

# **Report for the Secretariat of the Pacific Regional Environment Programme (SPREP)**

## **Compile and Review Invasive Alien Species Information for the Federated States of Micronesia and its constituent states Chuuk, Kosrae, Pohnpei and Yap**

March 2015

Shyama Pagad  
Biodiversity Data Management Ltd.  
Programme Officer, IUCN SSC Invasive Species Specialist Group



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# Glossary and Definitions

## NATIVE SPECIES

Plants, animals and other organisms that occur naturally on an island or in a specified area, having either evolved there or arrived there without human intervention.

## INTRODUCED (= ALIEN SPECIES)

Plants, animals and other organisms taken beyond their natural range by people, deliberately or unintentionally.

## INVASIVE SPECIES

Introduced species that become destructive to the environment or human interests; can also include some native species that proliferate and become destructive following environmental changes caused by human activities.

## BIOSECURITY

Sometimes used to include all aspects of invasive species management, but in this document used in the more restricted sense of preventing the spread of invasive species across international or internal borders, including between islands.

## SURVEILLANCE

Monitoring to detect the arrival of new incursions of invasive species.

## MONITORING

Programmes to detect change, e.g. in the distribution of invasive species, the success of management projects etc.

## CONTAINMENT

Keeping an invasive species within a defined area.

## CONTROL

Reducing the population of an invasive species.

## BIOLOGICAL CONTROL / BIOCONTROL

Controlling an invasive species by introducing a natural enemy, such as an insect or fungus, that specifically attacks the target species and does not attack other native or economically important species.

Definitions as set out in the *Guidelines for Invasive Species Management in the Pacific*



# Compile and Review Invasive Alien Species Information – Report

## Introduction

A Global Environment Facility (GEF) funded project is currently being implemented in the Federated States of Micronesia (FSM) titled the “*Prevention, Control and Management of Invasive Alien Species in the Pacific Islands*”. This is a multicountry project and includes the Niue, Cook Islands, Marshall Islands, Papua New Guinea, Palau, Tonga, Kiribati, Samoa and Vanuatu. Activities within the framework of this project include the conservation of priority species and ecosystems and the management of invasive alien species. Please see Table 1 below for list of key deliverables identified by the Government of the FSM.

*Table 1: List of Activities identified by the Government of the Federated States of Micronesia for implementation as part of the GEF funded project 'Prevention, Control and Management of Invasive Alien Species in the Pacific islands'. This information has been extracted from the table of 'Key Deliverables'*

Activity	Deliverable
Attend RISC biannual meeting of Micronesian Chief Executives to provide advice about IAS management and resource needs.	Meeting minutes and communiqué report IAS discussions involving RMI.
Collect, test and release known agents for Mikania and Clidemia biocontrol.	Report about agent rearing and release sites. Agents released. Monitoring data to determine effectiveness.

FSM and its constituent states have undertaken to develop a National Invasive Alien Species Strategy and Action Plan (NISSAP) in 2015. This desktop study is being implemented to support the development of the NISSAP.

The following areas were identified for this desktop review leading to the development of a comprehensive **invasive alien species database for the Government of the FSM**

- ☞ An annotated inventory of IAS by state, island, invasiveness and habitat including risk assessment ranking
- ☞ An annotated inventory of key endemic and threatened species at state, island and site level
- ☞ An annotated inventory of designated natural areas and ecosystems with notes on threat/pressures on these areas
- ☞ An annotated inventory of ‘at risk’ invasive species in neighbouring countries with pathways of introduction and dispersal



- ☞ An annotated inventory of all invasive species prevention, management/control related projects undertaken in FSM and its constituent states including on-going initiatives

A comprehensive desktop review was undertaken. Journal articles, reports, project documents and data and information from all significant databases was surveyed for relevant information. All the data and information collated was structured into annotated inventories at the country and where appropriate at the state level

A concise discussion is presented based on a synthesis of the data and information collated highlighting key invasive alien species already occurring in the country or at the verge of potential invasion (considering pathways of introduction), key endemic and threatened species, and threatened ecosystems with description of threats/pressures. State level syntheses for relevant sections have been prepared.

The discussion is presented in five sections and includes four Appendices (**Appendix 1-4**) that summarise results for each of the four states of Chuuk (**Appendix-1**), Kosrae (**Appendix-2**), Pohnpei (**Appendix-3**) and Yap (**Appendix-4**) and a Bibliography<sup>1</sup>

- ☞ Section 1- presents a comprehensive account of alien and invasive species in FSM at the country and state level. Impacts on native and endemic species and natural areas have been recorded where information available
- ☞ Section 2- presents information on 'at risk' alien and invasive species present in neighbouring countries and key trading partners including pathways and vectors of introduction and spread
- ☞ Section 3- describes key endemic and threatened species of FSM as well as threats to these species
- ☞ Section 4- describes the priority conservation areas and ecosystems of FSM as well as threats to the ecological integrity of these sites. State wise inventories have also been prepared
- ☞ Section 5- describes all invasive species related management action undertaken in FSM and constituent states including completed, on-going and planned

All data and information collated are compiled in sortable annotated lists in Excel format that facilitate analysis and allow users to store, filter, manipulate and graph data. These inventories are annexed to this report (see **FSM Inf 1- Inf 6**).

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<sup>1</sup> All source information has been submitted in a country source information folder



## Key Information Sources

Five main online resources were used for data and information related to IAS; they are the IUCN ISSG Global Invasive Species Database (GISD)<sup>2</sup>, Pacific Island Ecosystems at Risk (PIER)<sup>3</sup>, CAB International Invasive Species Compendium (ISC)<sup>4</sup>, FishBase<sup>5</sup> and SeaLifeBase<sup>6</sup>. Additional searches were conducted on Biological Abstracts Database, Google Scholar and other reports.

