High Conservation Value Forest Toolkit for Papua New Guinea

A national guide for identifying, managing and monitoring High Conservation Value Forest

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TABLE OF CONTENTS

A river weaving its way through the dense forest in the East Sepik province, Papua New Guinea. Forest loss in the other parts of the whole means that Papua New Guinea now contains the planets third largest block of rainforest.

EXECUTIVE SUMMARY

The Papua New Guinea High Conservation Value Forest (HCVF) toolkit was developed through consultative processes and peer reviewing by experts and stakeholders. The HCVF concept was initially developed by the Forest Stewardship Council (FSC) for use in forest management certification. Within FSC certification, for compliance with Principle 9, forest managers are required to identify any High Conservation Values (HCVs) that occur within their individual forest management units and manage them in order to maintain or enhance the values identified.
The key to the concept of HCVFs is the identification and maintenance of High Conservation Values (HCVs). The FSC's definition of HCVs encompasses exceptional or critical ecological attributes, ecosystem services and social functions. The global HCV definitions are listed below, with an example of a Papua New Guinea HCVF for each.

- HCV1: Forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia). HCVs 1.1 - 1.4 are protected areas, threatened and endangered species, concentrations of endemic species, and critical temporal use.

- HCV2: Forest areas containing globally, regionally, or nationally significant large landscape level forests contained within, or containing the management unit where viable population of most, if not all naturally occurring species, exist in natural patterns or distribution and abundance (e.g. viable populations, wide-ranging species, etc)

- HCV3: Forest areas that are in or contain rare, threatened or endangered ecosystems (e.g. breeding sites, migratory sites, etc).

- HCV4: Forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control).

  HCV 4.1 - 4.3 are forests critical to water catchments, forests critical to erosion control, and forests providing barriers to destructive fire.

- HCV5: Forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health) and critical to local communities' traditional and cultural identity (areas of cultural, ecological, economic or religious significance in cooperation with such local communities) .

The High Conservation Value Forest Toolkit for Papua New Guinea can be described by the following key statements:

- Is intended only for use by forest managers undergoing FSC accredited forest management certification and by FSC accredited certification auditors assessing or monitoring conservation values in Papua New Guinea as part of a complete FSC assessment or evaluation process
- Will create an industry standard and provide guidelines to compliance with FSC's 9th Principle by helping to identify, manage and monitor forests of High Conservation Value
- Stresses equal importance to social, biological, and environmental values which forests in PNG contain
- Has been developed through a full consultative process taking into account the major stakeholders involved with forest ownership and industry participation
- Is owned by the PNG FSC National Initiative
- Is referenced in the current PNG FSC National Standards
- Will be updated along with the PNG FSC National Standards at a periodicity of every two years after the endorsement of the PNG FSC National Standards
- Is a major step forward that ensures that the interest of all stakeholders in forest conservation is integrated.

It is anticipated that this document will assist in making FSC certification acceptable within the forest industry in Papua New Guinea.

1. INTRODUCTION

1.1 What are high conservation values and high conservation value forests?

All forests contain environmental and social values such as wildlife habitat, watershed protection and cultural significance. Where these values are considered to be of outstanding significance or critical importance, the forest can be defined as a High Conservation Value Forest (HCVF). Identifying these values, knowing to whom these values are considered important, and locating the forest areas which harbour the values is the essential first step in developing appropriate management for them.

The HCVF concept was initially developed by the Forest Stewardship Council (FSC) for use in forest management certification. Within FSC certification, for compliance with Principle 9[1] , forest managers are required to identify any High Conservation Values (HCVs) that occur within their individual forest management units and manage them in order to maintain or enhance the values identified.

The key to the concept of HCVFs is the identification and maintenance of High Conservation Values (HCVs). The FSC's definition of HCVs encompasses exceptional or critical ecological attributes, ecosystem services and social functions. The global HCV definitions are listed below, with an example of a Papua New Guinean HCVF for each.

HCV1. Forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia).

e.g. the forests which house the Fire-maned Bower Bird (Sericulus bakeri) in the Adelbert Range, Madang Province.

HCV2. Forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.

e.g. the vast lowland rainforests of the West Papuan Shelf in which New Guinea Harpy Eagles (Harpyopsis novaeguineae) still hunt healthy breeding populations of Lowland Tree Kangaroos.

e.g. the Monsoon Forests which stand out like islands in the flood plain savannas of the TransFly, Western Province.

HCV3. Forest areas that are in or contain rare, threatened or endangered ecosystems.

HCV4. Forest areas that provide basic services of nature in critical situations .

e.g. the watersheds of the Sirinumu Dam, Sogeri, Central Province.

(e.g. watershed protection, erosion control).

HCV5.[2] Forest areas fundamental to meeting basic needs of local communities and critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities)

e.g. areas that supply building materials, traditional medicine, bush meat for Papua New Guinea's rural majority

e.g. ples tambu or sacred sites in forest areas around rural villages in Papua New Guinea

In summary, a High Conservation Value Forest is the area of forest required to maintain or enhance a High Conservation Value. An important implication of this definition is that management (e.g. harvesting) is not automatically precluded in HCVFs. However, any management that does take place must be compatible with maintaining or enhancing the identified HCV.

1 FSC Principles and Criteria. Document 1.2; revised February 2000. Available from www.fscoax.org

2 Note that the drafters of the Toolkit found it appropriate to consolidate HCV5 and 6 into one.

1.2 What is the HCVF toolkit?

The PNG HCVF National Toolkit, or the Toolkit, provides practical guidance to forest managers and other stakeholders in Papua New Guinea to identify, manage, and monitor High Conservation Value Forests as specified within any FSC accredited certification or time bound management improvement activities which lead to FSC certified forest management.
The Toolkit is intended to help forest managers comply with the 9th Principle of the Papua New Guinea FSC National Standards for forest management and is referenced in the current National Forest Management Standards for Papua New Guinea.

The completed Toolkit was endorsed by the PNG FSC National Working Group and its methodology recommended for FSC certification within the PNG FSC National Standards. Users should understand that while this toolkit might form the best available guidance on interpreting FSC Principle 9 for PNG it is only one of the possible tools to do this.

While the HCVF National Toolkit Working Group, or the HCVF WG, recommended a focused utilization of the Toolkit they recognized the broad spectrum of applications which could be derived from it. The following applications of the toolkit are possible:

a. Forest managers to meet standards related to HCVF
Forest managers could carry out evaluations of their forest areas to determine whether any of the defined HCVs are present within their FMU, so they could integrate them into their overall forest management planning and activities. This is a requirement of FSC certification and might also be demanded by customers, donors or investors.

b. Certifiers assessing HCVF
The defined national HCVs, together with management guidance, should form the HCVF element of national forest management certification standards. When no national standard exists, certification auditors would be required to develop 'interim standards' against which to assess forest management.

c. Landscape planners trying to prioritise different land-uses
Based on information that was already held or was being collated, the defined national HCVs can be used to draw up landscape-level plans and maps to show actual or potential HCVF. Such maps could then be used to inform and prioritise land-use planning decisions and conservation planning and land-use advocacy.

d. Purchasers implementing precautionary purchasing policies
Purchasers implementing HCVF policies could utilise landscape-level information about the presence of HCVs, or use the nationally defined sets of HCVs to also undertake evaluations for the presence of HCVs in specific FMUs, or in setting precautionary purchasing policies. Many purchasers and retailers have complex supply chains and so would normally need either maps of HCVFs or possibly clear guidelines (rather than maps or guidelines of areas that potentially contain HCVs) that are recognised by a wide range of stakeholders.

e. Investors and donors
Investors and donors are increasingly concerned to provide safeguards to ensure that investments or donations do not promote socially or environmentally irresponsible actions from potential recipients. This might take the form of either screening potential recipients or introducing requirements that the recipients fulfil their social and environmental responsibilities. By concentrating on the most critical environmental and social values, the HCVF framework provides a potential mechanism for ensuring that donors and investors fulfil their own environmental and social policies

The HCVF WG limited the use of the Toolkit in compliance with the 9th Principle of FSC by companies undergoing FSC accredited certification. While the HCVF WG realized the potential applications of the Toolkit outside of the certification process, it emphasizes the importance of keeping the use of the Toolkit part and partial to the remaining 9 Principles of FSC which provide the full scale of checks and balances to responsible and sustainable forest management in Papua New Guinea. Any application or adaptation of the Toolkit outside of FSC certification would have to be done as part of comprehensive social, environmental, and economic sustainability criteria and would need approval from PNG FSC National Working Group.

The Toolkit can be used for the purpose of demonstrating compliance with the FSC Controlled Wood Standards (FSC-STD-30-010 and FSC-STD-40-005), whereby non-FSC certified forest management enterprises and/or wood trading companies need to prove to FSC accredited assessors that harvest of this wood does not endanger HCVF, in order for it to be allowed to be mixed with FSC certified material (FSC, 2004).

Use of this toolkit requires specialized knowledge of the conservation and social issues in Papua New Guinea which constitute the High Conservation Values. This will require an understanding of the uniqueness of forest areas, land/forest owners and the threats to their resources. Toolkit users would need to rely on national or international experts (scientists, research institutions, NGOs) to evaluate the quality of data and information on the conservation values in a particular forest area.

1.3 How was the Papua New Guinea HCVF toolkit developed?

STEP	PERIOD/DATE	TASK PROCESS	PEOPLE INVOLVED
1	1 February 28 to March 2, 2005	Preliminary first draft developed through a drafting workshop on Motupore Island, Port Moresby. The workshop was facilitated by a Smartwood consultant.	Social scientists, biologists, ecologists, foresters, cartographers, cartographers, planners and certification specialists from WWF-PNG, Wildlife Conservation Society, Department of Environment and Conservation, National Forest Service, Rainforest Alliance, FORCERT and a Smartwood consultant
2	March 28 to April 8, 2005	i) Preliminary first draft field-tested with a small scale community-owned logging operation undergoing certification under the FORCERT group certification scheme in Danaru and Kalifilum villages, Usino Bundi district of Madang Province. ii) A Smartwood consultant peer-reviwed the preliminary first draft. iii) Recommendations/comments made by these people were consolidated into a preliminary 2nd draft.	Expert field biologists and social scientists, HCVF Working Group, Smartwood, villagers in small scale logging operation in Madang Province
3	Two weeks	i) 2nd draft report by the HCVF WG and was presented to the PNG FSC National Standards Working Group for their input and endorsement for wider stakeholder consultation. ii) 2nd draft of the toolkit circulated for stakeholder comments.	HCVF working group, PNG FSC National Standards Working Group and other stakeholders
4	July 15, 2005	General stakeholder meeting convened at Holiday Inn, Port Moresby. Issues and concerns raised during the stakeholder reviews were further discussed with HCVF WG and incorporated into working document.	HCVF Working Group and stakeholders
5	2 weeks August 23-25,2005 2 weeks	i) This revised 2nd draft again circulated for final stakeholder comments. iI) This document also presented at the South-East Asia HCVF conference at Bali, Indonesia. iii) Document recognised as preliminary final draft which was again circulated for final stakeholder comments.	HCVF working group plus all other stakeholders, both in the country and abroad
6	October 1-12, 2005	i) Preliminary Final Draft presented at the Western Province Forest Plan meeting in Kiunga for further community consultation. During the meeting the issues of HCVF and forest planning were addressed in practice. ii) Final comments obtained from stakeholders and HCVF NWG incorporated those comments into preliminary final draft.	HCVF Working Group, stakeholders and community
7	November 16, 2005	Final meeting held at Gateway Hotel, Port Moresby in which the HCVF NWG incorporated the changes and/or recommendations made by final peer review.	HCVF working group and stakeholders
8	November 18, 2005	Final Draft was reviewed, discussed, amended and endorsed by the PNG FSC National Standard Working Group at WWF PNG Country Office, Port Moresby. Thus, the First Edition of the PNG HCVF National Toolkit was completed and ready for publication.	HCVF working group and PNG FSC National Standard Working Group

The Papua New Guinea HCVF toolkit is based upon an interpretation of the generic, global definitions of High Conservation Values by the FSC. The toolkit follows the methodology developed by Proforest to interpret the parameters, values, and thresholds within the context of Papua New Guinea as believed appropriate within the country.
The following table shows the steps, the tasks and the people involved in the development of the toolkit.
Due to the necessity of industry buy in the concepts and methodologies recommended in the Toolkit it is envisaged that the 1st Edition will be revised and edited as it gets increasingly used. It is highly recommended that subsequent editions are produced as part of the two yearly review of the PNG FSC National Standards. The HCVF WG envisages that this will be the responsibility of the PNG FSC National Standard Working Group.

