Published by: The Bahamas Environment, Science and Technology (BEST) Commission, Ministry of Health and Environment in conjunction with the British High Commission, Nassau, The Bahamas

Citation: BEST Commission (2003), *The National Invasive Species Strategy for The Bahamas*. BEST, Nassau, The Bahamas, 34 pp.

Cover design by:

Layout by:

Printed by:

Available from: The BEST Commission, Ministry of Health and Environment
Sir Cecil Wallace Whitfield Centre
West Bay Street, Cable Beach
P.O. Box CB 10980
Nassau, The Bahamas
Tel: 242-327-4691
Fax: 242-327-4626
URL: **www.best.bs**

The National Invasive Species Strategy For The Bahamas

March 2003

Message from the Minister of Health and Environment

As the world becomes a global village, countries find it more and more difficult to isolate themselves from problems in other countries. The issue of biological invasion has become globally significant because no country is immune to the negative impacts it can cause.

Invasive species are typically defined as those organisms that negatively impact the environment, economy, human welfare and human health of a country. Invasives are thought to be one of the main causes of biodiversity loss worldwide. This problem is of sufficient significance to be addressed in the Convention on Biological Diversity, the international agreement on conservation, protection and sustainable use of biodiversity.

The National Invasive Species Strategy Project has afforded The Bahamas the opportunity to examine what invasive species occur in our country, which species need to be given priority and what mechanisms can be developed to address their introduction and spread. The project has involved a series of stakeholder workshops, public awareness campaigns and training. One of its objectives has been realized in the publication of this document, the National Invasive Species Strategy. It is hoped that various aspects of this Strategy will be implemented immediately and others in the near future.

Consultation has been an important aspect of this project as the Government recognizes that we cannot deal with issues of national significance without national discussions. Stakeholder workshops were carried out in several Bahamian islands, including Abaco, Andros, Grand Bahama and Eleuthera. All other islands were consulted through Local Government representatives. The result is a plan that encompasses as succinctly as possible the concerns expressed by all.

I encourage you to not only read this Strategy, but to also contribute to its implementation. If every citizen of The Bahamas can apply what is recommended, if only within their own homes, we will have achieved much in our efforts to address the invasive species problem.

On behalf of the Government, I wish to again express our gratitude to the British Government for their assistance in combating this global biological problem. This project represents the first joint effort between our two countries in addressing an environmental issue. It is our sincere hope that this is only the beginning of a fruitful cooperative relationship.

On behalf of the Ministry of Health and Environment and the BEST Commission, I wish to thank all who have participated in this worthy effort and have made this project a success.

Dr. Marcus C. Bethel
Minister of Health and Environment
The Commonwealth of The Bahamas

Message from the British High Commissioner

The National Invasive Species Strategy Project represents an important milestone in the cooperative relationship between the United Kingdom and the Commonwealth of The Bahamas. It is the first opportunity that my Government has been able to work jointly with the Government of the Commonwealth of The Bahamas on an issue of environmental concern.

Invasive species pose not only a threat to The Bahamas, but to the world. Everyday, native species and habitats are put at risk of displacement and extinction from invasion by non-native plants and animals. These invasions have increased globally due to expansion in the trade of goods and services, the increased mobility of people, the liberalization of markets and the use of exotic species in a wide range of activities.

This project has enabled The Bahamas to begin to assess the impact of invasive species nationally and develop a strategy to combat invasion and protect its native species and habitats. The British Government is proud to be able to contribute to such a worthwhile activity and to aid in the conservation and protection of the biological diversity of these islands.

Funding for this project has been made possible through the Environment Project Fund of the Foreign and Commonwealth Office (FCO) of the British Government. The FCO works to protect and improve the quality of the global environment as a foundation for sustainable development. It is committed to addressing critical environmental issues, such as biodiversity, biotechnology, energy, resource supply and climate change.

The FCO accomplishes its tasks through a global network of missions, and the Environment Fund aims to utilise this network in association with governments, NGOs and institutions to support a range of focused, high quality environment projects, such as the Bahamian invasive species project.

It is our hope that this is only the beginning of joint efforts between the United Kingdom and The Bahamas to address environmental issues and concerns to the betterment of all humankind.

His Excellency Peter Heigl
British High Commissioner
Nassau, The Bahamas
15th February 2003

Message from the Ambassador for the Environment

The National Invasive Species Strategy Project represents the second phase in a national effort to address the issue of biological invasion. This project builds on the work completed under the Inter-American Biodiversity Information Network Invasives Information (I3N) Project, which enabled the development of databases of invasive species found in The Bahamas. While we realize these databases are not complete, they provided a starting point for work to begin on dealing with this problem.

Both projects have provided The Bahamas the opportunity to work cooperatively with foreign Governments and organizations. The information project was made possible through assistance from the United States Geological Survey and the current strategy project, through the Environment Project Fund of the British Government's Foreign and Commonwealth Office. The willingness of these agencies to work cooperatively with The Bahamas, a small islands developing State, speaks to the global concern on this issue.

Invasive species are not just an ecological problem. They are also an economic one. Worldwide, millions of dollars are spent every year to control invasive species and to repair the damage they cause. As we experience trying economic times globally, we must strive to ensure that issues that may further impact us negatively are adequately addressed. Biological invasion is one such issue.

Island states, like The Bahamas, are generally considered highly susceptible to invasions because of their particularly vulnerable native biodiversity and predominantly import driven economies.

The recommendations contained within this Strategy represent The Bahamas' initial effort to deal with invasive species nationally. It is our intent to continue to build on this initial work towards achieving implementation and instituting effective management mechanisms.

On behalf of the BEST Commission, I thank the British High Commission and all persons involved for their invaluable assistance in this project, and making the publication of this document possible through their contributions of knowledge, expertise, insights and opinions.

His Excellency Keod M. Smith
Ambassador for the Environment
The Commonwealth of The Bahamas

Preface

The National Invasive Species Strategy (NISS) project was developed in 2002 and jointly funded by The Bahamas Government and the Environment Project Fund of the Foreign and Commonwealth Office of the British Government.