The ISSG holds extensive archives collected over a decade and of IAS information in species folders, country folders and in thematic folders; the archives are enhanced on a daily basis. The GISD focuses on alien species known to have negative impacts on native biodiversity and ecosystems. It features over 850 species profiles of some of the most harmful species. While there are taxon and geographical biases on selection of species (due to funding sources and priority themes) that are featured on the GISD, the Oceania region is well represented with a large number of harmful species listed. Other information extracted from the GISD included information on taxonomy, species organism type, common names, habitat type, biome, biostatus information and information on pathways of introduction and spread of these species.

The PIER database is focused on plant species that are known to have been introduced to the Pacific region including the Pacific Rim. Information extracted from PIER included biostatus of alien species at island level, common names (in Chuukese, Kapingamarangi, Kosraen, Pingelapan, Pohnpein, Satawalese, Ulithian, Woleaian, Yapese), habitat information and most importantly links to risk assessments conducted for the Pacific region. PIER data on the occurrence of alien plants is drawn from all past and recent surveys undertaken by experts including Lorence & Flynn 2010<sup>7</sup> and Herrera et al 2010<sup>8</sup>.

CABI ISC is an encyclopedic type of database on invasive alien species that impact biodiversity and livelihoods. CABI maintain compendia on Crop Protection, Forestry, Aquaculture and Animal Health and Production. The CABI ISC lists invasive species that impact biodiversity as well as pests of crops and pathogens. The focus for this project was on species that are known to impact biodiversity and ecosystems.

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<sup>2</sup> Global Invasive Species Database < <http://www.issg.org/database/welcome/>>

<sup>3</sup> Pacific Islands Ecosystems at Risk < <http://www.hear.org/pier> >

<sup>4</sup> CAB International Invasive Species Compendium < <http://www.cabi.org/isc/default.aspx?site=144&page=4066>>

<sup>5</sup> FishBase < <http://www.fishbase.org/>>

<sup>6</sup> SeaLifeBase < <http://www.sealifebase.org/>>

<sup>7</sup> Lorence, David H./Flynn, Timothy. 2010. Checklist of the plants of Kosrae. Unpublished checklist. National Tropical Botanical Garden, Lawai, Hawai'i. 26 pp.

<sup>8</sup> Herrera, Katherine/Lorence, David H./Flynn, Timothy/Balick, Michael J. 2010. Checklist of the vascular plants of Pohnpei with local names and uses. Allertonia, in press. National Tropical Botanical Garden, Lawai, Hawai'i. 146 pp.



FishBase and SeaLifeBase are databases focused on all fish species known to science. Data and information included in FishBase includes ecological information, information on traits and distribution at country and ecosystem level including in the introduced range of fish species in the aquatic system (both marine and freshwater). SeaLifeBase consists of similar information on marine species.

The IUCN Red List of Threatened Species<sup>9</sup> was the key resource consulted for information on native and endemic species. The World Database on Protected Areas (WDPA) dataset featured on the Protected Planet Site<sup>10</sup> was used to identify all designated protected areas. Birdlife International's Datazone<sup>11</sup> was consulted for information on native birds and designated Important Bird Areas and Endemic Bird Areas in FSM.

National reports to the Convention on Biological Diversity (CBD) and the National Biodiversity Strategy and Action Plan's (NBSAPS) including those of each state of FSM were key sources of information on national priorities

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<sup>9</sup> IUCN Red List of Threatened Species <<http://www.iucnredlist.org/>>

<sup>10</sup> Protected Planet <<http://www.protectedplanet.net/>>

<sup>11</sup> BirdLife International Datazone <<http://www.birdlife.org/datazone/>>



## SECTION 1

# Alien and Invasive Species in FSM and constituent States of Chuuk, Kosrae, Pohnpei and Yap

The Guidelines for Invasive Aliens Species Management in the Pacific describes invasive species as *“Introduced species that become destructive to the environment or human interests; can also include some native species that proliferate and become destructive following environmental changes caused by human activities.”* Invasive species can negatively impact native ecosystems and the species they contain. These impacts may disrupt the ecosystem processes, degrade habitats, reduce biodiversity and introduce diseases to flora and fauna

Island ecosystems appear to be more vulnerable to invasions. Island ecosystems tend to have fewer species present and are less complex with distance from the continent; simpler systems are less resilient to new arrivals. Introduced invasive plants, mammal predators (rats, feral cats, mongooses, stoats and pigs) and herbivores (rabbits, deer, goats and sheep), and introduced diseases have had devastating effects on native and endemic island species and their habitats.

A comprehensive desk-top review was undertaken to compile annotated inventories of introduced and invasive species that have impacts on native biodiversity and natural areas were recorded in FSM, its constituent states, atolls and islands.

## Results of information review

Results of the desktop review indicate that 597 alien species that are known to have impacts on the environment in their introduced range (invasive and potentially invasive) have been recorded in FSM. The majority of these are plant species in the terrestrial environment/system. Over 185 species in this inventory are classified as ‘invasive’ based on 1) evidence of impact or 2) evidence or record of aggressive spread in the natural environment. The remaining species are classified as ‘invasiveness not specified’).