1.4 Consulting experts and developing partnerships

The toolkit-drafting group realized that the diversity and highly variable conservation context and land use patterns of different regions in Papua New Guinea makes the development of nationally relevant definitions and lists of HCVs very difficult. Thus, the toolkit has often avoided defining values with specific sizes and numbers, although quantified thresholds have been suggested for some HCVs. Instead, toolkit users are encouraged to consider the island and ecoregion context (Mainland of New Guinea or satellite islands) of the forest area in a level of detail that will require consulting which is not provided through this document. Thus, other sources of information and resources will be necessary.

The HCVF toolkit requires users to identify HCVs that cover a wide range of ecological, environmental, and social issues and requires an understanding of regional biodiversity issues, animal and plant ranges and behaviour, water and soil resources, ecosystem health, anthropology and local economy. It is very likely that toolkit users will not have all of the expertise necessary to evaluate these issues alone. The toolkit process is highly reliant upon the input of local and national expert organizations and individuals.

Users should consult with local and national experts during HCV identification and while developing management and monitoring techniques. In a number of cases, these organizations should provide the key inputs as to whether a forest area/forest type should be considered critical, threatened, etc. Expert organizations will also be able to provide input on the status of forest types and rare, threatened, and endangered species and help devise management strategies to ensure the maintenance or enhancement of these values.

Who are regional and national experts? The drafting group cited the research and resources available from many organizations and scientific institutions active in the field of social and biodiversity conservation. In the appendices, lists of references and organizations are provided for those who may be able to provide information or should be consulted on communities and conservation. The expertise that comes from local and traditional knowledge should not be overlooked, and should form an important source of information in the application of this Toolkit.

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1.5 Precautionary approach

An important component of the management of HCVFs is the application of the Precautionary Approach. HCVFs are, by definition, the most important forests from a conservation or social perspective (depending on the HCVs identified). Therefore, it is critically important that the values identified are not lost. But with the current level of knowledge about forests and how they function, it is not possible to be sure in every case that a particular management strategy will work. Therefore, the identification, management and monitoring of HCVs will draw upon the precautionary approach when dealing with HCVF.

In practice, this means: "Planning, management activities and monitoring of the attributes that make a forest management unit a HCVF should be designed based on existing scientific and indigenous/traditional knowledge to ensure that these attributes do not come under threat of significant reduction or loss of the attribute and that any threat of reduction or loss is detected long before the reduction becomes irreversible. Where a threat has been identified, early preventive action, including halting existing action, should be taken to avoid or minimise such a threat despite lack of full scientific certainty as to causes and effects of the threat" (FSC Principle 9 Advisory Panel, 2000).

The precautionary approach has been incorporated into the methodology for identifying HCVs and should form a basis for any management regime and monitoring programme.

- **Assessing the presence of HCVs:** where doubt exists as to whether an attribute, or collection of attributes, are sufficient to signify HCVs, then the forest manager will treat these attributes as HCVs until information proves otherwise. This should occur when the toolkit users and regional and national experts lack sufficient information to make an informed judgement.

- **Managing and monitoring HCVFs:** where doubt exists as to the appropriate management of the HCVF, management should include applying treatments to the HCVF at a scale and intensity that does not threaten the HCV before applying the management more generally within the forest management unit.

1.6 How does this toolkit work?

Following this introductory section, the Papua New Guinea HCVF toolkit includes one section for each of the FSC-defined five High Conservation Values. Each section will be organized as follows:

Description -
This sub-section is a brief description of the intent of the HCV or HCV element.

Definition -
This sub-section defines the HCV in terms of the forests that should be considered as an HCVF when certain conditions or thresholds are met.

Rationale -
This sub-section provides background and offers justification as to how and why a particular attribute is considered of high conservation value in the context of Papua New Guinea. The rationale includes discussion on the existing prioritization schemes and processes for determining areas of conservation significance and whether or not, or how, these should be used in the toolkit. This section attempts to explain the interpretation of the HCV definition based on the assessment by the toolkit drafters with respect to the limits to existing knowledge, science, and research and how one could arrive at a reasonably defensible series of definitions of HCVs and HCVF.

Identifying the Presence of the HCV -
For each HCV and HCV element, the toolkit provides guidance on the tasks that the user can follow to identify the existence of the HCV and it's applicability within a forest management unit. This sub-section will suggest the priorities for existing evaluation approaches, data requirements or information sources, and indicates examples of the HCV.

Recommendations for managing and monitoring the HCV - If, after evaluation, it is found that a particular HCV is not present within the FMU, no further action is necessary. If a value/component is present within the FMU, then the manager is expected to take steps to make changes to ensure the maintenance of the identified value through appropriate management and monitoring of/for the value.

Recommendations are included to help toolkit users develop plans to maintain the HCVs present within a forest area. Recommendations are brief and are meant to guide users on the types of information and consultations necessary to develop effective planning and monitoring programs. The guidance provided is not meant to fulfil the role of either standard operating procedures or basic prescriptions for conservation management plans.

Due to the site-specific nature to preparing management and monitoring plans to address maintenance or enhancement of particular HCVs, forest managers would be expected to develop more in-depth planning efforts related to HCVFs. Forest managers may find it necessary and useful to consult other organizations in Papua New Guinea who should be consulted for their experience and involvement in developing management, monitoring or research programs relevant to maintaining or enhancing HCVs.

2. HCV1

Forest areas containing globally, regionally[4] or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia)

HCV1 has to do with values that are related to biodiversity values. It contains the following four elements:

HCV1.1 Protected areas
HCV1.2 Threatened and endangered species
HCV1.3 Concentrations of endemic species
HCV1.4 Critical temporal use.

Most of the assessments within this HCV are focused on the occurrence of species within taxanomic groups. Due to the practical limitations of logging businesses to assess these, the HCVF WG recommended that only mammals, birds, frogs, reptiles and higher vascular plants are considered taxa groups for identifying and monitoring HCVFs. The following table describes the recommended taxa groups by scale of logging operation and frequency of assessments.

Table 1. Taxa groups to be identified by scale of operation and frequency of assessements

Scale	Birds	Mammals	Reptiles/Frogs*	Vascular Plants
Small (<1000m3/yr)	1	1	2	
Medium(1000-5000m3/yr)	1	1	2	
Large (>5000m3/yr)	1	1	1	2
1-During baseline survey and every two years thereafter				
2-During baseline survey and every four years thereafter				
*During baseline survey any one of these taxa can be surveyed or otherwise				

HCV1.1 Protected areas[5]

Description

The concept of protected areas on Papua New Guinea is different to many other countries in which HCVF Toolkits have been and are being developed. This is because of the fact that at least 97% of the land is privately owned under traditional land tenure systems and the resulting decentralized nature of decision making over land resources makes protected areas, in the traditional sense, scarce.

Definition

All gazetted PAs, Conservation Deeds and proposed[6] areas with forest cover should be considered HCVFs. This should include PAs with forest plantations, if any exists, and marine protected areas that include mangroves.

Rationale

There is no unifying procedure that determines the goals and functions of Protected Areas (PAs) in Papua New Guinea. Based on the Rapid Assessment of Parks and Protected Areas Management (RAPPAM, in press) study for PNG, recently conducted by WWF, about 18 different categories of PAs have been identified. Although some of these categories are directly useful to determine a HCVF (e.g., sanctuaries or Ramsar sites), the percentage of areas covered by PAs in PNG is very small (<3%). Moreover, lowland terrestrial eco-regions are very poorly represented. Proposed PAs for the near future will not add significantly to this percentage.

Future legislation may ban logging within all or certain kinds of protected areas.

4 Above the level of country, i.e. S.E. Asia
5 PA refers to Protected Areas in general throughout this document.
6 A proposed PA is indicated by legitimate landowners having written to DEC with the intention of declaring a PA or a proposed Conservation Deed agreed upon by legitimate landowners and their respective agencies (i.e industries, government, NGOs, academia, etc). All proposed PAs should have boundary maps (including sketch maps).

Identification of HCV

Tasks	Data sources & requirements
Determine if logging unit boundaries fall within gazetted PA or Conservation Deeds in PNG.	The Department of Environment and Conservation, PNG Forest Authority, Provincial Administrations, Local Level Government (LLG)
Determine if logging unit boundaries fall within a proposed PA in PNG.	The Department of Environment and Conservation, Papua New Guinea Forest Authority, Provincial Administrations, Local Level Government (LLG), FSC Principles
Determine if legislation and community PA rules exist which ban logging operations	The Department of Environment and Conservation, PNG Forest Authority.
Examples:	A logging concession in Simbu Province has been planned overlapping a large portion of Crater Mountain Wildlife Management Area. All areas of the concession overlapping with Crater Mountain WMA shall be considered HCVFs.

Management and monitoring for HCV 1.1

Management Recommendation	Guidance
No logging permitted within all PAs declared under the National Parks Act and all Conservation Areas.	DEC's PA Registry, NGOs and local community leaders may assist in identifying the PA boundaries.
Within Wildlife Management Areas timber harvesting and other economic activities may be allowed as per respective WMA rules and landowner agreements. Specific management plans required.	DEC, PNGFA, WMA Committee, community needs determines type of activity.

HCV1.2 Critically endangered species

Description

Forests that contain concentrations of threatened or endangered species are clearly more important for maintaining biodiversity values than those that contain none or a few, simply because these species are more vulnerable to continued habitat loss, hunting, disease etc. FSC Criterion 6.2 already deals in a general way with individual rare, threatened or endangered species present. HCV element 1.2 adds further protection for forests that contain outstanding concentrations of rare and endangered species.

Definition

A forested site is considered as HCVF if:

1) There is reliable field data on the presence of at least one IUCN Red List endangered, and critically endangered species

OR

2) The forest contains at least one of the following abundances of a CITES Appendix I listed species:
   - at least three breeding pairs of animals (regardless of density) or
   - at least five trees/hectare, or
   - five small plants or shrubs/hectare

OR

3) The forests are important for the long-term survival of a species if they are susceptible to adverse impact due to logging

Rationale

The island of New Guinea and satellite islands are well-known centers for high levels of endemism. Many species are confined to limited distribution ranges. Because of this, and due to human-made habitat alterations, many of these species are considered Endangered (En) or Critically Endangered (Cr) or are so rare that they are considered Data Deficient (DD) according to the IUCN Red List (www.redlist.org). All these are recognized as HCV and the forests they inhabit as HCVFs.

The quality of information available precludes any threshold for numbers present of critical species (PNG endemics, endangered, critically endangered or data-deficient) or assemblages. Therefore, the presence of one individual of an En, Cr or DD species in a location shall render the forest as HCVF.

The geological processes underpinning the evolution of these threatened PNG endemics affects all taxa. The presence of one endangered endemic is therefore harbinger of the existence of a center of endemism and other equally endangered species. These centers of endemism cover extensive areas of mainland PNG and virtually all satellite islands. There is no prioritization mapping process carried out by DEC, other than the Conservation Needs Assessment (CNA, 1993), based on the biological/threat status of species. The CNA results reflect areas of high endemism and high biodiversity, which correlate with the location of endangered and critically endangered species. However, because very little is known of the fauna and flora of PNG, the CNA draws on expert opinion and limited data and is considered outdated.

Because of the paucity of data on the location and biology of endangered, critically endangered, or data-deficient species, field surveys must be conducted at all sites requesting FSC certification. If in the future better maps of locations of data-deficient, endangered and critically endangered species, or Known Biodiversity Areas, are available from NGOs, these should be used as guides for field surveys instead of the CNA. The tree database lists locations by province, which should be used as guides for tree species surveys. Normal forestry inventories may not identify the presence of endangered tree species, because sometimes only 1% of the forest is surveyed, and only trees of >50 cm DBH are identified (from PNGFA). Thus, a proper botanical survey of trees should be conducted; it may not be replaced by the forestry inventory.

Maps in the CNA or from other sources may be too coarse to identify specific habitat types used by endangered species. If biological information on habitat preferences of the endangered species is available, this could be used to further detail the outline, within a logging concession, of the HCVFs.

By using the IUCN Red List and Threatened Trees of PNG database (www.unep-wcmc.org), concerns of quality and scope of the data/classification are sufficiently addressed, because the Red List and the database are updated periodically and all taxa are considered.