The project facilitates the assessment of the current mechanisms existing in The Bahamas to address the invasive species issue while enabling increased public awareness and involvement in the process. There have been numerous stakeholder and public exercises during the project over the past few months. The project has resulted in the development of awareness materials that will hopefully be of benefit, not only to The Bahamas, but also to other Small Island Developing States (SIDS).

The NISS project has also afforded The Bahamas the opportunity to begin to build partnerships with international organizations, such as the Global Invasive Species Programme (GISP), Invasive Species Specialist Group (ISSG), Islands Initiative and The Nature Conservancy (TNC).

This project builds on initial work completed under the Inter-American Biodiversity Information Network (IABIN) Invasives Information Network Project in which databases on invasives species, expertise and programmes were developed and made accessible on the Worldwide Web. This phased approach has been very successful and it is intended that the work on this issue will continue, resulting in the development of a comprehensive infrastructure that will prevent the entry and establishment of unwanted invasive species and other biological threats to the biodiversity of the Bahamian islands.

Acknowledgements

This project was successfully completed through the hard work of the following individuals of the BEST Commission: Dr. Donald Cooper, Nakira Wilchcombe, Stefan Moss, Sharrah Moss, Lorca Bowe, Maria Hield and Diane Adderley; and the British High Commission, Nassau: Dave Wells and Sheila Lendgren.

The following persons have made invaluable contributions through the lending of their time, knowledge and expertise: Dr. John Hammerton, Paul Dean, Dr. Maurice Isaacs, Pastor James Redmon, Chris Bergh, Ruark Cleary, and Dr. Maj de Poorter.

Consultants for the project were: Dr. Moses Kairo, Cynthra Persad and Dr. Bibi Ali, CAB International and Lihong Zhu, Natural Resources Institute.

All stakeholders and members of the public who provided input and insight in discussions on invasive species and how the country can move forward have made the project worthwhile and fulfilling for all who have participated.

Stacey Wells-Moultrie
Project Coordinator
BEST Commission
Ministry of Health and Environment

Nassau, March 2003

Table of Contents

1.0 Abbreviations and Acronyms

BEST	Bahamas Environment, Science and Technology
CAB International	Successor of a number agencies including the Commonwealth Agricultural Bureau initially existing in the United Kingdom and other parts of the Commonwealth
CBD	Convention on Biological Diversity
FAO	United Nations Food and Agriculture Organization
FCO	Foreign and Commonwealth Office
GISP	Global Invasive Species Programme
I3N	IABIN Invasives Information Network
IABIN	Inter-American Biodiversity Information Network
ICAO	International Civil Aviation Organization
IMO	International Maritime Organization
IPPC	International Plant Protection Convention
ISSG	Invasive Species Specialist Group
IUCN	World Conservation Union
NBSAP	National Biodiversity Strategy and Action Plan
NGO	Non-Governmental Organization
NISS	National Invasive Species Strategy
OIE	Office International des Epizooties
Ramsar	Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar, 1971)
SIDS	Small Island Developing States
SPS	Agreement on the Application of Sanitary and Phytosanitary Measures
TNC	The Nature Conservancy
UNCLOS	United Nations Convention on Law of the Sea (Montego Bay, 1982)
UNCED	United Nations Conference on Environment and Development (Rio de Janeiro, 1992)
WHO	World Health Organization
WTO	World Trade Organization

2.0 Glossary of Terms

Aggressive species – Those species (plants, animals, micro-organisms) that overwhelm the landscape whether they are native or introduced.

Alien species – non-native, non-indigenous, foreign, exotic species occurring outside of their natural range and dispersal potential, and includes any part, such as seeds and larvae, that might survive and subsequently reproduce.

Biodiversity – The variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. Short for biological diversity.

Conservation of biodiversity - The management of human interactions with genes, species, and ecosystems so as to provide the maximum benefit to the present generation while maintaining their potential to meet the needs and aspirations of future generations; encompasses elements of saving, studying, and using biodiversity.

Domesticated or cultivated species - Species in which the evolutionary process has been influenced by humans to meet their needs.

Ecology - A branch of science concerned with the interrelationship of organisms and their environment.

Ecosystem - A dynamic complex of plant, animal, fungal, and microorganism communities and their associated non- living environment interacting as an ecological unit.

Endemic species – A species restricted to a specified region or locality.

Harmful or dangerous – Plants and animals that sting, prickle, cause allergies, are poisonous to humans or other organisms or exclude other organisms from an ecosystem or habitat.

Feral animals – Animals that are untamed or wild.

Historic – Those plants and animals that were introduced long ago but now are accepted by most persons as “native”.

Intentional introduction – An introduction made deliberately by humans, involving the purposeful movement of a species outside of its natural range and dispersal potential. Such introductions may be done legally or illegally.

Introduction – The movement by human agency of a species, subspecies or lower taxon outside its natural range. This movement can be either within a country or between countries.

Invasive alien species - Alien species that become established in a new environment, then proliferate and spread in ways that are destructive to native ecosystems, human health, and ultimately human welfare.

Native species – A species occurring within its natural range and dispersal potential, i.e. within the range it occupies naturally or could occupy without direct or indirect introduction or by care of humans. Those plants and animals that occurred when Columbus arrived.

Naturalized – Plants and animals that have been introduced and now propagate on their own.

Unintentional introduction – An unintended introduction made as a result of a species utilizing humans or human delivery systems as vectors for dispersal outside its natural range.

3.0 Introduction: An Overview of Invasive Alien Species

Invasive alien species may be defined as:
Alien species that become established in a new environment, then proliferate and spread in ways that are destructive to native ecosystems, human health, and ultimately human welfare.

Invasive species spread because the natural controls that keep them in check in their native homelands, such as disease and predators, do not exist when they introduced into a new habitat.

Invasive species occur globally and are represented in every taxonomic group. They can be:

- micro-organisms, such as bacteria and plankton;
- plants, such as trees, shrubs and vines; or
- animals, such as insects, reptiles, amphibians and mammals

Invasive species have negative economic and environmental impacts. Some of these negative impacts include:

- loss of genetic diversity, i.e. they dilute the gene pool through hybridization;
- competition with native species, resulting in their loss or displacement;
- introduction of diseases; and
- change in the physical properties of the environment, e.g. decrease amount of dissolved oxygen in water, decrease the amount of sunlight reaching an area.

