distant points in the Atlantic. Its presence near Brazilian and Caribbean ports indicates that *O. mirabilis* could have been spread by shipping.

This colorful marine animal clings in multitudes to corals and sponges and reproduces asexually, by splitting in two and regenerating severed body structures. The ability of one star to “clone” vast numbers of identical twins enormously increases the species’ capacity to proliferate and disperse.

The impact of the yellow brittle star remains to be seen. However, further expansion of the range of *Ophiothela* could alter the appearance and the ecology of Atlantic coral reef habitats because this species, in multitudes, densely colonizes gorgonians and sponges on Indo-West central Pacific and on tropical eastern Pacific reefs.

The Giant African Land Snail

The giant African land snail (*Achatina fulica*) is native to the humid region of Eastern Africa. It has now spread throughout many tropical regions in the Pacific, Asia and the Caribbean. These soft-bodied molluscs are embedded in a dark brown to light brown shell. They prefer moist and cool areas like thick grass, rock crevices and under shady trees. These snails are hermaphrodites and are well known for their very high reproductive rate. They can lay around 300-400 eggs after a single mating.

These snails normally feed on decayed vegetation, animal matter and various types of vegetables and legumes. Since their introduction to St. Eustatius in 2012, they have been kept under control within a limited area, however they can cause significant damage to crops and plants and are considered to be a potential nuisance and financial burden to residents and farmers in particular.

The aggregation of these snails is very unsightly as they discard a slimy residue and faeces on buildings. They can also act as a vector for certain human diseases caused by parasites.

These gregarious characteristics have earned the giant African land snail its spot on the top 100 world's worst invasive species list, and it is therefore extremely difficult to eradicate them. Residents are encouraged to keep their properties clean and should consistently try to collect and destroy any snails or eggs around their property. Also mollusc (*molluscicide*) bait should be used to help control these pests.





Tan Tan

Tan Tan (*Leucaena leucocephala*), as it is locally called, is a plant native to Mexico and Central America, but it is known to be quite adaptive to coastal, natural or disturbed habitats. Tan Tan can grow to heights of 3-15 meters and its branches are affixed with pods that occur in crowded clusters of 5-20 per flower head.

This plant is also associated with rapid replication as its seeds are quite easily dispersed and germinated under varied wet and dry conditions. It spreads quickly and has the ability to form thick, dense vegetation that can become almost impassable. This prolific growth also threatens the survival of native and endemic plants. For this reason, Tan Tan is in the top 100 of the world's worst invasive exotic species list.

On St. Eustatius, Tan Tan has taken over acres of natural and disturbed landscapes. This rapid reproductive characteristic has caused it to be a burden to farmers as it often overtakes their plots. Residents are encouraged to manage the growth of Tan Tan on their property and are also warned not to indiscriminately clear their land as it can easily become invaded with Tan Tan.



Goats and cows

Goats (*Capra hircus*) and cows (*Bos pp.*) were introduced by humans to many Caribbean islands more than 400 years ago as a source of food. However, many native species of oceanic islands have evolved in the absence of large herbivores. The introduction of goats to islands worldwide has resulted in widespread primary and secondary impacts via overgrazing by free-ranging herbivores, often leading to ecosystem degradation via soil erosion and biodiversity loss. In the absence of population control, goats have become a dominant species on many islands. This results in numerous plant species becoming threatened or altered by excessive grazing.

Eliminating free-ranging cattle can lead to the rapid recovery of suppressed vegetation. On the Galapagos Islands, native vegetation recovered swiftly despite being heavily impacted by goats over many decades. Seedbanks or small populations inaccessible to goats appear capable of preventing insular plant extinctions; these species often recover demographically once goats are eradicated or controlled. The problems associated with excessive numbers of feral goats have rarely been studied or formally recognized and the issue of free-roaming animals remains politically sensitive.