Annotations that have been recorded for each of the species include higher taxonomy, organism types, species preferred habitats, pathways of introduction and spread, risk assessment scores with links and biological status. A list of common names of alien and invasive plant species in Chuukese, Kapingamarangi, Kosraen, Pingelapan, Pohnpeian, Satawalese, Ulithian, Woleaian, Yapese and English (from PIER-2014) has been provided. Species have been recorded at the country level, as well as at atoll and island level. Individual annotated inventories have been prepared at the country level (FSM) and at each of the four state level (Chuuk, Pohnpei, Kosrae



and Yap) (see FSM Inf-1, Chuuk-Inf, Kosrae-Inf, Pohnpei-Inf and Yap-Inf). State level summaries are provided in Appendix 1-4) The supporting information includes the annotated inventory as well as a alien/invasive species list.

*Note: It is possible that there may be changes in the classification of the biological status of these species related to invasiveness based on feedback received. The lack of a universal standard related to 'invasive species' terminology causes confusion in the assignation of this status*

*The review process is a critical part of this project. It is envisaged that all the records created will be reviewed and corrections made and gaps identified. Revisions to the dataset will be made based on comments before finalisation of the invasive alien species inventory.*



## SECTION 2

### Pathways of introduction and spread of invasive alien species

Information on the identity of the pathways of introduction and spread of invasive alien species along with details of vectors are necessary for the prevention of introduction of potentially invasive species and also for the containment of further spread of established invasions. This knowledge allows conservation managers to a) Prepare for the arrival of known (and unwanted) potentially invasive species (and other species of uncertain status that may prove to be likely to become invasive as determined by a risk assessment), b) Develop monitoring systems for yet unknown (and unwanted) potentially invasive species applicable in specific areas or industries, c) Establish barriers (physical, legislative, community-managed) to the introduction of unwanted species, d) Prepare for the spread of recognized invasive species that have already entered a country (or ecosystem) and e) Develop communication campaigns and codes of conduct addressing key stakeholders to support preventative measures (from the Invasive Alien Species Pathway Management Resource<sup>12</sup>)

The two key pathways of entry of introduced and potentially invasive species into island nations are through the Air and Shipping (including visiting yachts) services.

Where pressurized aircraft cabins and holds are not screened or treated it is possible for mammals and invertebrates to enter these areas prior to a flight, survive the journey and be released on arrival at the destination. Whilst this may not always happen in adequate numbers for the species to establish in the new location, however it has been shown that for some invasive species the main vector for transference has been an aircraft. For example- Yellow crazy ants (*Anoplolepis gracilipes*) have been spread from their natural range by becoming accidental stowaways on aircraft causing these species to establish globally. The yellow crazy ant through its ability to forage night and day and extremely competitive foraging techniques is causing severe environmental damage through displacing keystone species and by degrading leaf litter, reducing seedling recruitment and speeding up microbial decomposition processes.

Ships ballast water has been the introduction pathway for many damaging and costly invasive species. The ballast water that is pumped into tanks to stabilise cargo ships is continually loaded and discharged to balance a continually changing freight manifest. Water can be taken on in large quantities in one harbour and then discharged in the next; this may be a few kilometres

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<sup>12</sup> The Invasive Alien Species Pathway Management Resource is a toolkit under development  
<<http://www.pathway-toolbox.auckland.ac.nz/>>



away, or in a new country several thousand kilometres away. When the water is taken on board and likewise when it is discharged there are few controls on what is taken on board in the water, in this way species are spread around the planet and this vector has been the cause of the spread of a large number of pest species.

Ships including yachts also move simple static species when these attach themselves to the ship and form a small colony on a ship's hull. This can develop during a voyage, or between periods of renewed anti-fouling, and are spread merely by their normal processes of reproduction being on a mobile substrate. Depending on the methods of anti-fouling, when a ship is taken into dry dock and has its hull cleaned species that are removed, if not carefully disposed of, can establish locally when the dock is re-flooded or in adjacent waterbodies and drains. This vector provides for the spread of many mollusc, fanworm, algae and aquatic plant species (Information on pathways from the Invasive Alien Species Pathway Management Resource)

Knowledge of pathways and vectors of spread of established invasive alien species is crucial for their containment. Assessing the risk of spread of species is important especially for taking decisions regarding the allocation of scarce resources for the control of established invasive species. Information on pathways of introduction and spread has been included in **FSM- 1**- see 'SPREAD/DISPERSAL' and 'PATHWAYS OF INTRODUCTION'- notes have been reproduced for plant species from PIER (2013) and ISSG (2013)

Inventories of species both native and known invasive species were created for some of the key Pacific Island nations and trading partners of FSM – Marshall Islands, Guam, Palau and the Hawaiiin Islands (USA) (see **FSM-Inf-2**) (in terms of potential introduction of species through human mediated introductions). Inventories were scanned to identify high risk species (through risk assessment information for plant species) that occurred in neighbouring countries and trading partners and were not known to be present in FSM. An inventory of these 'at risk' species with annotations of their known pathways of introduction and spread was created (see **FSM-Inf-2**).