The direct economic costs of invasive alien species run into many billions of dollars annually. A recent effort by United States ecologists to calculate the annual costs of all alien invasives in the United States concluded that invasive weeds cost US agriculture about $27 billion per year. The total costs to the United States of all non-indigenous species (plants, animals, and microorganisms) were estimated at over $138 billion per year.

Increasing globalization of markets and rises in global trade, transport, travel and tourism mean that more and more species from all parts of the world are moving to new habitats, enhancing the possibility of invasion in all ecosystems all over the world.

The degradation of natural habitats globally has made it easier for alien species to establish and become invasive. Global climate change is also a factor assisting the spread and establishment of invasive alien species. For example, increased temperatures may enable alien, disease-carrying mosquitoes to extend their range.

There are three categories of activities that can result in alien species becoming invasive:

1. Intentional introduction of species for use in biological production systems, i.e. agriculture, forestry, fisheries and landscaping, as well as recreational and ornamental purposes and for biological control of pests;

2. Intentional introduction of species as a commodity for uses where there is a known risk of escape or release to the wild, i.e. zoos, aquaculture, mariculture, aquariums, horticulture, pet trade, etc.; and
3. Unintentional introduction of species through pathways involving transport, trade, travel or tourism.

With unintentional introductions, alien species can be present in bilge and ballast water of ships, airplane wheel wells, tourists' shoes, as well as gut and hooves of imported livestock. Absent bioterrorism, the spread of disease by international travelers or freight, is also an unintentional introduction, e.g., West Nile virus.

Studies have shown that islands, like those of The Bahamas, are especially vulnerable to invasions. Island species often have small populations and are unique when compared to continental species due to the isolation of islands throughout prehistoric times. This isolation has been provided by the natural barriers of oceans, mountains, rivers and deserts that have enabled these unique species and ecosystems to evolve. Most island species are ill-equipped to defend against aggressive invading species and fare poorly in the face of competitors, predators, pathogens and parasites from other areas.

While the isolation of islands has proved to be a weakness in the ability of island species and ecosystems to be resilient against biological invasion, it can be used as an advantage by improvement of the capacity of governments of Island States to prevent the arrival of invasive alien species with better knowledge, improved legislation and greater management capacity, supported by quarantine and customs systems that are capable of identifying and intercepting invasive alien species.

4.0 Mechanisms to Manage and Control Invasive Species

Measures that can be taken to address invasion by alien species include:

- Prevention
- Early detection and response
- Eradication
- Control

Prevention of the entry and establishment of unwanted invasive species will require a comprehensive infrastructure that includes a national inspection system, training of human resources, and funding. Public education and awareness is also an important part of prevention (see also Appendix I).

Prevention also involves reduction or elimination of those activities that make invasion possible, i.e. clear-cutting, pollution and other forms of habitat degradation.

An early detection system was previously used in The Bahamas for the Pink Hibiscus mealy bug (*Maconellicoccus hirsutus*). Early detection and response involves inventory and mapping of species, a rapid-response plan, public notification, and the resources to act quickly when a new invader is discovered. This system is the same as would be employed by a public health agency in the event of a new disease outbreak. A system for addressing invasive species would include components for:

1. Raising public awareness;
2. Generating support and funds for quality programs;
3. Developing effective integrated management plans with specific control actions; and
4. Assessing the economic and social impact of invasives.

An important component of an early detection system is monitoring. Monitoring of species must occur on a regular basis.

Early detection is facilitated by collaboration within the country to maximize human and financial resources with monitoring being carried out by those who are regularly in the field, i.e. birdwatchers, landscape crews and researchers.

Out of all possible management strategies of invasive species, eradication (removal of the entire population) is the most suited as a means for restoration of native biological diversity, although it is also the most difficult and expensive strategy to employ. Whether or not eradication can be accomplished is affected by whether it is feasible and if it can be carried out early enough in an invasion to be successful. Eradication of established populations of invasive species requires significant resources and years of committed action to accomplish. It is important to note that the most successful examples of eradication are from small islands.

Control of invasive species requires initial treatment followed by maintenance control. Maintenance control involves use of techniques in a coordinated manner on a continuous basis in order to maintain invasive populations at the lowest acceptable level. Options for control include prohibition and restriction with conditions. Control also involves ensuring the use of proper disposal methods and areas, especially with respect to invasive plant material. Control methods should be socially, culturally and ethically acceptable as well as efficient and non-polluting. Methods employed should minimize adverse affects on native flora and fauna, human health and well-being or agricultural stocks.

In exploring all the options available for addressing the invasive species problem, we must recognize the role that human habits and behaviours play in the introduction and spread of invasives and work to modify or change these. For example, in management of dogs, we must also focus on fostering responsible care of owned dogs, implementation of current and new legislation to achieve this and enforcement of legislation.

Human decisions and human activities not only affect the introduction and spread of invasive species, but also affect the resilience of ecosystems and the possibility of timely policy responses to deal with invasions. Degraded habitat, such as land that has been clear-cut, is prime habitat for invasion. If policy responses are slow, the risk of invasive species becoming established is increased and the success of preventive or control measures is negatively affected.

Any meaningful prevention and control strategy has a cost. Given budget constraints, any decision-making on what measures to apply will inevitably involve setting priorities and accepting trade-offs. In consequence, the determination of costs and benefits of invasive alien species control and the related options for prevention, control and management becomes vital.

There are a number of reasons why it may be economically worthwhile to protect native biological diversity. These include protecting:

- human health and safety - invasive species that introduce disease can impact directly on human well-being through sickness, debilitation and death.
- production standards - invasive species may disrupt production processes by reducing the productivity of pasture, plants and livestock. Such incursions of invasive species may impact on production through increased costs, reduced output volumes or lower prices from products perceived as of inferior quality.
- access to overseas markets - other countries may use the presence of potentially damaging invasive species in The Bahamas as a reason to erect trade barriers against Bahamian seafood and produce exports. These barriers can impact the prices for exports, and in the long term, may also lead to changes in the volume of products sent to export.
- a sense of security and cultural identity - such impacts are difficult to quantify, but there can be a real reduction in well-being for the population at large from introduction of invasive species which damage parts of the environment significant for national or cultural identity, such as traditional use beaches and fisheries.