Species listed in the Appendix I and II of CITES may not be endangered but are of biological importance. Several of these species may be island-wide endemics (not regional endemic). By using these species to appraise the forests, many areas would fit the definition of HCVFs. Thus, only those PNG endemic species listed in the CITES Appendix I shall be considered as HCVs and the habitats supporting them as HCVFs. Those species listed in CITES Appendix 2 should only be noted for their potential of moving into Appendix I.

Considerable debate in the conservation literature over the past three decades on the minimum viable population size for management has led to no unanimous figure. Recent proposals include numbers higher than 5,000 breeding pairs (Reed et al. 2003). Past proposals to set general guidelines for establishing/ensuring viable populations (Gilpin and Soule 1996) consider populations of 50-1,000 individuals or pairs as a minimum value (i.e. a short-term goal), while 1,000-10,000 would be adequate (Meffe and Carroll 1997). For the purpose of identifying HCVFs, areas with at least three observed breeding pairs of a CITES Appendix I species are considered. For plants, lowland forest plots of <10 cm trees include some 400-600 stems/hectare. Hence, a mid-abundance value of 1% of stems of a CITES-listed species, or five stems/hectare, suffices to declare an area as HCVF. Areas with five plants or shrubs/hectare of the CITES listed species should be considered HCVFs.

If the thresholds above are not reached, but the areas inside the FMU are important, or suspected to be important based on expert evaluation, for the long-term survival of the population (in combination with areas outside the FMU), these shall be treated as HCVFs.

Identification of HCV 1.2

Tasks	Data sources & requirements
Determine if the logging concession falls within an area recognized as housing En, Cr or DD species (see Appendix 2 for list of PNG CITES 1 listed species)	PNG CNA, Threatened Trees of PNG database, the IUCN Global Species Assessment, IUCN Red List, CITES, FRI, DEC, Conservation and Research NGOs..
Determine if the logging concession contains forests home to species En, Cr, or DD species in CITES Appendix I, IUCN species listing, and species protected under the PNG Fauna [Protection and Control] Act	Medium to Large Scale Field surveys conducted by authoritative institutions/researchers or experts in all or at a minimum suspected taxa of En, Cr, DD species CITES 1 species, IUCN, CI and other authoritative body) andtheir location in PNG Small-scale Interviews with landowners conducted by specifically trained supporting organisation staff
Compile ecological studies, if any, indicating the biological needs of the species and attempt to further refine the habitats where the HCVs are found.	NGO and expert consultation
Examples:	*Dendrolagus matschiei*, the Huon Tree kangaroo, is found in mid- to high-elevation forests in the Huon Peninsula. Forests at these elevations in the peninsula, known to host at least one individual of the tree kangaroo, are considered HCVFs. Further, the tree kangaroo is restricted to primary forests and at present is not known to enter disturbed habitats, secondary forests or plantations. Thus, primary forests, and not plantation forests, are considered the HCVFs.

Management and monitoring for HCV 1.2

Management Recommendation	Guidance
PNG is mandated to manage CITES listed species to ensure that populations remain at least stable, if not improving. Any logging practice in an HCVF housing a CITES species should abide by this mandate.	Large and Medium Scale Expert consultation and periodic survey analyses. Experts may indicate best practices and critical resources that must remain unchanged to protect the species (e.g., critical habitats for the species, such as riparian habitats; or nesting trees; or connectivity areas).

Management Recommendation	Guidance
NB. Depends on the end use and management plan of that particular species, e.g. Eaglewood, Gynostylus sp. NB. When areas are put out on tender HCVF should already be identified so the investor knows what they are dealing with.	Surveys must occur prior to and every two years subsequent to felling. Small-scale Interviews with landowners conducted by specifically trained supporting organisation staff must occur prior to and every two years subsequent to felling.
Reduced Impact Logging can take place in an HCVF housing a CITES 1 species provided a minimum area (appropriately sized set aside/buffer zone recommended by experts) of forest management unit is set aside for large, medium and small scale operations.	Identify Institutions/Experts/Researchers with >10 years of experience in PNG in taxa identified as En, Cr, and DD species (refer to Appendix 6). Only those authoritative bodies/researchers that have been identified shall be consulted to do monitoring. Large and Medium Scale Expert consultation will determine the presence of En, Cr or DD species in the forests through field surveys. Small-scale Interviews with landowners conducted by specifically trained supporting organisation staff
If negative impacts on populations of CITES 1 species are observed, no logging shall happen until recovery of their populations is observed, or until the problems are properly identified and practices are improved to overcome them	Large and Medium Scale Expert consultation will determine the presence of En, Cr or DD species in the forests through field surveys. Small-scale Interviews with landowners conducted by specifically trained supporting organisation staff

HCV1.3 Concentrations of endemic species

Description

Endemic species are ones that are confined to a particular geographic area. When this area is restricted, then a species has particular importance for conservation.

Definition

Three breeding pairs, or five plants, of one local endemic species is enough to render a forest as housing an HCV and thus shall become an HCVF.

If maps on the distribution of local endemics from reliable sources are available, areas containing at least three local endemic species shall become HCVFs. If the maps indicate that less than three local endemic species are found in an area, but evidence exists that the area contains a data deficent, endangered or critically endangered local endemic species the forest is considered HCVF.

Rationale

There is no source with a comprehensive outline and classification of areas based on the presence of endemics across

taxa in PNG. Compilation of all records of endemic species is a worthwhile effort. The CNA includes areas of endemism but these were drawn by experts based on limited data and cover a large extent of PNG, and is considered outdated and too coarse scaled by active field biologists. The areas highlighted in the Endemic Bird Areas (Endemic Bird Areas of the World, 1998) cover more than 70% of the country and are thus also unrealistic as a guide to identify HCVFs. Conservation and research NGOs may be consulted in the future for maps of concentrations of endemic species, as they are compiling and geo-referencing records for all New Guinea species for all taxa. Maps are also being drawn from the Global Species Assessments of the IUCN.

NB: it is acknowledged here that New Guinea-wide endemics are also of high biological value. Although management recommendations herein shall apply to HCVFs only, it is strongly encouraged that logging be conducted in non-HCVF habitats with due consideration to these species.

The largest percentage of New Guinea endemic mammals are found at mid-elevations 1500-2500m, but high elevations also have high percentages (but lower numbers) of endemics. The EBA considers areas above 1000m as of urgent priority for conservation of the island's avian endemics. Lowlands are recognized as high priority for the conservation of endemics, as well as all satellite islands. These assessments render most of PNG as important for endemics.

PNG endemics, on the other hand, are restricted to localized areas (as opposed to New Guinea-wide endemics). These localized endemics are considered of HCV. Additionally, any mid- to high-elevation forest (<1000m) should be considered as potentially housing concentrations of local endemics. The highlands (above 1,000m), the satellite islands and the northern mountain ranges are recognized as housing high concentrations of local endemic species (see CNA, Mammals of New Guinea and EBA).

NB: endemic freshwater fishes are not being considered, but it is acknowledged that these are directly dependent on the health of the forests for survival.

Due to imprecision in current maps and information, it is suggested here that the assessment be based on a preliminary list of species and their location by Ecoregion (Wikramanaye, 2002) (provided as Appendix 3). This list shall be updated periodically until maps from reliable sources (CI or the IUCN Global Species Assessment) are available showing areas and concentrations of local endemics. When such maps are available, areas containing at least three local endemic species shall become HCVFs.

These local endemic species, by their isolated and spatially restricted nature, are also under high threat of extinction. These are largely the same species considered in Criterion 1.1. Thus, management recommendations will be identical: no logging shall happen in areas where they are known to exist.

Identification of HCV 1.3

Tasks	Data sources & requirements
Determine if at least three breeding pairs or five plants of one local endemic species are found within the concession Determine if at least three local endemic species are expected to be present in the area	Large and Medium Scale Field survey by experts (approved expert list in Appendix 6 or FSC Certifer's accredited independent experts) in the known or suspected taxa (list provided in Appendix 3)
Examples:	Small-scale Interviews with landowners conducted by specifically trained supporting organisation staff Distribution maps from reliable sources (see Appendix 6), expert consultation and/or field surveys by experts.

Tasks	Data sources & requirements
Determine if at least three local endemic species are expected to be present in the area	Distribution maps from reliable sources (see Appendix 6)
Examples:	Fire-maned Bower Bird (*Sericulus bakeri)* is only restricted to the Adelbert Range, Madang Province and areas with this endemic species should be considered a HCVF.

Management and monitoring for HCV 1.3

Management Recommendation	Guidance
Reduced Impact Logging can take place, provided; Experts endorsement (see Appendix 6 for expert list) indicating that these endemics can withstand timber harvesting Medium to Large Scale The location of the protected area covering 20% of the total fmu, shall be determined by an identified authoritative Institution/ Researcher/ Expert of a suspected taxa (En, Cr, DD species by CITES, IUCN, CI, Protected by PNG Fauna Act) or Ecosystems (critical ecosystems) agreed upon by the land owners. Small Scale Allocation of the 10% of protected area in a small scale fmu shall be determined by the landowners, advised by specifically trained support organisation staff.	PNG CNA, Threatened Trees of PNG database, the IUCN Global Species Assessment, IUCN Red List, CITES, FRI, DEC, Conservation and Research NGOs.. Medium to Large Scale Field surveys conducted by authoritative institutions/researchers or experts in all or at a minimum suspected taxa of En, Cr, DD species CITES 1 species, IUCN, CI and other authoritative body) andtheir location in PNG Small-scale Interviews with landowners conducted by specifically trained supporting organisation staff NGO and expert consultation *Dendrolagus matschiei*, the Huon Tree kangaroo, is found in mid- to high-elevation forests in the Huon Peninsula. Forests at these elevations in the peninsula, known to host at least one individual of the tree kangaroo, are considered HCVFs. Furthermore, the tree kangaroo is restricted to primary forests and at present is not known to enter disturbed habitats, secondary forests or plantations. Thus, primary forests, and not plantation forests, are considered the HCVFs.

HCV 1.4 Critical temporal concentrations

Description

This element is designed to ensure the maintenance of important concentrations of species that use the forest only at certain times or at certain phases of their life-history. It includes critical breeding sites, wintering sites, migration sites, migration routes or corridors (latitudinal as well as altitudinal).

Definition

Those areas that are critical for temporal use by animals, where these concentrate seasonally as part of their life cycle, should be considered HCVFs.

All mangrove forests, high- and low-water refuges in woodlands and wetlands are considered HCVFs.

Rationale

It is likely that many critical areas for the temporal concentration of species in PNG have not been identified. Generalizations for identification of critical areas can be made based on biological knowledge from PNG and other countries. All mangrove forests should be considered HCVFs because these act as spawning sites for many economically important fishes. High- and low-water refuges (woodlands) in the Trans-Fly should be considered HCVFs because these offer refuge to many water-dependent species at different times of the year.

Because these areas are critical for large numbers of individuals of one or a large number of species, and because to date the known areas occupy a minimal percent of PNG's land, these shall remain un-logged.

Identification of HCV 1.4

Task	Data Sources and Requirements
Determine if the logging concession contains critical temporal sites	Large and Medium Scale Field survey by experts in the known or suspected taxa (list provided in Appendix 6) Small-scale Interviews with landowners conducted by specifically trained supporting organisation staff
Determine if the concession contains mangrove forests, high- and low-water refuges in woodlands and swamps	Detailed map of forest cover and other features within the concession; expert assessment. Forest Inventory Mapping System (FIMS) UPNG/UNDP Landcover Mapping Project It is likely that vague definitions of forest cover types may lead to argumentation, because of the dearth of data. In such cases, if a forest cover type is suspected to be a critical site, it shall be considered an HCVF.
Examples:	Flood plain and wetland areas in the Trans-Fly region and Moresby Savannas.

Management and monitoring for HCV 1.4

Management Recommendation	Guidance
Reduced Impact Logging can take place, provided; Experts endorsement (see Appendix 6 for expert list) indicating that these endemics can withstand timber harvesting. Medium to Large Scale Allocation of up to 20% of protected area in a fmu (large scale operation) shall be determined by an identified authoritative Institution/Researcher/Expert of a suspected taxa (En, Cr, DD species by CITES, IUCN, CI, Protected by PNG Fauna Act) or Ecosystems (critical ecosystems) agreed upon by the land owners. Small Scale Allocation of up to 10% of protected area in a small scale fmu shall be determined by the landowners, advised by specifically trained support organisation staff Other aspects of logging operations should be also considered, like log transportation along waterways/marine routes, ie/ Gulf/Western Provinces.	Expert consultation before, during and after felling. Strict complicance to the PNG LCOP and Environment Act 2000.