Cats

Many cat owners believe their pets are harmless, however this couldn't be further from the truth. Feral and free-ranging cats are generalist predators that have contributed to multiple wildlife extinctions on islands. In the USA, the estimated 80 million feral cats and 40 million free-ranging pet cats kill hundreds of millions of birds each year. On islands, cat prey on a variety of native species, many of which lack evolved defenses against mammalian predators and can suffer severe population declines or even extinction. Given that islands are home to a disproportionate share of terrestrial biodiversity, the impacts of cats on islands can have significant biodiversity impacts.

On Saba, feral cats were documented entering and removing chicks from two tropicbird nesting sites. This resulted in 0% fledging success at both sites. Even well-fed pet cats are known to kill birds and other animals; the hunting instinct of cats is independent of the urge to eat. Cats on St. Eustatius are known to eat juvenile iguanas and other native reptile species. Therefore it is recommended that pet owners keep their cats indoors.



Dogs

Dogs are another species that were brought to islands by humans, but relatively little is known about their influence on native island fauna and flora. Nevertheless, studies suggest that dogs have an impact on native animals and ecosystems, especially breeding birds.

Free-roaming dogs pose problems to wildlife, public health, and animal welfare on islands. In the Galapagos Islands, introduced species are believed to be the greatest threat to the unique biodiversity via predation, competition, infectious diseases, and habitat destruction. Dogs prey on lizards, small tortoises, iguanas and birds. In addition to preying on wildlife, dogs spread diseases that can affect human health as well as the health of endemic wildlife. Finally, stray and free-roaming dogs (and cats) suffer a host of problems, including lack of adequate food; water, shelter and veterinary care for injuries and disease. Dog owners are therefore requested to control their animals in order to minimize impacts to wildlife.

Dengue mosquito

The dengue mosquito (*Aedes aegypti*) is a non-native species of mosquito that is native to Africa, but is now found in tropical and subtropical regions throughout the world. This mosquito can spread not only dengue fever but also chikungunya, yellow fever viruses and other diseases. It can be recognized by the white markings on its legs.

Aedes aegypti mosquitoes most commonly bite at dusk and dawn, indoors, in shady areas, or when the weather is cloudy. They can bite and spread infection all year long and at any time of day. These mosquitoes prefer to breed in areas of stagnant water such as flower vases, uncovered barrels, buckets, and discarded tires, but the most dangerous areas are wet shower floors and toilet tanks, as they allow them to breed within your residence. Wear long-sleeved clothing and long trousers when outdoors during the day and evening, and spray mosquito repellent on clothing.

Mosquito control is currently the best method for disease prevention. This includes source reduction, pesticide spraying or “fogging”, or the use of mosquito traps. Although the lifespan of an adult *A. aegypti* is two to four weeks depending on conditions, the eggs can be viable for over a year in a dry state, which allows the mosquito to re-emerge after a cold winter or dry spell.

Dengue fever is a tropical disease caused by the dengue virus. Symptoms include fever, headache, muscle and joint pains, and a characteristic skin rash that is similar to measles. Dengue is principally transmitted by *A. aegypti* mosquitoes. As there is no commercially available vaccine, prevention is sought by reducing the habitat and the number of mosquitoes.

Dengue has become a global problem since the Second World War and occurs in more than 110 countries. Apart from eliminating the mosquitoes, work is ongoing on a vaccine, as well as medication targeted directly at the virus.



6

Potentially threatening invasive species on St. Eustatius



The Green Iguana

The Green Iguana, *Iguana iguana*, is a large lizard that is native to parts of South and Central America, as well as a few islands in the Caribbean. It can grow to approximately 1.5m in length and 4 to 5kg in weight. The Green Iguana can reach maturity within three to four years and females are capable of producing clutches of 20 to 70 eggs annually. These reptiles are associated with warm coastal regions, low elevations and waterways, especially where trees extend over water.

Green Iguanas are primarily herbivores, feeding on several species of plants. Once they have consumed various species of vegetation, the seeds are deposited in their faeces. Therefore, they act as a potential dispersal agent for invasive weeds and other plants.

While the Green Iguana does not currently exist on St. Eustatius, efforts must be made to prevent its entry to the island. Green Iguanas arrived on other Caribbean islands floating on logs of wood from Guadeloupe, shortly after two hurricanes in 1995. Since then, their populations on islands have grown significantly, with many more arriving via the importation of plants.