5.0 Recommendations

It must be clarified that actions recommended under this strategy are specific to invasive plants and animals. It is hoped that at a later stage micro-organisms and diseases will be addressed.

Stakeholders consulted during the project have recommended the following:

1. There should be building of awareness through the development of a database on invasive species to include:
- Information on risks associated with each species;
- All characteristics of each species (e.g. breeding habits. migration patterns, physical description;
- Management mechanisms and
- Visual representation.

2. Training should occur in the following areas:
- Customs officers in the identification, safe handling, holding and transfer of invasive species; and
- Agricultural and fisheries officers in the identification, safe handling, holding, transfer and disposal of invasive species as well as methods of risk assessment and management.
- Enforcement officers in the identification, safe handling, holding and transfer of invasive species.

3. All officers should be trained in a national mechanism that would coordinate action in the field with respect to invasive species. This mechanism would set up clear powers and responsibilities between the agencies concerned.

4. As monitoring cannot be achieved for the entire archipelago, it is recommended that specific sites be identified for regular monitoring, such as:
- All public areas
- National parks
- Protected areas
- Freshwater sources (groundwater and well fields)
- Field stations

5. Existing legislation related to management and control of alien species should be enforced and where deficient, be amended. There will also be the need to draft and amend new legislation specific to management and control of invasive alien species.

6. There should be a sequenced approach to invasive species control:
   i. Preventing entry of potential invasives from other countries and other Bahamian islands;
   ii. If entry has already occurred, preventing the establishment and spread of invasives, i.e. rapid response;

iii. Eradication of invasives at the earliest possible stage is preferred. Methods of eradication should be as ethical and humane as possible;
iv. If eradication is not feasible or cost-effective, containment and long-term control measures should be considered.

7. Priority species should be listed for eradication and control. These lists therefore would not include all known invasives for The Bahamas. The latter list can be found at Appendix XVI and is the most current list to date. It should also be noted that species on the eradication and control lists would be reviewed on a regular basis with the result that current species may be deleted and new species added.

Species recommended for eradication are:

Casuarina glauca	Suckering Australian Pine
Melaleuca quinquenervia	Melaleuca, (paper bark)
Mucuna pruriens	Monkey Tamarind
Scaevola taccada	Asian Scaevola, White Inkberry, (Hawaiian Seagrape)
Schinus terebinthifolius	Brazilian Pepper, Bahamian Holly
Molothrus bonariensis	Shiny Cowbird
Procyon lotor	Raccoon (for all islands except New Providence and Grand Bahama)

Species recommended for control are:

Albizia lebbeck	Woman's Tongue
Antigonon leptopus	Coral Vine
Bauhinia variegata	Poor Man's Orchid
Casuarina equisetifolia	Casuarina, Australian Pine, (beefwood)
Delonix spp.	Poinciana
Eichhornia crassipes	Water Hyacinth
Haematoxylon campeachianum	Logwood
Impomoea purpurea	Morning Glory
Leucaena glauca	Jumbey
Pimenta racemosa	Bay Rum
Prunus amygdalus	Almond
Ricinus communis	Castor Bean
Spathodea campanulata	African Tulip Tree, Flame of the Forest
Schefflera actinophylla	Schefflera, Queensland Umbrella Tree
Trachelosperumum jasminoides	Star Jasmine
Wedelia trilobata	Wedelia, (carpet daisy)
Columba livia	Rock Dove
Passer domesticus	House Sparrow
Streptopelia decaocta	Eurasian Collared Dove

Canine	Dogs
Felis catus	Cats
Procyon lotor	Raccoon (for New Providence and Grand Bahama)

8. The Government accept and implement an Invasive Species Policy as outlined in the draft at Appendix IV

9. Specific actions should be taken by the Government as given in the Code of Conduct in Appendix V.

10. Specific actions should be taken by sectors as identified in the Voluntary Codes of Conduct in Appendices VI through XIV.

11. The Government commit to give and seek funding for a sustained management program of invasive species and explore the option of maintaining a contingency fund specifically for emergency response purposes. Determining the size of such a fund would involve estimating the risk of an invasion emergency and the likely magnitude of such an event.

12. The Bahamas seeks to establish a comprehensive infrastructure for the management of invasive alien species in compliance with its international obligations under the following international agreements and organizations:
    i. 1992 Convention on Biological Diversity, Article 8(h) and the Interim Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species
    ii. 1971 Ramsar Convention, Resolution VII/14 on Invasive Species and Wetlands;
    iii. 1995 FAO Code of Conduct for Responsible Fisheries and Code of Conduct for the Import and Release of Exotic Biological Control Agents
    iv. 1994 World Trade Organization (WTO) Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement)
    v. International Plant Protection Convention (IPPC)
    vi. World Health Organization (WHO)
    vii. Codex Alimentarius Commission for Food Safety and Human Health
    viii. Office International des Epizooties (OIE) for Animal Health
    ix. 1982 United Nations Convention of the Law of the Sea (UNCLOS), Article 196
    x. 1997 IMO Guidelines for the Control and Management of Ships' Ballast Water to Minimize the Transfer of Harmful Aquatic Organisms and Pathogens
    xi. 1998 International Civil Aviation Organization (ICAO) Assembly Resolution A-32-9 on preventing the Introduction of Alien Invasive Species
    xii. Agenda 21, United Nations Conference on Environment and Development (UNCED), 1992

xiii. 1994 Barbados Programme of Action for the Sustainable Development of Small Islands Developing States (SIDS)

References

Clare Shine, Nattley Williams and Lothar Gundling (2000), *A Guide to Designing Legal and Institutional Frameworks on Alien Invasive Species*. IUCN, Gland, Switzerland Cambridge and Bonn. xvi + 138 pp.