3. HCV2

Forest areas containing globally, regionally, or nationally significant large landscape level forests, contained within, or containing the management unit, where viable population of most, if not all naturally occurring species, exist in natural patterns or distribution and abundance.

Description

This part of the HCVF definition aims to identify forests that contain viable populations of most, if not all, naturally occurring species. It also includes forests that contain important sub-populations of very wide-ranging species (e.g. Adelbert and Huon mountains may contain sub-populations of plants and animals found throughout the northern mountain ranges) even though the sub-populations may not be viable in the long term. It includes forests where ecological processes and ecosystem functioning (e.g. natural disturbance regimes, forest succession, species distributions and abundance) are wholly or relatively unaffected by recent human activities. Such forests are necessarily large (tens of thousands of hectares) and will be less affected by recent human activities than other forests within the region. Such forests are increasingly rare and continue to be threatened throughout the world, through processes such as deforestation, forest fragmentation and degradation.

Papua New Guinea retains a relatively large proportion of forest cover so the working group has had to decide the extent to which patterns of historical and current use as well as current threats have reduced the ability of forests to support the natural array of species.

It is also worth emphasising that the forest considered under HCV2 is not necessarily confined to a particular administrative unit (e.g. forest management unit). This is because several contiguous administrative units of forest land may together form a significant large, landscape level forest. An individual administrative unit can be a HCVF under HCV2 if it is whole or part of a significant large, landscape level forest.

Definition

Where opportunity exists to append new protected areas to existing or proposed PAs, to bolster conservation of all forest types, these should be considered as HCVFs.

On the mainland, contiguous forest blocks around PAs that can potentially become protected areas or areas that may become PAs extending beyond 500,000 ha in size are considered HCVFs.

On satellite islands, contiguous forest blocks around PAs that can potentially become protected areas extending beyond 20% of the total island forest cover are considered HCVFs.

On both mainland and satellite islands, areas that represent significant contribution to large landscape-level forests through connectivity for ecological and ecosystem processes are considered HCVFs including mangrove swamp forests of PNG.

Any contigious forest area remaining from any forest type (Appendix 8), 50 % of which has been removed, and is found either on the mainland or satelite islands,is to be considered HCVF.

Where possible, or where data is available, it is recommended that the large landscape-level HCVFs be identified through reliable evidence of the presence of at least five to 10 breeding pairs of an umbrella species (identified by experts or see Appendix 4 for list of recognised species), in the mainland and satellite islands.

Rationale

There is insufficient protection to date for any forest type (primary forests) in PNG as protected areas only cover 2.7%. There are examples where appending new protected areas to existing ones would enhance conservation of forest types. For example:

- Tonda (Monsoon forests)
- Crater (Lower to mid montane)
- Hunstein (Lowland and lower montane)

- Managalas Plateau (Mid montane)
  New protected areas that cover large areas are also in the process of being developed:
- Kokoda Track / Owen Stanley Ranges (lower to mid montane)
- Lakekamu basin (Lowland and lower montane)
- Great Papuan Plateau (Lowland and mid montane)
- Kamiali extensions (Lowland and lower montane)
- Nakanai mountains (Lowland and mid montane)
- Torricelli mountains (Mid montane)
- Manus (Lowland Mountains)

Since the current level of protection is very low, even consideration of annexes to proposed areas will not represent extensive forest covers as HCVF. Thus, HCVFs should be considered where there is the opportunity to extend PAs through contiguous blocks to cover at least 500,000 ha on the mainland, and 20% plus of the island's forest cover. See examples in 2.3. Also, HCVFs should apply to forested areas integral to the functioning of PAs and other HCVFs through connectivity.

For the determination of landscape-level ecological processes, it is possible to consider sensitive, wide-ranging umbrella species susceptible to forest fragmentation and human population pressures to define HCVFs (refer to Appendix 4 for list of recognised species). It is expected that the landscape level forests maintain processes that ensure the persistence of these focal or umbrella species. This has been variously translated in the literature to population figures, usually 500 pairs. If this approach is to be considered, focal species should be identified for each island or region in the mainland with the assistance of an expert.

Unfortunately, there are probably no animals in New Guinea large enough to indicate presence of large forests and landscape-level ecological processes. Adding to the problem with this definition, it is unrealistic that surveys could be conducted to determine abundance of the wide-ranging species mentioned above, especially in the rugged terrain and difficult field conditions of PNG. Perhaps as the only surrogate to field data, reliable evidence of persistent small breeding populations of the same species may indicate a large forest type (e.g Cassowary).

Identification of HCV 2

Tasks	Data sources & requirements
Determine the presence and size of forested areas surrounding PAs	DEC PA registry, WWF's RAPPAM analysis results, forest cover maps (DEC, UPNG, PNGFA).
Identify large continuous blocks of forest extending >500,000 ha on the mainland, and >20% of island cover on satellite islands	Forest cover maps (DEC, UPNG, PNGFA).
Identify small blocks of forest that may be important for connectivity between a PA and a large block of forest, or between two blocks of forest.	Forest cover maps (DEC, UPNG, PNGFA). The small blocks may not need to be directly connecting the two adjacent forested areas. These small blocks may act as "stepping stones", as long they are within 5 km of at least two large forested areas, and are at least 500 ha in size (this certainly will not work for forest-interior mammals, but for plants and birds.
If possible, or where data is available, determine the presence and persistence or abundance of a recognized umbrella species.	A list of recognized species that may act as indicators of large-scale ecological processes is included in Appendix 4. Expert survey and expert consultation shall indicate if an umbrella species is present and persistent in a block of forest, and/or its current estimated abundance.

Tasks	Data sources & requirements
Examples:	1. Tenkile Tree-kangaroo (Dendrolagus scottae) habitat in the Toricelli mountains. 2. Calophyllum forest of Manus province.

Management and monitoring for HCV 2

Management Recommendation	Guidance
HCVFs shall be managed by reduced impact logging.	Before logging takes place, experts must indicate best practices to minimize impact; experts must also conduct surveys to ensure the presence and abundance of indicator (umbrella) species are not compromised.
If there is evidence of negative impacts on landscape-level ecological processes, logging shall not occur until recovery is observed, or the problems properly identified and addressed through improved practices.	Expert consultation. Satellite imagery. Large, medium and small scale monitoring surveys must be conducted once every two years.

4. HCV3

Forest areas that are in or contain rare, threatened or endangered ecosystems

Description

Some ecosystems are widespread and under little threat, whereas others are naturally rare or are declining rapidly due to human pressures. In order to conserve the full range of biodiversity, it is important that sufficient areas of each of these rare or declining habitats are kept in good condition. The most effective way to achieve this is to aim for adequate coverage within secure protected areas. Where this is not feasible, or has not yet been achieved, sympathetic management is needed for key sites outside the protected areas system. The goal for this HCV is to identify sites where this is required for each rare, threatened or endangered habitat type. For some habitats, no such special management will be required, for others every surviving example of the habitat may be considered precious, but for many there will be a need to identify and concentrate on the higher priority sites from a range of sites of varying importance.

Definition

1) Identified threatened or endangered lowland forests on satellite islands, mangroves, swamp forests, Araucaria forests, Eucalyptus deglupta forests, Terminalia brassii forests, Castanopsis forests, Nothofagus forest, Savanna forest and Monsoon forest.
2) All forests on karst or ultrabasic soils that do not promote regeneration are considered as HCVFs
3) Forests that do not regenerate sufficiently after logging and where regeneration management and/ or silvicultural measures cannot be applied then in consultation with DEC and PNGFA can be declared HCVF.

Rationale

No prioritization plans are available based on threatened or endangered ecosystems as there is limited information or availability of data on the conservation of ecosystems in PNG. Some of the most threatened ecosystems in PNG are island ecosystems, including satellite islands and ecosystems in mountain tops.

Examples of forest types likely to be identified as of high concern include: lowland forests on satellite islands, mangroves, swamp forests (Sepik plains, Gulf deltas and Fly river delta swamps), lower montane forests, Araucaria forests, Eucalyptus deglupta forests, Terminalia brassii forests, Castanopsis forests, Nothofagus forests, etc (refer to Appendix 8 for the vegetation types of PNG, see also the text by Paijman, 1975).

Forest types found on particular substrate are notable for possessing high levels of endemism, such as karst forest and ultrabasic soil forests. These should be considered for HCV.

Other forests may become threatened by global warming due to their isolation on mountain tops, such as high montane forests, forests in areas of low relief and forests in fragmented landscapes. Because of this, these are considered HCVFs.

There shall be no size threshold for forest types identified as threatened or endangered through DEC's Vegetation Change Analysis, or for forests on limestone karst or ultrabasic soils. Forests threatened by global warming (i.e., high montane forests, forests in areas of low relief and forests in fragmented landscapes) that maintain, or may attain, connectivity to larger areas of the same forest type to maintain landscape-level processes (i.e., areas that together cover 500,000 ha or more on the mainland and >20% on satellite islands) shall be considered, regardless of their size. If no connectivity exists as defined in HCVF2, or if the forest links to other forests of the same type but together do not reach 500,000 ha, it may not be considered HCVF.

Identification of HCV 3

Tasks	Data sources & requirements
Determine the forest types inside the concession and their level of threat.	Vegetation cover maps (DEC, UPNG, PNGFA-FIMS), Field verification and sampling
Determine the kind of substrates inside the concession	Soil maps, geo-morphological maps, geological maps (DEC, UPNG), Field verification and sampling. Those forests on limestone or on ultrabasic soils shall be considered HCVFs (PNGRIS)
Determine if forest is able to regenerate after logging or if regeneration and/or silvicultural measures can be applied.	FRI, PNGRIS (eg Soils), Field verification and field trial
Examples:	Mid montane forests at Gumi, West Watut TRP, which have poor regeneration after felling.

Management and monitoring for HCV 3

Management Recommendation	Guidance
Because these are already identified as critcal or threatened ecosystems, no medium or large scale logging shall occur within these HCVFs.	Only upon expert consultation re-evaluate and identify the current level of threat to the ecosystem Identify the authorized institution/ NGO/ researcher/ expert who can be consulted (see Appendix 6).

5. HCV4

Forest areas that provide basic services of nature in critical situations (e.g. watershed protection, erosion control)

All forests provide some services of nature such as watershed protection, stream flow regulation or erosion control and these services should always be maintained under good management. In most forests the consequence of a breakdown in these services is relatively minor. In some cases, however, their failure would have a serious catastrophic or cumulative impact. For example, a forest that forms a large proportion of the catchment area of a river that has a high risk of damaging and destructive flooding downstream may be critical in preventing flooding and would be considered a HCV. It is this type of situation that HCV4 attempts to identify.

Since there is a range of separate ecosystem services, this value has been sub-divided into three elements:

HCV4.1 Forests critical to water catchments

Forests play an important role in preventing flooding, controlling stream flow and regulating water quality. Where a forest area constitutes a large proportion of a water catchment, it is able to play a critical role in maintaining these water quantity and quality. The greater the importance of the water catchment, in terms of flooding or drought risk or water usage, the more likely it is that the services provided by the forest are critical and that the forest is a HCVF.

HCV4.2 Forests critical to erosion control

A third basic service of nature that forests provide is terrain stability, including control of erosion, landslides, avalanches and downstream sedimentation. All areas suffer some degree of erosion and many are also prone to a degree of terrain instability, but often the extent or risk of these is very low or the consequences minor. In some cases, though, forests protect against erosion, landslides and avalanches in areas where the consequences, in terms of loss of productive land, damage to ecosystems, property or loss of human life, are severe. In these cases, the ecosystem service provided by the forest is critical, and it is these that should be designated HCVFs.

HCV4.3 Forests providing barriers to destructive fire

Fire is a part of the natural dynamics of many forest ecosystems, such as boreal forests in Canada or eucalypt forests in Australia. Mostly these fires are small and pose no great threat or risk. However, forest fires, whether started by natural causes or by humans, can sometimes develop into destructive, uncontrolled fire that can be a serious risk to human life and property, economic activity, or to threatened ecosystems or species. A HCV under this element includes forest that naturally acts as a barrier to fire in areas that are prone to fire where the consequences are potentially severe.