*Note: This exercise of identification of species that may be of potential risk to FSM was merely one of matching lists of species. No research was conducted to evaluate the potential risk based on climate matching etc.*



## Results of surveys

A survey of islands in Micronesia and American Samoa for IAS was requested by the Pacific Islands Committee, Council of Western State Foresters and undertaken by experts. Surveys included (1) a survey of several islands of Chuuk, from 30 March to 4 April 2000 (Space et al 2000a); (2) a survey of the island of Kosrae from 24 to 28 March 2000 (Space et al 2000b) and (3) and as part of a larger survey of selected Micronesian Islands- a survey of the Islands of Pohnpei and Yap from July 19 to August 6, 1998 (Space and Falanruw 1999). Reports of these surveys include tables of list of alien and known invasive species that are present in the neighbouring islands that could potentially be introduced to the surveyed area. They include:

- Dangerous species not known to be in Micronesia (Space and Falanruw 1999)
- Species that are invasive elsewhere in similar ecosystems but are not known to be present on Kosrae (Space et al 2000b(1))
- Invasive species present in Guam, Pohnpei or Hawai'i but not present in Kosrae (Space et al 2000b(2))
- Species that are invasive elsewhere in similar ecosystems but are not known to be present in Chuuk (Space et al 2000a(1))
- Invasive species present in Guam or Pohnpei but not present in Chuuk (Space et al 2000a(2))

These listed tables have been extracted and provided ([see FSM Inf-3](#))



## SECTION 3

### Federated States of Micronesia and its biodiversity

The Federated States of Micronesia (FSM) lie in the eastern part of the Caroline Islands in the western Pacific Ocean. It covers a land area of approximately 700 sq kms. FSM consists of four states- Chuuk, Kosrae, Pohnpei and Yap, all of them except Kosrae are made up of numerous atolls.

FSM is a Party to the Convention on Biological Diversity (CBD) and the Cartagena Protocol on Biosafety<sup>13</sup>. FSM's commitments to the CBD are the basis of all priorities related to the conservation of biological diversity. The Government of FSM signed and ratified the Convention in 1992 and became a Party to it in 1994. The principle instrument for implementing the CBD at the national level is the National Biodiversity Strategy and Action Plan (NBSAP). FSM National Biodiversity Strategy and Action Plan (NBSAP) was developed in 2002. Measures taken for the implementation of the Convention and their effectiveness have to be reported to the Convention in National Reports. A First, Second, Fourth and Fifth National Reports were submitted in 2001, 2002, 2010, 2014 respectively<sup>14</sup>. Biodiversity Strategies were prepared for each of the States in 2004.

Island biodiversity, mountain biodiversity, forest biodiversity, Inland water ecosystems etc. are thematic programmes under the CBD. Protected Areas is a cross-cutting issue within the CBD. Each of these themes has a programme of work, in the case of protected areas known as the Programme of Work on Protected Areas (PoWPA)<sup>15</sup>. Countries are also required to submit action plans related to the PoWPA. FSM has submitted a National Action Plan for PoWPA.

In addition to the CBD, FSM is a signatory to the Convention concerning the Protection of the World Cultural and Natural Heritage - World Heritage Sites<sup>16</sup>, United Nations Framework Convention on Climate Change (UNFCCC)<sup>17</sup>, and the United Nations Convention on the Law of the Sea (UNCLOS)<sup>18</sup>. Regionally FSM is a member of the Secretariat of the Pacific Region

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<sup>13</sup> Convention on Biological Diversity (CBD) < <http://www.cbd.int/>>

<sup>14</sup> National Reports and NBSAPS- RMI (CBD) < <http://www.cbd.int/reports/search/?country=fm>>

<sup>15</sup> Programme of Work on Protected Areas (PoWPA) <<http://www.cbd.int/protected/implementation/actionplans/>>

<sup>16</sup> Convention concerning the Protection of the World Cultural and Natural Heritage - World Heritage Sites < <http://whc.unesco.org/en/conventiontext/>>

<sup>17</sup> United Nations Framework Convention on Climate Change (UNFCCC) <<http://unfccc.int/2860.php>>

<sup>18</sup> United Nations Convention on the Law of the Sea (UNCLOS)

<[http://www.un.org/depts/los/convention\\_agreements/convention\\_overview\\_convention.htm](http://www.un.org/depts/los/convention_agreements/convention_overview_convention.htm)>



Environment Programme (SPREP)<sup>19</sup> and the Secretariat of the Pacific Community (SPC)<sup>20</sup>. FSM has also signed up to the Memorandum of Understanding for the Conservation of Cetaceans and their Habitats in the Pacific Islands Region<sup>21</sup>. This Memorandum is concluded under the auspices of the Convention on the Conservation of Migratory Species of Wild Animals (CMS)<sup>22</sup> in partnership with SPREP.

## Endemic and Threatened Species of FSM

The following resources have been used to compile records of endemic and native species of FSM that are under risk of extinction (threatened and or endangered) and collate information on their conservation status and threats- they include the IUCN Red List of Threatened Species™<sup>23</sup>, Journal articles, reports including the FSM NBSAPs and National Reports submitted to the CBD.

### IUCN Red List of Threatened Species

The IUCN Red List of Threatened Species provides taxonomic, conservation status and distribution information on plants and animals that have been globally evaluated using the IUCN Red List Categories and Criteria. Species are classified as Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) are threatened with the risk of extinction. Other categories include Near Threatened (NT), Lower Risk (Conservation dependant) (LR/cd), Least Concern (LC) and Data Deficient (DD). Species that are Extinct (EX) are also included. The IUCN Red List also provides information on the major threats driving the decline of these species populations.

A query on 'FSM' on the IUCN Red List results in an annotated inventory of 1293<sup>24</sup> species that are known to be native to the country. **The list includes species that have been declared extinct, endemic species, species that have a restricted range that includes some Pacific countries, as well as those with a world-wide distribution.** These species have been conservation assessed using IUCN Red List criteria and categories. A majority of the assessed species belong to Animalia (1235) - and 58 to Plantae.