This reptile species could be a serious threat to St. Eustatius' native iguana, the Lesser Antillean Iguana (*Iguana delicatissima*). The Green Iguana is more aggressive and will outcompete the Lesser Antillean Iguana for food, but a far greater risk is that of hybridizing. On Guadeloupe, where both species exist, the Green Iguana has mated with the Lesser Antillean Iguana, resulting in sterile hybrids and the loss of a pure native population.

Residents are encouraged to report any sightings of Green Iguanas to the Department of Agriculture and Fisheries or the National Parks Foundation (318 2884).

Iguana iguana or *Iguana delicatissima*?

The Green Iguana (*Iguana iguana*) is a potential threat to the native and endemic Lesser Antillean Iguana (*Iguana delicatissima*). With two species looking so much alike, it's important to know the difference. Once you learn what to look for, it becomes very easy to identify both species.

Green Iguana



Striped tail

Lesser Antillean Iguana



Unicolour tail



Up close, the Green Iguana (*Iguana iguana*) can be recognized by the large scale below the eardrum.



The Lesser Antillean Iguana (*Iguana delicatissima*) has a series of scales stretching along the jaw-line.

Contact the National Parks office if you are uncertain which species of iguana you have encountered.



The Small Indian Mongoose

The small Indian mongoose (*Herpestes auropunctatus*) grows to a length of around 0.5 meter, and was introduced to some Caribbean islands such as St. Kitts & Nevis and Puerto Rico to protect sugar cane fields from rats and snakes. Instead of controlling pests, the mongoose became a pest itself, harming far more wildlife than anticipated. This agile creature preys on birds and small reptiles, and is responsible for causing the extirpation of the Red-bellied Racer snake (*Alsophis rufiventris*) on St. Kitts & Nevis. The mongoose has so far caused the extinction of 12 reptile and amphibian species from Puerto Rico, the West Indies and Jamaica.

In addition, the critically endangered/possibly extinct Jamaica petrel suffered drastic decline in numbers in the 19th century presumably due to predation by mongoose (capable of taking incubating adults) and rats. Mongooses have also been implicated in the decline of many other bird, reptile and mammal species. Mongooses also eat invertebrates but the impact of this predation on invertebrate populations has not been studied. In the Caribbean, mongooses prey on the critically endangered hawksbill turtle eggs in fragmented beach habitat.



The Cuban Tree Frog

The Cuban tree frog (*Osteopilus septentrionalis*) is native to the Caribbean region and eats lizards, insects, spiders, small snakes and even members of its own species. Its wide diet and ability to thrive amongst humans has made it a highly invasive species with colonies in Florida, Hawaii, and the Caribbean. They range in size from 3 to 5.5 in and vary in color from olive-brown, bronze to grayish-white, and have a warty skin, making them distinguishable from other frogs. Their arrival in a new community is believed to be detrimental to local species, and it has been suggested that these frogs be destroyed on sight upon their arrival in new habitats. Cuban tree frogs are commonly available as pets, but the toxic mucus from its skin can cause a burning sensation in the eyes, meaning it is not an ideal pet.

This frog is now present on Nevis where it is thought to have been brought in with plants imported from Florida. Introduction of the Cuban tree frog to St. Eustatius would have a negative impact on the Johnstone's whistling frog (*Eleutherodactylus johnstonei*) and other small species.



Johnstone's whistling frog

The Johnstone's whistling frog (*Eleutherodactylus johnstonei*) is the only species of frog that exists on St. Eustatius. However, it is not native to the island. This small frog is an adept colonizer that has expanded its range throughout the Caribbean region. It has been introduced both purposefully and unintentionally by humans, and is expanding into new habitats mainly parallel to human expansion (habitat disturbance through land development) and extreme climatic events (habitat disturbance through hurricanes and volcanism).

It is important that on islands with more than one native frog species developed, monitoring of *Eleutherodactylus johnstonei* and native frog species is conducted before a management programme is implemented.