HCV4.1 Forests critical to water catchments

Description

All forests affect the watersheds in which they occur. However, the watershed protection function of individual forests is not always critical. Some forest types are particularly important in regulating stream flow, and so more likely to be critical to watershed functioning.

Forests can be considered critical to watershed protection when a particular forest area protects against:

- potentially catastrophic floods or drought
- widespread loss of irreplaceable water for drinking, agriculture, hydroelectric schemes and other uses,
- the destruction of fisheries where spawning grounds had been protected by mangroves or riparian forests
- changes to the hydrology of catchments that would seriously and irreversibly degrade a protected area.

Definition

Forests critical to water catchments are defined as forests that:

1. provide critical water supplies for urban areas which are defined by established catchment plans (Waterboard, PNG Power)

2. have catchments as identified by Wetlands (Ramsar) Convention, Directory of Asian Wetlands
3. provide rural communities with class 2 stream according to Logging Code of Practice (LCOP), including all water bodies and water courses
4. are within designated Water Control Districts
5. Provide water for energy (electricity) source

Rationale

There are no national water catchments classifications, however, several catchments have been identified as critical. These are:

- Laloki (hydro and water supply) Urban
- Fly (irrigation, navigation, transport, tourism, fishing) Rural
- Sepik (irrigation, fishing, tourism) Rural
- Markham-Ramu (hydro) Urban
- Purari (due to no development seen as a control) Rural
- All urban water supply catchment areas and their tributaries.

Water Control Districts identified under the Environment Act 2000 (section 95 div v). A list of Water Control Districts is included in Appendix 5.

Water permit areas as identified under the Environment Act 2000 (section 82 div 1 part vii).

As a signatory to the Convention on Wetlands of International Importance (Ramsar Convention), PNG has an international obligation to protect wetlands listed on the Ramsar "List of Wetlands of International Importance" and the upstream catchments affecting these areas. PNG currently has two Ramsar listed areas - Lake Kutubu WMA (24,100 ha) in Southern Highlands Province and Tonda WMA (590,000 ha) in Western Province.

The Directory of Asian Wetlands (Osbourne 1989; 1993) lists 30 biologically important wetland sites and areas which need to be considered in planning forestry developments.

Eighteen high priority wetlands are identified in the Conservation Needs Assessment (1993). Forestry operations within and upstream of these areas will need to maintain the values for which these were designated.

Downstream impact on protected or economically important fisheries needs to be considered (e.g. Gulf of Papua and Milne Bay prawn fisheries; barramundi in Western and Gulf provinces; black bass fisheries in Western, Gulf and WNB provinces; crocodiles in Sepik and Western provinces.

Identification of HCV 4.1

Tasks	Data sources & requirements
Determine if the catchment is within a Wetlands (Ramsar) Convention, Directory of Asian Wetlands.	Ramsar Sites, Directory of Asian Wetlands
Determine if the catchment provides critical water supply to urban areas (water permit)	Waterboard, PNG Power, DEC, Provincial Government, Local Level
Determine if the catchment provides critical water supply to rural communities Determine if the catchment is a gazetted	Governments Rural communities, use Stream Class 2 within the LCOP
Water Control District	DEC (Environment Act 2000)
Examples:	A forester working in the Sogeri District consulted the Waterboard and found out that Laloki River is a priority catchment.

Management and monitoring for HCV 4.1

Management Recommendation	Guidance
Identify and mark where catchment boundary borders with the concession	This has to be identified in the field by establishment of permanent, marked boundaries. Experts assistance is required to verify
Establish a 50 meter buffer outside of the catchment where logging may not take place	This has to be identified in the field by walking along watershed boundary and flagging them with orange flagging tapes.
In urban catchment areas and gazetted Water Districts no logging will be permitted	Consult Waterboard, PNG Power, DEC, Provincial Government, Local Level Governments,
For definitions 1 and 3, reduced impact logging is permitted using the PNG Logging Code of Practice Key Standard Number 2.	Consult PNG Logging Code of Practice.

HCV4.2 Forests critical to erosion control

Description

Forests are often important in maintaining terrain stability, including control of erosion, landslides and avalanches. Most standards for responsible forest management take this into account. In some cases, though, the risks of severe erosion, landslides and avalanches are extremely high and the consequences, in terms of loss of productive land, damage to ecosystems, property or loss of human life, are potentially catastrophic. In these cases, the ecosystem service provided by the forest is critical, and it is these that should be designated HCVFs.

Definition

A forest should be considered HCVF when on a slope of > 30 degrees (PNG Logging Code of Practice (LCOP)).

Rationale

The existing classification used in the PNG Logging Code of Practice sufficiently identifies areas prone to erosion and landslides. It does not identify materials with erosion potential which is either below or above the average cut-off slope recommended. While it is advisable to develop a separate more conservative slope class according to erosion potential, the necessary information - relief, soil structure, seismic activity - is not easily available to forest managers or at a scale relevant to forest management plans.

Identification of HCV 4.2

Tasks	Data sources & requirements
Identify areas of corresponding slope classes from maps	Derive slope from 1:100,000 Topographic Maps, Use slope classes and queries within PNGRIS and the SRTM DEM, UPNG DEM of PNG.
Verify slope classes in the field	Verify slopes with chain and clinometer.
Examples:	The operations forester will receive maps of corresponding slope classes from the maps produced by the survey section and verify slope classes with chain and clinometer in the field for set-up planning.

Management and monitoring for HCV 4.2

Source: PNG LCOP

	Slopes from 0 to 30 degrees	Slopes steeper than 30 degrees
Selective Logging Extraction System	Generally PNGLCOP Applies	Note: Generally prohibited under the terms and conditions of the Timber Permit
Ground-based Wheeled or tracked skidder	PNGLCOP applies	Prohibited
High Lead Cable System	Prohibited	Prohibited
Skyline Cable System	May be approved with specific permission of DEC and PNGFA but not covered by PNGLCOP	Prohibited
Helicopter	PNGLCOP applies	May be approved with specific permission of DEC and PNGFA. This may require variation of the Timber Permit

HCV4.3 Forests providing critical barriers to destructive fire

Description

Most standards for responsible forest management contain requirements for fire prevention and control in areas where this is appropriate. This element is not intended to include forests where fire is a natural or normal part of forest ecosystem process. Rather, it will include those few forests that provide natural barriers to fire where uncontrolled spread of fire could pose a serious risk to human life and property, economic activity or to threatened ecosystems or species.

Definition

Any forest that provides protection from fire to:

- forests declared protected according to the Forestry Act (Division 3. Section 52. Subsection 1 and 2), Fauna (Protection and Control) Act, National Park Act, Conservation Area Act.
- forest succeptible to fire (Monsoon and Savanna Forests, Swamp and Peat Forests).
- Plantations (as well as green breaks).

Rationale

There is no national fire risk assessment of forests nor is there an assessment of critical barriers to destructive fires. There is a provision under the Forestry Act 1991 (Section 52, Subsection 1 and 2) which allows the PNGFA Managing Director to declare certain forests that are under risk of destructive fires as protected, however this does not equate to identifying forests which provide critical barriers to destructive fire. Plantation forests are often at the risk of fires and with the exception of Bulolo Plantation none of these plantations have a fire management plan.

Identification of HCV 4.3

Tasks	Data sources & requirements
Verify if a forest has been declared protected from fire under the Forestry Act (Division 3. Section 52. Subsection 1 and 2), Fauna (Protection and Control) Act, National Park Act, Conservation Area Act.	Forest Management Division, PNGFA,DEC.
Verify the existence of barrier forests in dry zones of PNG susceptible to fires.	Forest Management Division, PNGFA FIMS
Verify the proximity to plantations.	Bulolo, Wau (Morobe) Stettin Bay, Hoskins Open Bay, East New Britain Kerevat, East New Britain Jant, Madang Lapegu, East Highlands Province Waghi, Western Highland Province Fayantina, Eastern Highlands Province Brown River, Central Kuriva, Central Ulabo, Milne Bay Sepik Plains, East Sepik
Examples:	Mt Susu National Park and the Araucaria forests of Bulolo, Morobe Province.

Management and monitoring for HCV 4.3

Management Recommendation	Guidance
Conduct awareness on the provision of the Forestry Act (Division 3. Section 52. Subsection 1 and 2), Fauna (Protection and Control) Act, National Park Act, Conservation Area Act in relation to declaration of protected areas and the forest types that are included under this provision	Prepare and disseminate awareness materials and carry out the awareness in consultation with these groups (Prov. Govt., LLG. Schools, Media, CBO).
In plantation susceptible to fires a "green break" should be established.	Grassland fires-HCV breaks must be at least 20 meters. Forest Fires-HCV breaks must be at least 100 meters.

6. HCV5

Forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health) and critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance in cooperation with such local communities)

Description

The HCVF National Working Group has combined HCV5 and 6 because of the shared requirement of consultation for these two values.

Many conservation designations view humans as purely prejudicial to forests. The definition of HCVFs is different because it recognises that some forests are essential to human well-being. This value is designed to protect the basic subsistence and security of local communities that are derived from forests - not only for "forest-dependent communities", but also for any communities that get substantial and irreplaceable amounts of income, food or other benefits from the forest.

Definition

1. If the community derives >50% of their needs for water, building materials,food, medicine, firewood, craft materials, cash NTFP's, cultural materials from the forest, this (part of the) forest shall be HCV for this particular need. Social assessment is necessary to determine individual community needs.
2. Any cultural and heritage significance (ples tambu), or historical sites within the forest will be regarded as HCV.
3. Areas identified as important and incorporated into the property list in the Incorporated Land Groups be regarded as a HCV.

Rationale

HCV5 applies to basic needs and maintaining cultural identity. For example, for a community that derives a large part of its protein from hunting and fishing in forests where there is no alternative source of meat or fish, the forests would constitute a HCV. If, in another forest, people hunted largely for recreational purposes (even if they did eat their catch) and where they were not dependent upon hunting, then this would not constitute a HCV. As well as being essential for subsistence and survival, forests can be critical to societies and communities for their cultural values. This value is designed to protect the traditional culture of local communities where the forest is critical to their identity, thereby helping to maintain the cultural integrity of the community.

A forest may be designated a HCVF if it contains or provides values without which a local community would suffer a drastic loss of a basic need or cultural change and for which the community has no alternative. A forest may have HCV status if local communities obtain essential fuel, food, fodder, medicine, or building materials from the forest, without readily available alternatives. In such cases, the High Conservation Value is specifically identified as one or more of these basic needs.

Identifying HCV5 will require consultation.

Employment, income and products are values that should be conserved if possible, without prejudice to other values and benefits. However, HCVs do not include excessive extraction, even when communities are currently economically dependent on it. Nor do they include the excessive application of traditional practices, when these are degrading or destroying the forests and the other values present in the forest.

The following would not be considered HCVs:

- Forests providing resources of minor importance to local communities.
- Forests that provide resources that could readily be obtained elsewhere or that could be replaced by affordable substitutes.

Over time, a value may grow or decline, with changing community needs and changes in land use. A forest, which was previously only one of many sources of supply, may become the only, or basic fundamental source of fuel wood or other needs. Conversely, needs may decline and disappear with time. This stresses the need for monitoring and review.

Communities living in and around forest areas have a varying degree of dependency on forest resources depending on their origin, their history, the influence of external parties such as traders, companies or government, as well as their access to markets and agricultural technologies. Communities living in isolated areas usually have a high degree of dependency to the forest. However, even migrant communities may become dependant on the forest if they harvest timber or non-timber forest products, for example, as part of their livelihood.

Assessing the availability of alternative sources may be delicate. The presence of communication and market access is an important factor. Isolated communities are likely to have few market options and a reduced access to alternative technologies to replace their forest-dependant livelihood pattern. Communities with easy market access and easy communication with traders and government services may be in an easier position to shift to new livelihoods. However, this may be limited by access to land, technology and capital. This should be considered carefully, and the principle of precaution should be applied, that is, when in doubt, assume that the people have no ready replacement.

Another delicate element to evaluate is the extent to which the use of the forest by the communities is sustainable and is compatible with the safeguard of other HCVs. Unsustainalbe levels of extractions such as excessive hunting of endangered species should be treated as HCVs and management criteria developed and applied that allows the continued sustainable harvest of these forests.