A majority of these species occur in the marine biome (1134) followed by terrestrial species (252) and freshwater (152) (see Table 2 for a breakdown of species and biomes). In the marine

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<sup>19</sup> Secretariat of the Pacific Region Environment Programme SPREP < <http://www.sprep.org/> >

<sup>20</sup> Secretariat of the Pacific Community SPC < <http://www.spc.int/> >

<sup>21</sup> Memorandum of Understanding for the Conservation of Cetaceans and their Habitats in the Pacific Islands Region < <http://www.pacificcetaceans.org/> >

<sup>22</sup> Convention on the Conservation of Migratory Species of Wild Animals (CMS) < <http://www.cms.int/en/node/3916> >

<sup>23</sup> IUCN Red List of Threatened Species < <http://www.iucnredlist.org/> >

<sup>24</sup> The actual query result is 1294 species- this includes *Homo sapiens* which has been excluded in this case



biome most of the species are found in the shallow marine environment from low waters to depths of 200 mts (600 ft) a zone that is characterized by relatively abundant nutrients and biologic activity because of its proximity to land. Together with the estuarine habitat, it is the most productivity in the sea. This is the zone where corals occur and provide the major food source to fish.

*Table 2: Threatened Species Biomes- FSM*

Environment/System	Number of species
Terrestrial	121
Freshwater	15
Marine	994
Terrestrial/Freshwater	23
Terrestrial/Marine	50
Terrestrial/Freshwater/Marine	56
Freshwater/Marine	33

164 of the 1293 species assessed are classed into an IUCN threatened category (6 'Critically Endangered (CR)', 19 'Endangered (EN)' and 139 'Vulnerable (VU)') (see Table 3 for the breakdown in Red List categories).

*Table 3: Native species of FSM that have been conservation assessed using the IUCN Red List criteria*

IUCN Red List Category	Numbers of species
Extinct (EX)	2
<b>Critically Endangered</b>	<b>6</b>
<b>Endangered (EN)</b>	<b>19</b>
<b>Vulnerable (VU)</b>	<b>139</b>
Lower Risk (Conservation dependant)	3
Near Threatened (NT)	146
Data Deficient (DD)	124
Least Concern (LC)	854

The inventory on conservation assessed native, endemic threatened species includes annotations on higher taxonomy, common names and synonyms, organism type,



environment/system, year assessed and status of population, and if the species is included in any of the appendices of the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora)<sup>25</sup> and the Convention on the Conservation of Migratory Species of Wild Animals (CMS)<sup>26</sup> in which the species occurs (see FSM-Inf-4).

Exploitation through overfishing and biological resource use are the worst threat impacting threatened species in FSM- most of which occur in the marine biome including fish (ray-finned and cartilagenous), echinoderms, marine mammals and reptiles. This is followed by the threat of human disturbance, the spread of invasive species and the impacts of a changing climate (flooding and dsevere weather events).

### Notes on key species

Alien mammal predators (*Rattus* spp.) (introduced to the islands by visitng whaling ships and humans) have been implicated in the extinction of the two Kosrae endemics- the Kosrae starling (*Aplonis corvina*), and the Kosrae crake (*Porzana monasa*)

Two taxa make up conservation assessed endemic species of FSM- the majority (over 60%) are molluscs (Gastropoda) and birds (Aves). Land use change (expansion of agriculture and residentaila development) habitat degradation and loss are major threats to the survival of these endemic species.

Three molluscs *Partula emersoni*, *Partula guamensis* (both endemic to the island of Pohnpei) and *Partula martensiana* are classified as Critically Endangered (CR). The primary threat to these species is predation by introduced mammals -Ship rat (*Rattus rattus*), Polynesian rat (*Rattus exulans*), Norwegian rat (*Rattus norvegicus*) and the introduced flatworm (*Platydemus manokwari*).

The Pohnpei starling (*Aplonis pelzelni*) and the Chuuk flying fox (*Pteropus insularis*) are also classified as CR. Loss of habitat to agriculture is the key threat to the survival of the fruits bat. Hunting, habitat loss to agriculture (the cultivation of *Piper* spp.) as well as predation by introduced *Rattus* spp. Are key threats to the surviving populations of the Pohnpei starling.

Agricultural land conversion to establish coconut, breadfruit, mango, banana and kava plantations, loss of valuable mangrove habitat due to building/construction and firewood impact endemic and native flying foxes including the 'Vulnerable (VU) Ponpei Flying fox (*P. molossinus*), Kosrae flying fox (*P. ualanus*) and the Yap flying fox (*P. yapensis*). Other species impacted include the Ponape skink (*Emoia ponapea*).

<sup>25</sup> CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) <<http://www.cites.org/>>

<sup>26</sup> Convention on the Conservation of Migratory Species of Wild Animals (CMS) <<http://www.cms.int/>>



## SECTION 4

# Priority Conservation Areas and Ecosystems of FSM and its constituent States

Protected areas are the cornerstone of biodiversity conservation, these designated areas of high biodiversity value host significant numbers of threatened native biodiversity and their habitats. Improving the efficacy of invasive alien species management within the boundaries of protected areas and other areas of high biodiversity value is critical in the conservation of species and natural areas

The World Database on Protected Areas (WDPA)<sup>27</sup> provides the most comprehensive dataset on protected areas worldwide. The WDPA lists 24 'Protected areas' for FSM. The areas include two UNESCO Biosphere Reserves<sup>28</sup> - Utwe UNESCO-MAB Biosphere Reserve and the And Atoll UNESCO-MAB Biosphere Reserve, nine Marine Protected Areas (MPAs), two Marine Parks and a Watershed Forest Reserve- Pohnpei Watershed Forest Reserve. (see FSM-Inf-5 and for State level inventories see Chuuk-Inf, Kosrae-Inf, Pohnpei-Inf and Yap-Inf). State level summaries are provided in Appendix 1-4)

Two Endemic Bird Area (EBA) (Yap Islands and East Caroline Islands) and 10 Important Bird Areas (IBA) have been designated by BirdLife International. These are important biodiversity areas designated to ensure the survival of viable populations of the world's threatened bird species (see FSM-Inf-5).