Secretariat of the Convention on Biological Diversity (2001), *Review of the efficiency and efficacy of existing legal instruments applicable to invasive alien species*. Montreal, SCBD, 42 p. (CBD Technical Series no. 2)

Missouri Botanical Garden and Royal Botanic Garden at Kew (2002), *St. Louis Invasive Plants Species Workshop, Linking Ecology and Horticulture to Prevent Plant Invasions: Draft Voluntary Codes of Conduct*. St. Louis, Missouri, Website: www.mobot.org/iss

BEST Commission and College of The Bahamas Research Unit (2002), *IABIN Invasives Information Network (I3N) Project Final Report – The Bahamas*. Nassau, The Bahamas. 23 pp.

BEST Commission (1999), *National Biodiversity Strategy and Action Plan – The Bahamas*. Nassau, The Bahamas. 105pp.

Appendices

I. The Public and Implementation of the Strategy

Public education and awareness must occur at all levels and we define public to include the following:

Cabinet Ministers
Policy makers
Judiciary
Government Ministries and officials
Local Government
Technical Officers
Enforcement agencies
Churches
Media
Youth
NGOs
Farmers
Fishermen
Tourism sector (including hotels and tourists)
Contractors (i.e. landscapers, architects and construction industry)
Schools and colleges
Importers and exporters
Airline companies
Shipping companies
Horticulturists
Plant nurseries
Botanical gardens
Homeowners
Gardeners/gardening enthusiasts
Gardening clubs
Pet stores
Pet breeders and dealers
Pet owners

Public education should involve utilization of the media in the promotion of information on invasive species and their management.

1I. Plant and Animal Species Recommended for Eradication

Casuarina glauca	Suckering Australian Pine
Melaleuca quinquenervia	Melaleuca, (paper bark)
Mucuna pruriens	Monkey Tamarind
Scaevola taccada	Asian Scaevola, White Inkberry, (Hawaiian Seagrape)
Schinus terebinthifolius	Brazilian Pepper, Bahamian Holly
Molothrus bonariensis	Shiny Cowbird
Procyon lotor	Raccoon (for all islands except New Providence and Grand Bahama)

III. Plant and Animal Species Recommended for Control

Albizia lebbeck	Woman's Tongue
Antigonon leptopus	Coral Vine
Bauhinia variegata	Poor Man's Orchid
Casuarina equisetifolia	Casuarina, Australian Pine, (beefwood)
Delonix spp.	Poinciana
Eichhornia crassipes	Water Hyacinth
Haematoxylon campeachianum	Logwood
Impomoea purpurea	Morning Glory
Leucaena glauca	Jumbey
Pimenta racemosa	Bay Rum
Prunus amygdalus	Almond
Ricinus communis	Castor Bean
Spathodea campanulata	African Tulip Tree, Flame of the Forest
Schefflera actinophylla	Schefflera, Queensland Umbrella Tree
Trachelosperumum jasminoides	Star Jasmine
Wedelia trilobata	Wedelia, (carpet daisy)
Columba livia	Rock Dove
Passer domesticus	House Sparrow
Streptopelia decaocta	Eurasian Collared Dove
Canine	Dogs
Felis catus	Cats
Procyon lotor	Raccoon (for New Providence and Grand Bahama)

IV. Draft Policy on Invasive Species

The Commonwealth of The Bahamas

The Government of the Commonwealth of The Bahamas,

Recognizing its obligation as a Party under Article 8(h) of the Convention on Biological Diversity to "prevent the introduction of, to control or to eradicate those alien species, which threaten ecosystems, habitats or species",

Acknowledging that scientists and governments throughout the world recognize that biological invasions by alien species pose serious threats to native biological diversity,

Noting that invasive alien species are found in all taxonomic groups: plants, animals and microorganisms,

Noting that invasive alien species are as damaging to native species and biological diversity as the loss and degradation of habitat,

Recognizing that, globally, hundreds of species extinctions have already resulted from invasive alien species,

Noting that the natural barriers to the movement of species - oceans, rivers, mountains and deserts - that provided the isolation essential for the evolution of unique and endemic species, have become increasingly ineffective,

Acknowledging that globalization, and the emphasis on free trade, provide even greater opportunities than hitherto for species to be introduced, either deliberately or accidentally, to new habitats, with the opportunity to become invasive,

Aware that small islands developing states are particularly vulnerable to the impacts of seemingly innocuous invasions, and The Bahamas perhaps especially so, given its archipelagic nature and many ports of entry,

Aware that the impacts of alien invasive species are immense, insidious, and often irreversible and that the costs due to their damage on a global scale are enormous, both in ecological and economic terms, and in terms of human welfare,

Recognizing that The Bahamas relies heavily on its natural resources, and has an open economy heavily dependent on imports,

Recognizing that the cost of allowing the introduction of invasive alien species is the irretrievable loss of endemic species and of unique ecosystems,

Recognizing also that there are direct economic costs of control of alien animals and plants, disease and pests,

Noting that introduced alien diseases and parasites of humankind not only result in suffering, and perhaps death, but also have economic costs of medical treatments and the loss of productivity,

Noting that global climate change is also a significant factor in facilitating the establishment of many alien species, and

Determined to conserve and sustainably manage the biological diversity of The Bahamas for the benefit of present and future Bahamians,

Has decided to adopt the following Policy:

- To enact legislation to prevent the introduction of, to control and to eradicate those alien invasive species which threaten the ecosystems, habitats, endemic species and the human health and welfare of The Bahamas, in support of the Convention on Biological Diversity;

- To prepare a National Invasive Species Strategy for The Bahamas, which lists and prioritizes in order of significant impact those invasive species present in The Bahamas;

- To prepare Strategic Management Plans for individual species of high priority as identified under the National Invasive Species Strategy;

- To facilitate research on the occurrence, distribution and impacts of invasive alien species and invasive native species in The Bahamas;

- To prevent the introduction of invasive alien species into The Bahamas by regulatory and other relevant means;

- To monitor invasive species populations in The Bahamas by the conduct of surveys and risk assessments;

- To undertake control and management activities in an environmentally and cost-effective manner;

- To monitor potentially invasive alien species not yet established in The Bahamas;

- To promote, undertake and facilitate the reestablishment of native species, where appropriate, and the restoration of invaded and damaged habitats;

- To conduct and facilitate research into the best management and control practices for individual species, including plants, animals and microorganisms, using chemical, physical and biological methods that are environmentally sound;

- To promote public education and outreach on invasive alien species at all levels of society by appropriate methods;

- To promote international and regional cooperation which would aid in the fulfillment of this policy and implementation of the National Invasive Species Strategy;

- To mandate such cooperation between Government Ministries, Departments and other Agencies including Non-Governmental Organizations and the Private Sector, as necessary, to implement this policy and to carry out the Strategy.