Guidance on appropriate consultation methods

This step aims to help forest managers determine whether use of the forest is:

- fulfilling one or more of the community's basic needs and
- whether the forest is fundamental to the cultural identity of the community (or communities).

1) Characterising the community:	Has to be adjusted to particular situations. Unless dealing with very small groups/clans, more than one consultation method should be used to verify the information gathered. To understand the community there has to be a community profile. This includes knowing the population, community structure (clan groups), decision making processes, language(s), socio-economic information, community groupings (women's groups, youth groups, churches), land boundaries, etc. Additional to the use of the forest by the landowners there will be rights to its use with other people. These user rights will have to be identified to achieve a full picture of the use of the forest in meeting basic needs.
2) Consultation methods: IMPORTANT: Land and use of its resources is a very sensitive issue in PNG. When collecting the information needed, the facilitators should make their objectives very clear and avoid asking for (sensitive, controversial) details.	Landownership can be identified using the Incorporated Land Group process. It is important to ensure proper process & approach is/has been used, so the group involved is aware of its purpose, all clan members are/were involved, and the correct information is/was collected. There is no existing methodology to obtain written evidence of user rights, although clear verbal agreements exist, passed down from generation to generation. It is also important to identify background of

Important considerations: • Approaches may have to be adapted to the specific situation (community groups, different ethnic groups) • In the identification of cultural sites existing rituals, customs, taboos, etc should be respected • Past, present and future status of basic needs provision from the forest needs to be assessed by the people • All clans within a forest management unit will have to be involved and all neighbouring clans have to be informed to avoid possible future disputes. • For practical reasons the consultation may be undertaken in stages (village by village). Preferably it should be undertaken before start of the harvesting operation. **NB:** • All methodologies used should be participatory processes • Facilitator role to be limited to guiding process only and should not be dominant or too leading • Facilitator to clearly explain that the HCV process is not aimed at getting outsiders to provide a solution or assistance, but to assist community to come up with their own solutions and management • Facilitator to clarify that secret information or knowledge that is not to be shared with outsiders, could be generally indicated to ensure it is included as HCV • Recheck information obtained from one group with other group(s) • Approach may have to be adapted to the specific situation • Utilise knowledge of existing Community Based Organisations, e.g. church groups • Use traditional knowledge on indicator species to identify HCV.	user rights, as this may influence management measures. Only general information on user rights and the extent to which they meet basic needs should be collected, to avoid getting bogged down into unnecessary and possible sensitive or controversial details. In order to consult under-represented individuals or groups, specific interviews, e.g. women, elders, youth and household, interviews/surveys can be used. Information on basic needs has to be collected. This could be done as part of a land use planning process. As slightly different methods & approaches are used by various organizations, it has to be verified if the land use planning process has been completed sufficiently and will provide the needed information. If not, an additional consultation process is needed.
3) What information is needed: NB: There is very little written information available. Even though some studies are available, they may be either too general or applicable to a certain area/group only.	Normally this would include: • What the community uses the forest for Main basic needs list: Water, building materials, food, medicine, firewood, craft materials, cash NTFP's • Patterns of resource use (how much, when, how many people) and alternative sources • Whether the use of one resource conflicts with the maintenance of another HCV • Whether resource use is sustainable (NB: Past, present and future status of basic needs provision from the forest needs to be assessed by the people to help determine this)

<table>
<tr><td>4) How to analyze the information obtained:</td><td>Determine relevance of individual basic needs obtained from the forest (table).

Potential indicators that a forest is fundamental to local communities may be when:
• A high proportion of the community's need comes from the FMU;
• There are no readily available, affordable and acceptable alternatives;
• A community would suffer diminished health or well-being through reduced supply of a resource;
• A particular resource provides only a small proportion of a community's basic needs or is only used occasionally but is nevertheless critical (e.g. when a forest provides a modest proportion of overall food consumed but most of the protein, or when a forest provides famine food or provides a large proportion of food at particular times of year).

Table: Basic needs</td></tr>
<tr><td></td><td><table>
<tr><th>Basic need</th><th>Forest</th><th>Other</th></tr>
<tr><td>Water</td><td></td><td></td></tr>
<tr><td>Building material</td><td></td><td></td></tr>
<tr><td>Food</td><td></td><td></td></tr>
<tr><td>Medicine</td><td></td><td></td></tr>
<tr><td>Fire wood</td><td></td><td></td></tr>
<tr><td>Craft materials</td><td></td><td></td></tr>
<tr><td>Cash NTFP</td><td></td><td></td></tr>
</table>
4 - Essential 100% of basic need is met by the forest
3 - Critical >50%
2 - Important 25-50%
1 - Not important 1-25%
0 - Non existent 0%</td></tr>
</table>

Identification of HCV 5

Tasks	Data sources & requirements
1. Identify landowning clan(s) within the forest management unit. If the FMU contains more than one village the HCV identification exercise has to be done per village.	Incorporated Land Group documents If there are no ILG's, get information from community on number of clans, their family members and land areas from the village recorder (according to Organic Law).
2. Consult with other stakeholders to find out if there is any existing relevant information.	National Museum and Art Gallery, NRI, PNGFA, UPNG, NGOs.

Management and monitoring for HCV 5

Tasks	Data sources & requirements
3. Determine appropriate methodology during a scoping visit 3.1 Agree on awareness meeting date	Awareness meeting to be held first to explain the purpose of the exercise and to give community members time to familiarise themselves with the idea. Meeting to take place in the village, at a date and time convenient to the community.
4. Facilitate awareness meeting 4.1 Agree on HCV identification meeting date	Inform (*toksave pastaim*), remind and reconfirm meeting date and time. Meeting must take place in the village, at a date and time convenient to the community Explanatory material
5. Facilitate HCV identification meeting	Materials: HCVF National Toolkit
6. Basic needs and cultural site identification 6.1 List of basic needs, cultural sites and users 6.2 When, where and how much and often used/collected 6.3 Determine if the use is sustainable 6.4 Alternative sources	Depending on selected (combination of) methodologies: - Participants draw resource map and compile lists - Facilitator meets with different groups and records information - Facilitator hold household interviews/surveys and collects information.
7. Process information and determine if basic needs are essentially or critically met by the forest.	Use thresholds and Table: Basic needs (see above in Guidance section)
8. Confirm results with community	Either at the same meeting or a separate/next meeting
9. Incorporation into overall HCV identification 9.1 Compare results with outcome of other HCVs and analyse. 9.2 Incorporate results with outcome other HCV into overall HCV identification	Results of HCV 1-5 eg. Over harvesting of certain species that are threatened or endangered may exterminate them.
10. Presentation/confirmation of overall HCV identification to/with community	
Examples:	Masalai ples forest areas where traditionally no harvesting or even presence of people is allowed.

Management Recommendation	Guidance
General remarks: Management recommendations and guidance given below apply to permit areas where outside contractors operate on customary land. Where landowners operate in small-scale operations on their own land, the community decides on the appropriate management recommendations, which will have to be respected by the management of their company. If basic need harvesting is unsustainable or pose a threat to other HCVs the community will have to develop management rules to ensure this threat is dealt with. Look back at customary rules and/or design 'modern' versions of these rules. E.g. peles masalai becomes WMA. NB: Look at protected and endangered species and indicator species under other HCV(s) to ensure these species receive the needed protection.	
MEDIUM - LARGE SCALE	
1. Water: buffer zones and no road crossings	LCOP
2. Building materials: - If identified as reserve, no logging + 100 m buffer zone - If no specific reserve identified, have to be specifically marked by landowner to be kept from harvesting by contractor.	LCOP, at time of set-up preparation. Timber permit extraction exclusion, at time of set-up preparation
3. Food: - trees have to specifically marked by landowner to be kept from harvesting by contractor. List of trees not be harvested	Timber permit extraction exclusion, at time of set-up preparation
4. Medicine: - If identified as reserve, no logging + 100 m buffer zone - If no specific reserve identified, have to be specifically marked by landowner to be kept from harvesting by contractor.	Timber permit extraction exclusion, at time of set-up preparation
5. Firewood: no recommendations thought necessary	
6. Craft materials: - If identified as reserve, no logging + 100 m buffer zone - If no specific reserve identified, have to be specifically marked by landowner to be kept from harvesting by contractor.	Timber permit extraction exclusion, at time of set-up preparation
7. Cash NTFP's: - If identified as reserve, no logging + 100 m buffer zone - If no specific reserve identified, have to be specifically marked by landowner to be kept from harvesting by contractor.	Timber permit extraction exclusion, at time of set-up preparation
8. Cultural sites	LCOP Timber permit extraction exclusion, at time of set-up preparation
SMALL SCALE	
1. Water: buffer zones & no road crossings	Same as medium-large: LCOP
2. Building materials: - If identified as reserve, no logging + 100 m buffer zone - If no specific reserve identified, have to specifically marked by landowner to be kept from harvesting by contractor	Same as medium-large: LCOP
3. Food: trees have to specifically marked by landowner to be kept from harvesting by contractor. List of trees not to be harvested	Same as medium-large: LCOP

SMALL SCALE	
4. Medicine: - If identified as reserve, no logging + 100 m buffer zone - If no specific reserve identified, have to specifically marked by landowner to be kept from harvesting by contractor	Same as medium-large: LCOP. NB: If landowners are managing their own forests there is no threat of over-harvesting or species becoming scarce due to their consumption.
5. Fire wood: no recommendations thought necessary	NB: Majority of firewood will normally come from garden areas, plus additional availability through the waste of the sawmilling operation. May be a problem in very highly populated areas, where then some reforestation specifically for fire wood production may be necessary.
6. Craft materials: - If identified as reserve, no logging + 100 m buffer zone - If no specific reserve identified, have to specifically marked by landowner to be kept from harvesting by contractor 6.1 Own use-sustainability generally not an issue 6.2 For sale-sustainability to be looked carefully	Same as medium-large: LCOP See 4. For sustainability assessment see Section 6 of HCV 5's Identification Table.
7. Cash NTFP's: - If identified as reserve, no logging + 100 m buffer zone - If no specific reserve identified, have to specifically marked by landowner to be kept from harvesting by contractor.	Same as medium-large: LCOP For sustainability assessment see Section 6 of HCV 5's Identification Table.
8. Cultural sites	Same as medium-large: LCOP Extraction exclusion, at time of set-up preparation

MONITORING

NB 1: Small scale operations will typically form part of a FSC Group Certificate, as becoming certified individually normally is way too expensive and too difficult (to know how to meet FSC requirements).

NB 2: For individually certified small-scale operations (not part of a group certificate) expert engagement for the HCV assessment will be required, which has to be repeated every five years, at the time of certificate renewal. For individually certified operations monitoring will be done directly by the certifier.

The group certificate manager will have to monitor the identified HCVs and compliance with any management rules under the HCVs.

Annual monitoring is recommended for a start, but possibly a two-yearly monitoring may suffice.

Monitoring as to start with (re)confirming sustainable resource use and/or assessing the impact of management rules on unsustainable use.

Collection of information has to be through field visits with community meetings plus, if necessary, interviews with specific (user) groups.

Specific attention has to be given to community rules associated with HCVs, their enforcement and effectiveness.

Monitoring results may lead to requests to the operation/community to improve /change existing rules or develop new/additional ones.