Conservation International (CI) has designated Key Biodiversity Areas (KBAs) in the three Biodiversity Hotspots of Oceania (Polynesia-Micronesia, East Melanesian Islands and New Caledonia) elaborated in the Critical Ecosystem Partnership Funds Ecosystem Profiles<sup>29</sup>. (see FSM-Inf-5). 52 KBAs (22 in Chuuk, five in Kosrae, ten in Pohnpei and 15 in Yap) have been designated in FSM.

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<sup>27</sup> World Database on Protected Areas –Protected Planet 2013 < <http://www.protectedplanet.net/>>

<sup>28</sup> Biosphere reserves are areas comprising terrestrial, marine and coastal ecosystems. Each reserve promotes solutions reconciling the conservation of biodiversity with its sustainable use. Biosphere reserves are nominated by national governments and remain under the sovereign jurisdiction of the states where they are located. Their status is internationally recognized < <http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/>>

<sup>29</sup> Critical Ecosystems Partnership Fund (CEPF) Ecosystem Profiles  
<[http://www.cepf.net/where\\_we\\_work/regions/asia\\_pacific/polynesia\\_micronesia/Pages/default.aspx](http://www.cepf.net/where_we_work/regions/asia_pacific/polynesia_micronesia/Pages/default.aspx)>



Additionally two areas are designated as 'Alliance for Zero Extinction Sites (AZE) Pohnpei Watershed Forest Reserve and Mount Winipot- the trigger species for these sites are the Great Truk White-eye (*Ruki ruki*) and the Pohnpei starling.

The major threats to areas of high biodiversity value are over exploitation of marine resources and species- including over-fishing and harvesting for commercial trade; destruction of habitats due to anthropogenic activities; habitat loss and decline in native and endemic species populations due to the spread of invasive alien species.

### Notes on key sites

#### And Atoll UNESCO-MAB Biosphere Reserve

And Atoll UNESCO-MAB Biosphere Reserve is a Marine Protected Area. And (Ahnd, Ant) Atoll is one of the most biologically diverse and undisturbed of Pohnpei's Atolls. This Atoll is Identified as a "Priority Action Area" in FSM's Eco-regional Plan under the NBSAP. "Pohnpei, is home to 13 species of reptiles, including the green turtle (*Chelonia mydas*) and hawksbill turtle (*Eretmochelys imbricata*), 25 bird species, seven mammals, and hundreds of other marine species" (UNESCO Biosphere Reserve).

Potential threats to marine ecosystems in the Pacific region include overexploitation, pollution, coastal development and the impacts of a changing climate including severe weather events

#### Mount Winipot Conservation Area

Mount Winipot Conservation Area contain some of the most unique and native forests of Chuuk. Besides several trigger bird species such as the Endangered (EN) Chuuk Monarch (*Metabolus rugensis*), Great Truk White-eye (*Ruki ruki*) and Vulnerable (VU) Caroline Ground-dove (*Alopecoenas kubaryi*), the area is home to the Critically Endangered (CR) Chuuk Flying Fox (*Pteropus insularis*) and the endemic poison tree (*Semecarpus kraemeri*). Threats to this area include land use change (expansion of Agriculture) and Residential and commercial development. Other designations of the Mount Winipot area include Key Biodiversity Area (KBA), Protected Area and Alliance for Zero Extinction Site (trigger species EN Great Truk White-eye).

While habitat degradation through low level timber extraction and logging is prevalent, the old native secondary growth forests are relatively undisturbed. A potential threat is the introduction of the brown tree snake (*Boiga irregularis*) from Guam, where it has caused the extinction of several bird species. Other threats include the impacts of a changing climate- rising sea levels and habitat destruction



## The Pohnpei Watershed Forest Reserve IBA

The Pohnpei Watershed Forest Reserve IBA is adjacent to the Pohnpei Watershed Forest Reserve an area which was legislated under the 1987 Pohnpei Watershed and Mangrove Act (CSP, 2007). The IBA is identical to the Pohnpei Watershed Forest Reserve protected area. This high biodiversity area is home to the Critically Endangered (CR) Pohnpei Starling (*Aplonis pelzelni*), the Endangered Ponape Skink (*Emoia ponapea*), the EN Pacific Sheath-tailed Bat (*Emballonura semicaudata*), and the Vulnerable (VU) Pohnpei Flying Fox (*Pteropus molossinus*).

Current threats to this area include land use change and the expansion of agroforestry, and the impacts of the spread of invasive alien species. Invasive alien species management is facilitated by the Conservation Society of Pohnpei working with the State Invasive Species Task Force. The Pohnpei Watershed Forest Reserve is designated as an AZE site; the trigger species is the CR Pohnpei Starling.

Notes have been provided for each of the designated areas (see **FSM-Inf-5**)



## Section 5

### Invasive alien species management actions and other key biodiversity related activities

A literature review and consulting exercise of key conservation practitioners was undertaken to compile an annotated inventory of invasive species and biodiversity related management action carried out on FSM and its constituent states.