The fact that the whistling frog is the only species that exists on St. Eustatius means it is not a threat to other native frog species. However, its potential impact on native insect species has yet to be determined. Therefore this frog can be considered introduced but possibly not invasive.



The Vervet Monkey

The Vervet monkey (*Chlorocebus pygerythrus*) was introduced to the Caribbean region from Africa in the late 17th Century. Vervet monkeys are omnivorous and opportunistic feeders, eating anything from bird eggs to ornamental and fruit plants and trees. They have black faces and grey body hair color, ranging in length from about 50 cm (20 in) for males to about 40 cm (16 in) for females.

On St. Maarten, research into the monkey population by Nature Foundation has found various breeding individuals and numerous infants. This is worrying since this may lead to a sharp increase in the number of the monkeys. The foundation has received increasing complaints and reports of monkeys causing problems for residents throughout the Dutch side.

Vervet monkeys can act aggressively to residents and pets, overturning garbage bins, destroying gardens and garden furniture and defecating on people's property. In St. Kitts and Nevis, some are proposing to stop Vervet monkeys from ravaging the island's crops by placing them on the local menu next to the other regional invasive delicacy: the lionfish.

The global economic impact of invasive alien species

It is well documented that many invasive alien species are responsible for causing an ecological imbalance in some environments. This has already been demonstrated in their ability to out-compete and cause the extinction of many species. For example, the introduction of the mongoose in the Caribbean region has been associated with the extinction of some species of snakes that were indigenous to the Caribbean. However, even more devastating is the economic impact of invasive species across the world. As illustrated in table below, invasive species have had varying effects on the economies of many countries.

Species	Economic variable	Economic impact
Introduced disease organisms	Annual cost to human, plant, animal health in USA	\$ 41 billion per year ¹
Coypu/nutria (aquatic rodent)	Damages to agriculture and river banks in Italy	\$2.8 million per year ²
Zebra mussel	Damages to US and European industrial plants	Cumulative costs 1988-2000 = \$750 million to 1 billion ³
Six weed species	Costs in Australia agroecosystems	\$105 million per year ⁴
Pines, hakeas and acacias	Costs on South Africa Floral Kingdom to restore to pristine state	\$2 billion ⁵
Water hyacinth	Costs in 7African countries	\$20-50 million per year ⁶
Varroa mite	Exonomic cost to beekeeping in New Zealand	\$267-602 million ⁷
Comb-jelly	Lost anchovy fisheries in Black Sea	\$17 million per year ⁸
Golden apple snail	Damage to rice agriculture in Philipines	\$28-45 million per year ⁹

References: ¹Daszak et al., 2000 - ²Panzacchi et al., 2004 - ³National Aquatic Nuisance Specis Clearinghouse 2000 - ⁴Watkinson, Freckleton & Dowling, 2000 - ⁵Turpie & Heydenrych, 2000 - ⁶Joffe-Cooke, 1997 - ⁷Wittenberg & Cock, 2001 - ⁸Knowler & Barbier, 2000, Knowler 2005 - ⁹Naylor, 1996

7

Eradicating, controlling and preventing invasive species

Ideally, all invasive species that have the potential to cause extreme impact on native biodiversity and the livelihoods of people should be eradicated, but this can be a very difficult and costly task. Our next step is to prioritize and control invasive organisms that are already present and which are most likely to cause significant problems. We can do this by physically removing pests with our hands or chemicals and machinery. However, prevention is better than cure. Especially in the case of reptiles, these are very hard to eradicate once they establish themselves on islands. Therefore it is important to make efforts to prevent new non-native species from coming into our island, and to try to manage and control existing invasive species.

In order to achieve this we do the following:

- Declare all plants and animals at entry ports
- Do not release pets into the wild
- Destroy invasive species around your property
- Keep your surroundings clean
- Take pictures of any suspicious looking plants and animals
- Report any strange looking species to the National Parks Office
- Learn more about the threats of invasive species and spread the word



Remember: early detection of a newly arrived invasive species could prevent its spread and growth. If you can contain the new species, do so immediately, or inform the National Parks office so the organism can be investigated and controlled. Early detection and rapid response is always the best solution for restricting or eradicating an invasive species.