- To promote and facilitate such infrastructural development as is necessary to enable Ministries, Departments, and other Agencies, to implement this Policy and the National Invasive Species Strategy.

V. Code of Conduct for Government

Require risk assessment for Government-led or financed plant and animal introductions to ensure that no new harmful species are introduced, intentionally or unintentionally.

Do not distribute existing holdings of invasive plant and animal species to areas where they can potentially do harm.

Coordinate and facilitate collaboration in databases, early warning systems, monitoring and other means of preventing invasive plant species problems.

Lead and fund the development of environmentally sound methods to control harmful invasive plant species, seek control of such species on Crown and other public lands and promote their control on adjacent private lands.

Develop and promote the use of non-invasive plant species within all Government agencies and to the public.

Facilitate, lead, coordinate and evaluate public outreach and education on harmful invasive species.

Encourage public servants and managers to participate in ongoing training programmes on invasive species.

Foster international and regional cooperation to minimize the risk of import and export of potentially invasive species.

Develop partnerships and incentive programmes to lessen the impact of invasive species and provide non-invasive restoration materials.

Provide a forum for regular evaluation of the effectiveness of these voluntary codes of conduct towards preventing the invasive species problem.

Enforce existing invasive species legislation at all levels, and enact new legislation where deficiencies occur in existing legislation.

VI. Voluntary Code of Conduct for Botanical Gardens

Conduct an internal review examining all activities that provide an opportunity to prevent the spread of invasive species and to inform visitors on this issue.

Avoid introducing invasive plants by establishing an invasive plant assessment procedure. This procedure should involve responsible and regular monitoring of the garden site.

Remove invasive species from plant collections. If for any reason the decision is made to retain an invasive species, ensure its control and provide strong interpretation to the public explaining the risk of the species and its function in the garden.

Seek to control harmful invasive species in natural areas managed by the garden and assist others in controlling them on their property, whenever possible.

Promote non-invasive alternative plants or help develop non-invasive alternatives through plant selection or breeding.

If your institution participates in seed or plant distribution, do not distribute known invasive plants except for bona fide research purposes and consider the consequences of distribution outside your biogeographic region. Consider attaching a statement of caution to species that appear to be potentially invasive but have not been fully evaluated.

Increase public awareness about invasive plants. Provide information on why they are a problem, their origin, mechanisms of harm and need for prevention and control. Work with local nurseries and seed industries to assist the public in environmentally safe gardening and sales.

Participate in developing, implementing or supporting regional, national or local early warning systems for immediate reporting and control.

Participate in the creation of regional lists of concern.

Become informed about the invasiveness of species within your institution in other biogeographic regions. Compile and share this information in a manner accessible to all.

Become partners with other organizations in the management of harmful invasive species.

Follow all laws on importation, exportation, quarantine and distribution of plant materials across political boundaries. Be sensitive to conventions and treaties that deal with this issue and encourage affiliated organizations (plant societies, garden clubs, etc.) to do the same.

-

VII. Voluntary Code of Conduct for Landscape Architects

Work with local plant ecologists, horticulturists, nurseries, botanic gardens, conservation organizations and others to determine what species in your region either are currently highly invasive or show aggressive potential.

Increase interaction with other professionals and non-professionals to identify alternative plant material and other solutions to problems caused by harmful invasive plants.

Take advantage of continuing education opportunities to learn more about the invasive species issue.

Identify and specify non-invasive species that are aesthetically and horticulturally suitable alternatives to invasive species in your region.

Eliminate specification of species that are invasive in your region.

Be aware of potential environmental impacts beyond the designed and managed area of the landscape plan (for example, plants may spread to adjacent natural areas or cropland).

Encourage nurseries and other suppliers to provide landscape contractors and the public with non-invasive plants.

Collaborate with other local experts and agencies in the development and revision of local landscape ordinances. Promote inclusion of invasive species issues in these ordinances.

VIII. Voluntary Code of Conduct for the Gardening Public

Ask for only non-invasive species when you purchase plants. Plant only environmentally safe species in your gardens. Work towards and promote new landscape design that is friendly to local ecosystems.

Seek the best information on which species are invasive in your area. Sources could include botanical gardens, nurseries, horticulturists, conservationists and Government agencies.

Remove invasive species from your property and replace them with non-invasive species suited to your site and needs.

Do not trade plants with other gardeners if you know they are species with invasive characteristics.

Request that botanical gardens and nurseries promote, display and sell only non-invasive species.

Help educate your community and other gardeners in your area through personal contact and in such settings as garden clubs and other civic groups.

Ask garden writers and other media to emphasize the problem of invasive species and provide information. Request that garden writers promote only non-invasive species.

Invite speakers knowledgeable on the invasive species issue to speak to garden clubs, schools and other community groups.
Seek the best information on control of invasive plant species and organize neighbourhood work groups to remove invasive plant species under the guidance of knowledgeable professionals.

Volunteer at botanical gardens and natural areas to assist ongoing efforts to diminish the threat of invasive plants.

Participate in early warning systems by reporting invasive species you observe in your area to the relevant authority, i.e. the BEST Commission, Department of Agriculture or the Botanical Gardens.

Assist garden clubs to create policies regarding the use of invasive species not only in horticulture, but in activities such as flower shows.

Urge florists and other to eliminate the use of invasive plant material.