It is possible that several projects especially those on management of invasive plants could have been missed. It is hoped that the review will provide comments and events that could have been missed.

Ten activities at the national level and 36 activities at the state level have been recorded for FSM using available information. For a summary of activities in Chuuk, Kosrae, Pohnpei and Yap, please refer **Appendix 1- 4**

National level activities including development of NBSAPS, Strategic plans and involvement in the Regional Micronesia Biosecurity Plan (MBP). State level activities related to IAS management were recorded including vegetation surveys, planned and ongoing 'eradication' and management of priority of vertebrates and invasive alien plant species, awareness raising, capacity building and training (see FSM Inf-6, and for state level projects see Chuuk-Inf, Kosrae-Inf, Pohnpei-Inf and Yap-Inf).



## Conclusion

The results of this review provide a baseline for biodiversity data and information for FSM, and a detailed description of the threat of invasive alien species on native species and natural areas. An internal review process was undertaken after the preparation of the draft and updates implemented.

Data and information on the distribution of endemic and native species, their conservation status; the extent and distribution of invasive alien species and other threat information are all critical for the prioritization of conservation action. Reliable and current knowledge of the distribution of invasive species, extent of spread and research into the impacts are critical to better management. Information on alien species that have the potential to become invasive, the need for assessing risk before introduction of any alien species and better border control to prevent introductions are other important factors to consider. It is also important to understand which the pathways of spread are so as to prevent the spread of these species from existing infestations. These data and information are necessary for reporting and planning future action.

It is recommended to keep this resource updated by providing all 'new' information to information providers.



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# Appendix 1

## Summary of information for Chuuk

### Alien and Invasive Species

Results of the desktop review indicate that 205 alien species that are known to have impacts on the environment in their introduced range (invasive and potentially invasive) are recorded in the state of Chuuk. The majority of these are plant species in the terrestrial environment/system. Over 15 species in this inventory are classified as ‘invasive’ based on 1) evidence of impact or 2) evidence or record of aggressive spread in the natural environment. The remaining species are classified as ‘invasiveness not specified). See **Chuuk-Inf**

African tulip (*Spathodea companulata*), Honolulu rose (*Clerodendron chinensis*), and sensitive plant (*Mimosa pudica*) are priority invasive plant species on Chuuk and subject to management action

Please read **Section 1** of the main report for additional details

### Designated areas of Chuuk

One Alliance for Zero Extinction site (Mount Winipot), one EBA (East Caroline Islands), four designated Important Bird Areas (IBAs), five proposed IBA’s, 22 Key Biodiversity Areas (KBA’s), Sanctuaries including the Trochus Sanctuaries and the Federated States of Micronesia Shark Sanctuary are covered by all four states.

Mount Winipot Conservation Area contain some of the most unique and native forests of Chuuk. Besides several trigger bird species such as the Endangered (EN) Chuuk Monarch (*Metabolus rugensis*), Great Truk White-eye (*Ruki ruki*) and Vulnerable (VU) Caroline Ground-dove (*Alopecoenas kubaryi*), the area is home to the Critically Endangered (CR) Chuuk Flying Fox (*Pteropus insularis*) and the endemic poison tree (*Semecarpus kraemeri*). Threats to this area include land use change (expansion of Agriculture) and Residential and commercial development. Other designations of the Mount Winipot area include Key Biodiversity Area (KBA), Protected Area and Alliance for Zero Extinction Site (trigger species EN Great Truk White-eye). While habitat degradation through low level timber extraction and logging is prevalent, the old native secondary growth forests are relatively undisturbed. A potential threat is the introduction of the brown tree snake (*Boiga irregularis*) from Guam, where it has caused the extinction of several bird species. Other threats include the impacts of a changing climate- rising sea levels and habitat destruction



See **Chuuk-Inf** for the complete listing of Designated areas in Chuuk including brief descriptions.

### **Chuuk Projects**

Five types of activities focused on biodiversity conservation and management of invasive species have been recorded for Chuuk. They include capacity building and awareness raising including training and workshops at the community level, vegetation surveys of areas infested with alien and invasive species, eradication/control and management of the spread of priority invasive plant species- African tulip tree, Honolulu rose and sensitive plant, and the development of action plans (see **Chuuk-Inf** for list of activities)



## Appendix 2

### Summary of information for Kosrae

#### Alien and Invasive Species

Results of the desktop review indicate that 231 alien species that are known to have impacts on the environment in their introduced range (invasive and potentially invasive) are recorded in Kosrae. The majority of these are plant species in the terrestrial environment/system. 16 species in this inventory are classified as ‘invasive’ based on 1) evidence of impact or 2) evidence or record of aggressive spread in the natural environment. The remaining species are classified as ‘invasiveness not specified’).

The Giant African snail (*Achatina fulica*), Crown-of-thorns starfish (*Acanthaster planci*) and several priority invasive plant species are subject of management action including eradication. Invasive alien plants that are priority species include Mile-a-minute (*Mikania micrantha*), firecracker bush (*Clerodendron quadriloculare*), *Lucanea* spp. and Siam weed (*Chromoleana odorata*)

Please read **Section 1** of the main report for additional details

#### Designated areas of Kosrae

The UNESCO Biosphere Area and the Marine Protected Area- Utwe UNESCO-MAB Biosphere Reserve, three designated Important Bird Areas (IBAs), one proposed IBA, and five Key Biodiversity Areas are designated in Kosrae

The Utwe UNESCO-MAB Biosphere Reserve was created in 2010. Its primary conservation purpose is to prohibit destructive activities in the marine core area, a 0.964 sq km area that covers mangrove swamps and coral reefs. Potential threats to marine ecosystems in the Pacific region include overexploitation, pollution, coastal development and the impacts of a changing climate including severe weather events

Sanctuaries including the Trochus Sanctuaries and the Federated States of Micronesia Shark Sanctuary are covered by all four states.