The National Parks Office is collaborating with local and international agencies to educate residents about the threats of invasive species and how to prevent/control them. This is being addressed through newspaper articles, radio interviews, school presentations, booklets, flyers, training exercises, and many more activities to help the general public comprehend the magnitude of the problem.

It is necessary to map the most troublesome species, whether they are spreading, and how they are entering the island. Ultimately, with funding, we will be able to initiate measures to prioritize the most threatening invaders, and then control or possibly eradicate some invasive species from the island.

8

Case Studies on the Impact of Invasive Species

The following reports are examples of both regional and non-regional occurrences of invasive species. In some instances, the invasive species were deliberately brought to their new habitat by humans attempting to control another invasive species.

LOCATION: Anguilla

SPECIES: African land snail

Around the year 2000, the giant African land snail was introduced to Anguilla. Since then it has caused significant damage to crops and plants and it is considered to be a nuisance to residents on the island. An unsightly species, it discards slimy residue and faeces on houses and buildings. According to records from the Department of Agriculture, efforts to control this invasive over the past five years have valued anything in excess of US \$100,000. This same snail cost Florida over US\$1 million in an eradication campaign in the 1970s, and it is currently costing the government of Barbados significant funds to monitor and control its spread.

LOCATION: **Dominica & Montserrat**

SPECIES: **Chytrid fungus**

The Caribbean islands of Dominica and Montserrat were recently invaded by a disease known as the Chytrid fungus, which poses a serious threat to their native frog (mountain chicken). The fungus has already wiped out over 80% of the mountain chicken in Dominica, and is now taking its toll on the Montserrat population. In an effort to safeguard the frog population from complete extinction, conservationists have airlifted a few individuals to zoos in the United Kingdom to be used in breeding programs.

LOCATION: **Hawaii**

SPECIES: **Rosy Wolf Snail**

In Hawaii, the Rosy Wolf snail was introduced as a predator to control the spread of the giant African land snail. As it turned out, the Rosy Wolf species had little impact on its intended victims, but instead attacked and caused the extinction of nine different species of Hawaii's native and endemic snails.

LOCATION: **Guam**

SPECIES: **Brown tree snake**

The Pacific island of Guam is known for its wide variety of bird species, of which 22 are native. However, the brown tree snake (*Boiga irregularis*) was accidentally introduced to the island in 1952 and has since caused the extinction of four of Guam's native bird species. Currently in Guam, the ratio of snakes to birds is four to one.

Below are some resources that were used to produce this booklet, recommended for further reading:

www.ciasnet.org
www.issg.org/database/welcome
www.invasivespecies.org/resources
www.gisp.org/publications/reports/invasivesandpoverty.pdf
<http://knowledge.cta.int/en/Dossiers/S-T-Issues-in-Perspective-Agricultural-Biodiversity/Articles/Mitigating-the-impacts-of-invasive-alien-species>
www.wikipedia.org/wiki/Introduced_species
www.reef.org/reef_files/Lionfish%20Quickfacts.pdf
www.gisp.org/index.asp
http://jncc.defra.gov.uk/pdf/jncc372_web.pdf
<http://jncc.defra.gov.uk/page-1532>
www.invasiveplants.net
www.invasivespecies.gov
www.oar.noaa.gov/oceans/t_invasivespecies.html
www.fs.fed.us/invasivespecies

For more resources, type the words “invasive species” into a search engine and it will bring up thousands of resources that are available on the internet. Voila!

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Know your native species!

These are our precious local species that could become at risk to invasive species:



Red-bellied Racer Snake
(endemic to St. Eustatius and Saba)



Statia Morning Glory
(endemic to St. Eustatius)



Red-billed Tropicbird
(St. Eustatius and Saba support up to 40% of the global breeding population)



Gonolobus aloi
(endemic to St. Eustatius)



Lesser Antillean Iguana
(endemic to the Lesser Antilles)



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