IX. Voluntary Code of Conduct for Nursery Professionals

Ensure that the invasive potential of plants is assessed prior to introducing and marketing a plant species new to The Bahamas. Invasive potential should be assessed by the introducer or qualified experts using risk assessment methods that consider plant characteristics and prior observations or experience with the plant elsewhere in the world.

Additional insights may be gained through extensive monitoring on the nursery site prior to distribution.

Work with local experts and stakeholders to determine which species are either currently invasive or will become invasive. Identify plants that could be suitable alternatives in your area.

Develop and promote alternative plant material through plant selection and breeding.

Where agreement has been reached among nursery associations, Government, academia and ecology and conservation organizations, phase out existing stocks of invasive species in areas where they are considered to be a threat.

Follow all laws on importation and quarantine of plant materials across political boundaries.

Encourage customers to use non-invasive plants.

X. Voluntary Code of Conduct for Zoos and Aquaria

Conduct an internal review examining all activities that provide an opportunity to prevent the spread of invasive species and to inform visitors on the issue.

Avoid introducing invasive animals by establishing an invasive animal assessment procedure. This procedure should involve responsible and regular monitoring of the facility.

Take due care to prevent the release or escape of animals that are known to cause damage as invasives or may be potential invasives.

Remove invasive species from exhibits or displays. If the decision is made to retain an invasive species, ensure its control and containment and provide strong interpretation to the public explaining the risk associated with the species and its function in the facility.

If your institution participates in breed stock exchange, do not distribute known invasive animals except for bona fide research purposes and consider the consequence of distribution outside your biogeographic region. Consider attaching a statement of caution to species that appear to be potentially invasive but have not been fully evaluated.

Increase public awareness about invasive animals. Provide information on why they are a problem, their origin, mechanisms of harm and need for prevention and control.

Participate in developing, implementing or supporting regional, national or local early warning systems for immediate reporting and control.

Participate in the creation of regional lists of concern.

Become informed about the invasiveness of species within your facility in other biogeographic regions. Compile and share this information in a manner accessible to all.

Become partners with other organizations in the management of harmful invasive species.

Follow all laws on importation, exportation, quarantine and distribution of animals across political boundaries. Be sensitive to conventions and treaties that deal with this issue and encourage affiliated organizations to do the same.

XI. Voluntary Code of Conduct for Farms (Agricultural and Aquacultural)

Ask for only non-invasive species when you purchase livestock or fish stock. If for any reason, the decision is taken to farm invasive species, ensure that they are controlled and contained through appropriate mechanisms, e.g. fencing to prevent escape or breeding with native species.

Take due care to prevent the release or escape of domestic animals that are known to cause damage as feral animals, e.g. pigs and goats.

Take due care to prevent the release or escape of livestock or fish stock that are known to cause damage due to their invasive characteristics or potential.

Seek information on which species are invasive in your area. Sources could include breeders, veterinarians, conservationists and Government agencies.

Do not trade stock with other farmers if you know that they are species with invasive characteristics.

Request that breeders and dealers promote and sell non-invasive species.

Help educate your community and other farmers in your area through personal contact and in such settings as farmers' association meetings.

Ask writers and other media to emphasize the problem of invasive species and be willing to provide information.

Invite speakers knowledgeable on the invasive species issue to speak to farmers' association meetings, schools and other community groups.

Seek the best information on control of invasive animal species.

Participate in early warning systems by reporting invasive species you observe in your area to the relevant authority, i.e. the BEST Commission, Department of Agriculture or Department of Fisheries.

Assist farmers' associations to create policies regarding the use of invasive species in agriculture and aquaculture.

XII. Voluntary Code of Conduct for Pet Stores, Breeders and Dealers

Ensure that the invasive potential of animals is assessed prior to introducing and marketing an animal species new to The Bahamas. Invasive potential should be assessed by the introducer or qualified experts using risk assessment methods that consider animal characteristics and prior observations or experience with the animal elsewhere in the world.

Additional insights may be gained through extensive monitoring at your facility prior to distribution.

Work with local experts and stakeholders to determine which species are either currently invasive or will become invasive. Identify animals that could be suitable alternatives in your area.

Where agreement has been reached among associations, Government, academia and ecology and conservation organizations, phase out existing stocks of invasive species in areas where they are considered to be a threat.

Follow all laws on importation and quarantine of animals across political boundaries.

Encourage customers to purchase non-invasive pets or livestock.

XIII. Voluntary Code of Conduct for Pet Owners

Ask for non-invasive species when you purchase pets. If the decision is taken to own an invasive species, ensure that it is contained and controlled through confinement to your property and reproductive control (e.g. spaying and neutering).

Seek information on which species are invasive in your country. Sources could include zoos, aquaria, pet stores, ecologists, conservationists and Government agencies.

Do not trade pets with other pet owners if you know they are species with invasive characteristics.

Request that pet stores and breeders promote, display and sell non-invasive species.

Help educate your community and other pet owners in your area through personal contact and in such settings as pet shows, training sessions, visits to the vet and other gatherings involving activities with pets.

Ask writers and other media to emphasize the problem of invasive species and provide information.

Invite speakers knowledgeable on the invasive species issue to speak to associations, clubs, schools and other community groups.

Seek the best information on control of invasive animal species and work with other like-minded individuals to remove these species from your area in an ethical and humane manner under the guidance of knowledgeable professionals.

Volunteer at zoos, aquaria, national parks and other natural areas to assist ongoing efforts to diminish the threat of invasive animals.

Participate in early warning systems by reporting invasive species you observe in your area to the relevant authority, i.e. the BEST Commission, Department of Agriculture or the Animal Control Unit.

XIV. Voluntary Code of Conduct for Veterinarians

Work with local ecologists, breeders, pet stores, conservation organizations and others to determine what species in your region either are currently highly invasive or show aggressive potential.

Increase interaction with other professionals and non-professionals to identify non-invasive animals and other solutions to problems caused by harmful invasive animals.

Take advantage of continuing education opportunities to learn more about the invasive species issue.

Identify and specify non-invasive species that are aesthetically and ecologically suitable alternatives to invasive species in your region.

Eliminate specification of species that are invasive in your region.