Acronym/Abbreviation	Meaning
CA	Conservation Area
CBO	Community-Based Organisation
CC	HCVF National Toolkit Working Group Chamber Coordinator
CI	Conservational International Inc
CITES	Convention of International Trade in Endangered Species
CM	HCVF National Toolkit Working Group Chamber Member(s)
CNA	Conservation Needs Assessement
CR	Critically Endangered
DEC	Department of Environment and Conservation
DD	Data Deficient
EBA	Endemic Bird Areas of the World
EN	Endangered
ENB	East New Britain
EU	European Union
FIMS	Forest Inventory Mapping System
FMU	Forest Management Unit
FRI	Forest Research Institute
FSC	Forest Stewardship Council
HCV	High Conservation Value
HCVF	High Conservation Value Forest
HCVF WG	HCVF National Toolkit Working Group
NGO	Non-Government Organisation
ILG	Incorporated Land Group
IUCN	International Union of Conservation of Nature
LLG	Local Level Government
NRI	National Research Institute
NTFP	Non Timber Forest Product
PA	Protected Area
PNG	Papua New Guinea
PNG LCOP	Papua New Guinea Loggging Code of Practice
PNGRIS	Papua New Guinea Resource Information System
PNGFA	Papua New Guinea Forest Authority
RAPPAM	Rapid Assessment and Priorisation of Protected Area Management
STRM DEM	Shuttle Topography Radar Mission Mapper Digital Elevation Model
TRP	Timber Rights Purchase
UNDP	United Nations Development Programme
UPNG	University of Papua New Guinea
WGC	HCVF National Toolkit Working Group Coordinator
WCS	Wildlife Conservatoin Society
WMA	Wildlife Management Area
WNB	West New Britain
WWF	World Wide Fund for Nature

Glossary

(all definitions are taken from www.dictionary.com unless indicated otherwise)

CITES	CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between Governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. www.cites.org
Conservation Areas	Land under community or other ownership that is managed by a community committee for conservation protection. The Prime Minister declares a Conservation Area on recommendation of the Minister for Environment and the landowners. It should have " particular biological, topographical, geological, historical, scientific or social significance or other special value for the present community or future generations". Conservation areas are to be managed by a committee including landholder representatives but do not provide exclusive landholder control as in the case with WMAs. The Conservation Area committee prepares a management plan that sets out the restrictions on the use of the rules. [Conservation Areas Act 1978].
Conservation Deeds	A voluntary agreement between a landowner and an authorised body to help the landowner protect and manage the environment on their land.
Convention on Wetlands	An intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. http://www.ramsar.org
DATA DEFICIENT (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified. www.redlist.org
Directory of Asian Wetlands	This Directory aims to provide an essential database as a basis for action. It provides an inventory of wetlands of international importance in the Oceania region, including 25 political entities from Palau, Guam and the Solomon Islands in the west to Easter Island in the east, and from the Marianas and Hawaiian islands in the north to New Caledonia and French Polynesia in the

	south. http://www.wetlands.org/inventory&/OceaniaDir/Prelims.html endangered adj : (of flora or fauna) in imminent danger of extinction; "an endangered species". www.dictionary.com
ENDANGERED (EN)	A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild. www.redlist.org endemismDefinition of an endemic species: a species which is only found in a given region or location and nowhere else in the world. This definition requires that the region that the species is endemic to, be defined, such as a "site endemic" (e.g. just found on Mount Celaque),6 a "national endemic" (e.g. found only in Honduras), a "geographical range endemic" (e.g. found in the Himalayan region, which however covers several Himalayan countries and therefore is not a national endemic), or a political region endemic (e.g. found in countries of Central America). www.birdlist.org
Ecoregion	An area defined by environmental conditions and natural features; a region defined by its ecology. www.dictionary.com. Landscape planning units for WWF, modified version for PNG - Conservation Planning Region (CPR) of the DEC. The DEC is using CPR as a base tool to analyse future conservation initiatives (e.g. DEC vegetation change assessment - intersected CPR + PNGFA FIMS Vegetation Types datasets).
Fauna (Protection and Control) Act, 1976	An Act that protects fauna within the following PAs such as Wildlife Management Areas, Fauna Sanctuaries, Nature Reserves and appointment of wildlife rangers (detailed information obtain from DEC).
Forest Stewardship Council	The Forest Stewardship Council (FSC) is an international network to promote responsible management of the world's forests. FSC brings people together to find solutions to the problems created by bad forestry practices and to reward good forest management practices. www.fsc.org
FSC Principles and Criteria	The Forest Stewardship Council has 10 Principles of Forest Stewardship. These Principles and associated Criteria form the basis for all FSC forest management standards. www.fsc.org
Fundamental	adj 1: serving as an essential component; "a cardinal rule"; "the central cause of the problem"; "an example that was fundamental to the argument"; Eg:"computers are fundamental to modern industrial structure" [syn: cardinal, central, key, primal] 2: being or involving basic facts or principles; "the fundamental laws of the universe"; "a fundamental incompatibility between them"; "these rudimentary truths"; "underlying principles" [syn: rudimentary, underlying] 3: far-reaching and thoroughgoing in effect especially on the nature of something; "the fundamental revolution in human values that has

	occurred"; Eg: "the book underwent fundamental changes"; "committed the fundamental error of confusing spending with extravagance"; "profound social changes" [syn: profound] n : the lowest tone of a harmonic series [syn: fundamental frequency, first harmonic] www.dictionary.com
IUCN	The International Union for the Conservation of Nature and Natural Resources. The World Conservation Union is the world's largest and most important conservation network. The Union brings together 82 States, 111 government agencies, more than 800 non-governmental organizations (NGOs), and some 10,000 scientists and experts from 181 countries in a unique worldwide partnership. www.iucn.org
Local endemics	These are species only restricted to a geographical area and not widely distributed in PNG. (Ted Mamu) CA Management Plan A plan prepared under section 27 (1)(d) under the Conservation Areas Act, 1980 (obtain detailed information from DEC)
Protected Areas	An area declared by the Minister for Environment to protect only those animals declared as protected. [Fauna (Protection and Control) Act 1966].
Peat Forest	Peat swamp forests are forested areas with extreme conditions of wetlands and characteristics of forest with composition of dead litters and twigs. For example, the forest on the southern part of Lake Kutubu in the Southern Highland Province, PNG, is a peat swamp forest with an average of 1 meter depth.
PNG wide Endemics	Species that are only found within Papua New Guinea. Note that these are distinct from local endemics. (Ted Mamu)
Population and Population Size	The term 'population' is used in a specific sense in the Red List Criteria that is different to its common biological usage. Population is here defined as the total number of individuals of the taxon. For functional reasons, primarily owing to differences between life forms, population size is measured as numbers of mature individuals only. In the case of taxa obligately dependent on other taxa for all or part of their life cycles, biologically appropriate values for the host taxon should be used. www.redlist.org
Ramsar Site	A wetland which fulfils the criteria set forth within the Convention of Wetlands (Sander van den Ende) Rare (R) Taxa with small world populations that are not at present 'Endangered' or 'Vulnerable', but are at risk. These taxa are usually localized within restricted geographical areas or habitats or are thinly scattered over a more extensive range. www.redlist.org
Reduced Impact Logging (RIL)	The term 'reduced impact logging' has become essentially interchangeable in the vernacular with timber harvesting. 'Reduced impact logging technology' is a collective term that refers to the use of scientific and engineering principles, in combination with education and training, to improve the application of labour, equipment and operating methods in the harvesting of industrial timber. www.fao.org

Refugia	Refugia is the term used to describe an area where susceptible corn borers will be able to survive when Bt corn use becomes wide spread. One of the biggest concerns with Bt corn is that its widespread use will lead to selection for corn borers that are resistant to Bt. Maintaining a population of susceptible corn borers is thought to be one way of reducing the speed of resistance build-up. www.dictionary.com
Sacred sites	Places of cultural and traditional significance including initiation grounds, ancestral spirits and witchcraft practices, rituals and taboos.
Satellite Islands	All islands off of the coast of Papua New Guinea
Temporal Use	Any habitat use that is not permanent, especially when making reference to national or international migratory use for feeding, mating and nesting. (Sander van den Ende)
Threatened (T)	According to the IUCN definition, "threatened" is a general term to denote species that are endangered, vulnerable, rare, or categorized as "indeterminate," meaning that there is insufficient information to indicate which of the first three categories is appropriate. www.redlist.org
VULNERABLE (VU)	A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild. www.redlist.org
Wetlands	A lowland area, such as a marsh or swamp, that is saturated with moisture, especially when regarded as the natural habitat of wildlife: a program to preserve our state's wetlands. www.dictionary.com

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Appendix 1 -

Critically endangered, endangered and data deficient IUCN species of animals in PNG

#	[Scientific Name]	Common Name(s)	Red List
	BIRDS		
1	*Aegotheles tatei*	STARRY OWLET-NIGHTJAR	DD ver 3.1 (2001)
2	*Aegotheles wallacii*	WALLACE'S OWLET-NIGHTJAR	DD ver 3.1 (2001)
3	*Androphobus viridis*	PAPUAN WHIPBIRD	DD ver 3.1 (2001)
4	*Aplonis brunneicapillus*	WHITE-EYED STARLING	EN C2a(i) ver 3.1 (2001)
5	*Collocalia orientalis*	MAYR'S SWIFTLET	DD ver 3.1 (2001)
6	*Collocalia papuensis*	PAPUAN SWIFTLET	DD ver 3.1 (2001)
7	*Columba pallidiceps*	YELLOW-LEGGED PIGEON	EN C2a(i) ver 3.1 (2001)
8	*Cracticus louisiadensis*	TAGULA BUTCHERBIRD	DD ver 3.1 (2001)
9	*Erythrotriorchis buergersi*	BÜRGER'S SPARROWHAWK	DD ver 3.1 (2001)
10	*Megalurulus grosvenori*	BISMARCK THICKETBIRD	DD ver 3.1 (2001)
11	*Melanocharis arfakiana*	OBSCURE BERRYPECKER	DD ver 3.1 (2001)
12	*Meliphaga vicina*	TUGULA MELIPHAGA	DD ver 3.1 (2001)
13	*Myzomela albigula*	WHITE-CHINNED MYZOMELA	DD ver 3.1 (2001)
14	*Pseudobulweria becki*	BECK'S PETREL	CR D ver 3.1 (2001)
15	*Rallina mayri*	MAYR'S FOREST-RAIL	DD ver 3.1 (2001)
16	*Tanysiptera hydrocharis*	LITTLE PARADISE-KINGFISHER	DD ver 3.1 (2001)
17	*Todiramphus nigrocyaneus*	BLUE-BLACK KINGFISHER	DD ver 3.1 (2001)
18	*Tyto aurantia*	NEW BRITAIN MASKED-OWL	DD ver 3.1 (2001)
19	*Uroglaux dimorpha*	PAPUAN HAWK-OWL	DD ver 3.1 (2001)
20	*Zosterops meeki*	TUGULA WHITE-EYE	DD ver 3.1 (2001
	TURTLE		
21	*Chelonia mydas*	GREEN TURTLE	EN A2bd ver 3.1 (2001)
	FROGS		
22	*Albericus brunhildae*		DD ver 3.1 (2001)
23	*Albericus fafniri*		DD ver 3.1 (2001)
24	*Albericus gudrunae*		DD ver 3.1 (2001)
25	*Albericus gunnari*		DD ver 3.1 (2001)
26	*Albericus rheaurum*		DD ver 3.1 (2001)
27	*Albericus siegfriedi*		CR B1ab(iii) ver 3.1 (2001)
28	*Aphantophryne minuta*		DD ver 3.1 (2001)
29	*Aphantophryne sabini*		DD ver 3.1 (2001)
30	*Asterophrys leucopus*		DD ver 3.1 (2001)
31	*Austrochaperina adamantina*		DD ver 3.1 (2001)
32	*Austrochaperina aquilonia*		DD ver 3.1 (2001)
33	*Austrochaperina archboldi*		DD ver 3.1 (2001)
34	*Austrochaperina brevipes*		DD ver 3.1 (2001)
35	*Austrochaperina mehelyi*		DD ver 3.1 (2001)
36	*Austrochaperina parkeri*		DD ver 3.1 (2001)
38	*Austrochaperina septentrionalis*		DD ver 3.1 (2001)