See **Kosrae-Inf** for the complete listing of Designated areas in Kosrae including brief descriptions.



## Kosrae Projects

Development of a Strategy and Action Plan, a Black List of Invasive species, working on Biosecurity and several 'Action on the ground' projects have been recorded for Kosrae. The include the conservation and protection of unique and vulnerable areas the Kosrae's Upland Forest, Yela Forest Reserve and the Olum Watershed area. Invasive species management actions include working towards the eradication of the Giant African snail and the management of priority plant species.

See **Kosrae-Inf** for the list of the 13 activities recorded for Kosrae



## Appendix 3

### Summary of information for Pohnpei

#### Alien and Invasive Species

Results of the desktop review indicate that 334 alien species that are known to have impacts on the environment in their introduced range (invasive and potentially invasive) are recorded in the state of Pohnpei. The majority of these are plant species in the terrestrial environment/system. Over 20 species in this inventory are classified as ‘invasive’ based on 1) evidence of impact or 2) evidence or record of aggressive spread in the natural environment. The remaining species are classified as ‘invasiveness not specified).

‘False Sakau’ (*Piper auritum*), Mile-a-Minute weed, the Yellow crazy ant (*Anoplolepis gracilipes*) and mammal predators (*Rattus* spp., Feral cats (*Felis catus*) are some of the priority species subject to management action in Pohnpei State.

Please read **Section 1** of the main report for additional details

#### Designated areas of Pohnpei

The And Atoll UNESCO-MAB Biosphere Reserve, Pohnpei Watershed Forest Area (which is an Alliance for Zero Extinction Site and an Important Bird Area (IBA) and a Key Biodiversity Area (KBA) are some of the key areas protected in the state of Pohnpei. Other areas include nine Marine Protected Areas (MPAs), three designated and two proposed IBA and 10 KBAs

The Pohnpei Watershed Forest Reserve was created by legislation in 1987 to protect 51.0 sq km of upland forest and watershed area. Road construction and permanent settlement is prohibited in this area.

Sanctuaries including the Trochus Sanctuaries and the Federated States of Micronesia Shark Sanctuary are covered by all four states.

See **Pohnpei-Inf** for the complete listing of Designated areas in Pohnpei including brief descriptions.

#### Pohnpei Projects

Development of a Strategy and Action Plan, and several ‘Action on the ground’ projects have been recorded for Pohnpei. They include the conservation and protection of unique and vulnerable areas such as the Pohnpei Watershed Forest from the impact of invasive plant species. The eradication ‘False Sakau’ (*Piper auritum*), the management and control of Mile-a-



minute infestations are ongoing actions. Eradication of introduced vertebrates (*Rattus* spp. have been implemented on Dekehtik Island in the mid 2000s)

See **Pohnpei-Inf** for the list of the 12 activities recorded for Pohnpei



## Appendix 4

### Summary of information for Yap

#### Alien and Invasive Species

Results of the desktop review indicate that 260 alien species that are known to have impacts on the environment in their introduced range (invasive and potentially invasive) are recorded in the state of Yap. The majority of these are plant species in the terrestrial environment/system. 16 species in this inventory are classified as ‘invasive’ based on 1) evidence of impact or 2) evidence or record of aggressive spread in the natural environment. The remaining species are classified as ‘invasiveness not specified’.

Priority invasive plant species such as Cogon grass (*Imperata cylindrica*), chain-of-love (*Antigonon leptopus*) and African tulip (*Spathodea companulata*) are subject to management action in Yap

Please read **Section 1** of the main report for additional details

#### Designated areas of Yap

Yap Islands Endemic Bird Area (EBA), three designated Important Bird Areas (IBAs), 15 Key Biodiversity Areas (KBAs) are some key high biodiversity value sites that lie in the state of Yap.

The Yap Islands EBA includes the four main islands of Yap, Yap Island (which is a designated IBA) Gagil Tomil, Maap and Rumung. Yap Islands were once covered by broadleaf deciduous forests, these have been largely destroyed and replaced by secondary forests and grasslands. Trigger restricted range species include the Near Threatened (NT) Yap Olive White-eye (*Zosterops oleagineus*), Plain White-eye (*Zosterops hypolais*), Yap Monarch (*Monarcha godeffroyi*), Micronesian Imperial-pigeon (*Ducula oceanica*) and White-throated Ground-dove (*Alopecoenas xanthonurus*).

Further habitat loss and degradation and the impacts of invasive alien species are major current threats. A potential threat includes the introduction of the Brown tree snake (*Boiga irregularis*) from neighboring Guam, a species known to have caused extinctions of several bird species there.

Sanctuaries including the Trochus Sanctuaries and the Federated States of Micronesia Shark Sanctuary are covered by all four states.

See **Yap-Inf** for the complete listing of Designated areas in Yap including brief descriptions.



## Yap Projects

Development of a Strategy and Action plan for Biodiversity Conservation, working on the conservation of the Yap flying fox (*Pteropus mariannus yapensis*), and targeted management of invasive alien plants such as Cogon grass, chain-of-love and African tulip are some of the key activities recorded for Yap.

See **Yap-Inf** for the list of the six activities recorded for Yap