Encourage breeders and pet stores to provide farmers, private firms and the public with non-invasive animals.

XV. Stakeholder Participant List

Abaco

David Knowles
Anita Rolle
Beatrice Moxey
Derrick Bailey
Michael Albury
A.J. Wells
Mel Wells
Don Cornish
Eric Collie
Ed Newell
Brickell Brennen
John Hedden
Moxey Williams
A.L. Knowles
John Bethell
Doug Evans
Lisa Evans
Cleveland Banks

Molly Roberts
Chris Roberts
Mimi Rehor
Dave Ralph
Kathy Ralph
Erin Pagliaro
Ron Pagliaro
Jack Hardy
Bobby Jones
Kendy Anderson
Wayne Cornish
H.B. Pinder
Paul Pinder
Chris Bergh

Andros

Donald Cash
Fred Pyfrom
Mary Wilson
Margo Blackwell
Dewitt Edgecombe
Deon Sweeting
Peter Douglas
Bill Adderley
Donna McQueen
Theresa Minnis
Reverend N.W. Hamilton

Eleuthera

Rufus E. Johnson
Lionel Fernander
Lloyd C. Johnson III
Michael C. M. Culmer
Robert Patterson
Lawrence Griffin
Bessie Culmer
Branka Hanford
Kevin Joseph Jr.
Manon Tousignant
Kingsley A. Bethel
Drexel Boothe
Kendal Sands
Sally Chisholm

Grand Bahama
Please call Nakira for these names

New Providence

Eugene Torchon-Newry
Lester Gittens
Timothy Bethel
Carol Albury
Dr. E. McPhee
Dr. Maurice Isaacs
Nehemiah Francis
Timothy Johnson
Gwen Hammerton
Dr. John Hammerton
S.J. Miller
Robert Myers
Stephen Bethel
Paul Dean
Earl Seymour
Pastor James Redmon
Marian Rolle
William Fielding
Robin Wright
Eric Rose
Derek Smith
Earlston McPhee
Daniel Drost
Eric Carey
Eleanor Phillips
Casuarina McKinney
Stephen Bellot
Stephan Moss
Sharrah Moss
Nakira Wilchcombe
Deon Stewart
Stacey Wells-Moultrie

Acklins & Crooked Island
Berry Islands
Bimini
Exuma & Ragged Island
Inagua
Long Island
Mayaguana
Run Cay & San Salvador

Still awaiting response for above islands;
will forward by Monday.

XVI. List of Known Invasive Alien Species in The Bahamas

Plant Species

Abrus precatorius	Rosary pea
Alibiza lebbeck	Woman's tongue
Antigonon leptopus	Coral vine
Asparagus densiflorus	Asparagus fern
Bauhinia variegata	Poor man's Orchid, Orchid tree
Casuarina equisetifolia	Australian Pine, Beefwood
Casuarina glauca	suckering Australian pine
Cestrum diurnum	Day jessamine
Colubrina asiatica	Lather leaf
Dioscorea alata	Winged yam
Dioscorea bulbifera	Air potato
Eichhornia crassipes	Water hyacinth
Eugenia uniflora	Surinam cherry
Haematoxylon campeachianum	Logwood
Impomoea purpurea	Morning Glory
Jasminum fluminense	Azores jasmine, Brazilian jasmine
Lantana camara	Lantana, Shrub verbena, angel lips, big sage, black sage, white sage, prickly lantana
Leucaena glauca	Jumbey
Melaleuca quinquenervia	Melaleuca, paper bark
Nephrolepis multifora	Asian sword fern
Panicum repens	Torpedo grass
Pennisetum purpureum	Napier grass
Pimenta racemosa	Bay Rum
Prunus amygdalus	Almond
Ricinus communis	Castor Bean
Ruellia brittoniana	Mexican petunia
Scaevola taccada	Asian Scaevola, Hawaiian seagrape, White inkberry
Schefflera actinophylla	Schefflera, Queensland umbrella tree
Schinus terebinthifolius	Brazilian pepper, Bahamian holly
Spathodea campanulata	African tulip tree, flame of the forest
Syngonium podophyllum	Arrow head vine
Thespesia populnea	Seaside mahoe, cork tree, Spanish cork
Trachelosperumum jasminoides	Star Jasmine
Wedelia trilobata	Wedelia, carpet daisy

Bird Species

Columba livia	Rock Dove

Molothrus bonariensis	Shiny Cowbird
Passer domesticus	House Sparrow
Streptopelia decaocta	Eurasian Collared Dove

Terrestrial Animals Species

Bos taurus	Holstein
Canine	Dogs (all breeds and types)
Capra hicus	Goat
Elaphe guttata	Corn snake
Eleutherodactylus coqui	Caribbean tree frog, common coqui
Equus asinus	Donkey
Felis catus	Cats (all breeds and types)
Mus musculus	Mouse
Ovis aries	Sheep
Procyon lotor	Racoon
Rattus norvegicus	Norway rat
Rattus rattus	Ship rat
Solenopsis invicta	Red imported fire ant
Sus scrofa	Pig
Trachemys scripta	Red-eared slider
Loxosceles reclusa	Brown recluse spider
Wasmannia auropunctatus	Little fire ant

Aquatic Species

Amphiprion sp	Clown fish
Artemia cysts	Brine shrimp
Callinectes sapidus	Blue crab
Callionymus lyra	Dragonet
Cherax quadricarinatus	Red claw
Chiloscyllium punctatum	Banded shark
Chkosoyllium piunctatum	Brown Bamboo shark
Chrysoara quinquechirra	Sea nettle
Family Cichlidae	Cichlid fish
Crassostrea virgnica	American oyster
Dunaliella sp.	Green algae
Epinephelus lanceolatus	Queenland grouper
Euxiophipops navarchis	Blue-girded angelfish
Euxiophipops xanthometapm	Yellow-faced angelfish
Hemiscylliidae	Bamboo shark
Heterodontus zebras	Zebra Bullhead shark
Nannochloropsis oculata	Algae
Oreochrommis ureblepis	Tilapia
Radianthus	Sea anemone