#	[Scientific Name] FROGS	Common Name(s)	Red List
39	*Austrochaperina yelaensis*		DD ver 3.1 (2001)
40	*Barygenys cheesmanae*		DD ver 3.1 (2001)
41	*Barygenys exsul*		DD ver 3.1 (2001)
42	*Barygenys flavigularis*		DD ver 3.1 (2001)
43	*Barygenys maculata*		DD ver 3.1 (2001)
44	*Barygenys parvula*		DD ver 3.1 (2001)
45	*Batrachylodes gigas*		DD ver 3.1 (2001)
46	*Callulops eurydactylus*		DD ver 3.1 (2001)
47	*Callulops glandulosus*		DD ver 3.1 (2001)
48	*Callulops marmoratus*		DD ver 3.1 (2001)
49	*Callulops sagittatus*		DD ver 3.1 (2001)
50	*Choerophryne allisoni*		DD ver 3.1 (2001)
51	*Choerophryne longirostris*		DD ver 3.1 (2001)
52	*Cophixalus aimbensis*		DD ver 3.1 (2001)
53	*Cophixalus ateles*		DD ver 3.1 (2001)
54	*Cophixalus bewaniensis*		DD ver 3.1 (2001)
55	*Cophixalus cryptotympanum*		DD ver 3.1 (2001)
56	*Cophixalus daymani*		DD ver 3.1 (2001)
57	*Cophixalus kaindiensis*		DD ver 3.1 (2001)
58	*Cophixalus pulchellus*		DD ver 3.1 (2001)
59	*Cophixalus tagulensis*		DD ver 3.1 (2001)
60	*Cophixalus verecundus*		DD ver 3.1 (2001)
61	*Copiula pipiens*		DD ver 3.1 (2001)
62	*Discodeles opisthodon*		DD ver 3.1 (2001)
63	*Hylophorbus richardsi*		DD ver 3.1 (2001)
64	*Liophryne allisoni*		DD ver 3.1 (2001)
65	*Liophryne dentata*		DD ver 3.1 (2001)
66	*Liophryne rhododactyla*		DD ver 3.1 (2001)
67	*Liophryne rubra*		DD ver 3.1 (2001)
68	*Liophryne similis*		DD ver 3.1 (2001)
69	*Litoria albolabris*		DD ver 3.1 (2001)
70	*Litoria bulmeri*		DD ver 3.1 (2001)
71	*Litoria contrastens*		DD ver 3.1 (2001)
72	*Litoria dorsivena*		DD ver 3.1 (2001)
73	*Litoria jeudii*		DD ver 3.1 (2001)
74	*Litoria leucova*		DD ver 3.1 (2001)
75	*Litoria longicrus*		DD ver 3.1 (2001)
76	*Litoria louisiadensis*		DD ver 3.1 (2001)
77	*Litoria majikthise*		DD ver 3.1 (2001)
78	*Litoria mucro*		DD ver 3.1 (2001)
79	*Litoria oenicolen*		DD ver 3.1 (2001)
80	*Litoria ollauro*		DD ver 3.1 (2001)

#	[Scientific Name]	Common Name(s)	Red List
	FROGS		
81	*Litoria rubrops*		DD ver 3.1 (2001)
82	*Mantophryne infulata*		DD ver 3.1 (2001)
83	*Mantophryne louisiadensis*		DD ver 3.1 (2001)
84	*Mixophyes hihihorlo*		DD ver 3.1 (2001)
85	*Nyctimystes daymani*		DD ver 3.1 (2001)
86	*Nyctimystes gularis*		DD ver 3.1 (2001)
87	*Nyctimystes obsoletus*		DD ver 3.1 (2001)
88	*Nyctimystes oktediensis*		DD ver 3.1 (2001)
89	*Nyctimystes papua*		DD ver 3.1 (2001)
90	*Nyctimystes perimetri*		DD ver 3.1 (2001)
91	*Nyctimystes persimilis*		DD ver 3.1 (2001)
92	*Nyctimystes semipalmatus*		DD ver 3.1 (2001)
93	*Nyctimystes tyleri*		DD ver 3.1 (2001)
94	*Nyctimystes zweifeli*		DD ver 3.1 (2001)
95	*Oreophryne insulana*		DD ver 3.1 (2001)
96	*Oreophryne kampeni*		DD ver 3.1 (2001)
97	*Oreophryne loriae*		DD ver 3.1 (2001)
98	*Oreophryne notata*		DD ver 3.1 (2001)
99	*Oreophryne parkeri*		DD ver 3.1 (2001)
100	*Oreophryne wolterstorffi*		DD ver 3.1 (2001)
101	*Oxydactyla coggeri*		DD ver 3.1 (2001)
102	*Oxydactyla crassa*		DD ver 3.1 (2001)
103	*Pherohapsis menziesi*		DD ver 3.1 (2001)
104	*Platymantis acrochorda*		DD ver 3.1 (2001)
105	*Platymantis gilliardi*		DD ver 3.1 (2001)
106	*Platymantis macrops*		DD ver 3.1 (2001)
107	*Platymantis macrosceles*		DD ver 3.1 (2001)
108	*Platymantis mimica*		DD ver 3.1 (2001)
109	*Platymantis myersi*		DD ver 3.1 (2001)
110	*Platymantis nexipus*		DD ver 3.1 (2001)
111	*Platymantis rhipiphalca*		DD ver 3.1 (2001)
112	*Xenobatrachus anorbis*		DD ver 3.1 (2001)
113	*Xenobatrachus huon*		DD ver 3.1 (2001)
114	*Xenobatrachus subcroceus*		DD ver 3.1 (2001)
115	*Xenobatrachus tumulus*		DD ver 3.1 (2001)
116	*Xenobatrachus zweifeli*		DD ver 3.1 (2001)
117	*Xenorhina arboricola*		DD ver 3.1 (2001)

Source: www.cites.org, **Citation:** IUCN 2002. 2002 IUCN Red List of Threatened Species Downloaded on 04 December 2002.

Appendix 2 -

List of PNG CITES Appendix I Species of Fauna and Flora

Phylum	Class	Order	Family	Species
FAUNA				
CHORDATA	Mammalia	Chiroptera	Pteropodidae	***Pteropus tonganus*** Quoy & Gaimard, 1830
		Rodentia	Muridae	***Xeromys myoides*** Thomas, 1889
		Cetacea	Delphinidae	***Orcaella brevirostris*** (Gray, 1866)
		Cetacea	Delphinidae	***Sousa chinensis*** (Osbeck, 1765)
	Aves	Falconiformes	Falconidae	***Falco peregrinnus*** Tunstall, 1771
		Columbiformes	Columbidae	***Caloenas nicobarica*** (Linnaeus, 1758)
		Psittaciformes	Cacatuidae	***Probosciger aterrimus*** (Gmelin, 1758)
	Reptilia	Testudines	Cheloniidae	***Caretta caretta*** (Linnaeus, 1758)
				Chelonia mydas (Linnaeus, 1758)
				Eretmochelys imbricata (Linnaeus, 1766)
				Lepidochelys olivacea (Eschscholtz, 1829)
			Dermochelyidae	***Dermochelys coriacea*** (Vandelli, 1761)
ARTHROPODA	Insecta	Lepidoptera	Papilionidae	***Ornithoptera alexandrae*** (Rothschild, 1907)
FLORA				
SPERMATOPHYTA	Mono-cotyledonae	Orchidales	Orchidaceae	***Paphiopedilum bougainvilleanum Fowlie***
				Paphiopedilum glanduliferum (Blume) Stein
				Paphiopedilum glanduliferum (Blume) Stein var. wilhelminae (L.O.Williams) P.J.Cribb
				Paphiopedilum papuanum (Ridl.) Ridl.
				Paphiopedilum praestans (Reichb.f.) Pfitzer
				Paphiopedilum violascens Schltr.
				Paphiopedilum wentworthianum Schoser & Fowlie

Source: www.cites.org, **Citation:** UNEP-WCMC. 23 February, 2005. UNEP-WCMC Species Database: CITES-Listed Species

Appendix 3 -

List of endemic bird and mammal species and their location by Ecoregion in PNG (Wikramanayake, 2002)

Ecoregion	Class	Genus	Species	Common name
Admiralty Islands lowland rain forests	Avia	Ducula	subflavescens	Yellow-tinted Imperial-Pigeon
Admiralty Islands lowland rain forests	Avia	Ptilinopus	solomonensis	Yellow-bibbed Fruit-Dove
Admiralty Islands lowland rain forests	Avia	Reinwardtoena	browni	Pied Cuckoo-Dove
Admiralty Islands lowland rain forests	Avia	Megapodius	eremita	Melanesian Scrubfowl
Admiralty Islands lowland rain forests	Avia	Myzomela	pammelaena	Ebony Myzomela
Admiralty Islands lowland rain forests	Avia	Philemon	albitorques	White-naped Friarbird
Admiralty Islands lowland rain forests	Avia	Monarcha	infelix	Manus Monarch
Admiralty Islands lowland rain forests	Avia	Rhipidura	semirubra	Manus Fantail
Admiralty Islands lowland rain forests	Avia	Pitta	superba	Black-headed Pitta
Admiralty Islands lowland rain forests	Avia	Zosterops	hypoxanthus	Black-headed White-eye
Admiralty Islands lowland rain forests	Avia	Micropsitta	meeki	Meek's Pygmy-Parrot
Admiralty Islands lowland rain forests	Avia	Ninox	meeki	Manus Hawk-Owl
Admiralty Islands lowland rain forests	Avia	Tyto	manusi	Manus Owl
Central Range montane rain forests	Avia	Aerodramus	nuditarsus	Bare-legged Swiftlet
Central Range montane rain forests	Avia	Aerodramus	papuensis	Papuan Swiftlet
Central Range montane rain forests	Avia	Aegotheles	archboldi	Archbold's Owlet-Nightjar
Central Range montane rain forests	Avia	Eurostopodus	archboldi	Archbold's Nightjar
Central Range montane rain forests	Avia	Rallina	rubra	Chestnut Forest-Rail
Central Range montane rain forests	Avia	Coracina	longicauda	Hooded Cuckoo-shrike
Central Range montane rain forests	Avia	Androphobus	viridis	Papuan Whipbird
Central Range montane rain forests	Avia	Ifrita	kowaldi	Blue-capped Ifrita
Central Range montane rain forests	Avia	Cormobates	placens	Papuan Treecreeper
Central Range montane rain forests	Avia	Amalocichla	sclateriana	Greater Ground-Robin
Central Range montane rain forests	Avia	Pachycephalopsis	hattamensis	Green-backed Robin
Central Range montane rain forests	Avia	Peneothello	cryptoleucus	Smoky Robin
Central Range montane rain forests	Avia	Peneothello	sigillatus	White-winged Robin
Central Range montane rain forests	Avia	Petroica	bivittata	Alpine Robin
Central Range montane rain forests	Avia	Lonchura	montana	Snow Mountain Munia
Central Range montane rain forests	Avia	Lonchura	teerinki	Black-breasted Munia
Central Range montane rain forests	Avia	Oreostruthus	fuliginosus	Mountain Firetail

Ecoregion	Class	Genus	Species	Common name
Central Range montane rain forests	Avia	Melanocharis	striativentris	Streaked Berrypecker
Central Range montane rain forests	Avia	Melidectes	belfordi	Belford's Honeyeater
Central Range montane rain forests	Avia	Melidectes	fuscus	Sooty Honeyeater
Central Range montane rain forests	Avia	Melidectes	ochromelas	Cinnamon-browed Honeyeater
Central Range montane rain forests	Avia	Melidectes	rufocrissalis	Yellow-browed Honeyeater
Central Range montane rain forests	Avia	Meliphaga	mimikae	Spot-breasted Meliphaga
Central Range montane rain forests	Avia	Oreornis	chrysogenys	Orange-cheeked Honeyeater
Central Range montane rain forests	Avia	Ptiloprora	erythropleura	Rufous-sided Honeyeater
Central Range montane rain forests	Avia	Ptiloprora	guisei	Rufous-backed Honeyeater
Central Range montane rain forests	Avia	Ptiloprora	meekiana	Olive-streaked Honeyeater
Central Range montane rain forests	Avia	Ptiloprora	perstriata	Black-backed Honeyeater
Central Range montane rain forests	Avia	Ptiloprora	plumbea	Leaden Honeyeater
Central Range montane rain forests	Avia	Colluricincla	umbrina	Sooty Shrike-thrush
Central Range montane rain forests	Avia	Daphoenositta	miranda	Black Sittella
Central Range montane rain forests	Avia	Eulacestoma	nigropectus	Wattled Ploughbill
Central Range montane rain forests	Avia	Pachycephala	lorentzi	Lorentz's Whistler
Central Range montane rain forests	Avia	Astrapia	mayeri	Ribbon-tailed Astrapia
Central Range montane rain forests	Avia	Astrapia	splendidissima	Splendid Astrapia
Central Range montane rain forests	Avia	Astrapia	stephaniae	Princess Stephanie's Astrapia
Central Range montane rain forests	Avia	Cnemophilus	loriae	Loria's Bird-of-paradise
Central Range montane rain forests	Avia	Cnemophilus	macgregorii	Crested Bird-of-paradise
Central Range montane rain forests	Avia	Epimachus	meyeri	Brown Sicklebill
Central Range montane rain forests	Avia	Loboparadisea	sericea	Yellow-breasted Bird-of-paradise
Central Range montane rain forests	Avia	Macgregoria	pulchra	MacGregor's Bird-of-paradise
Central Range montane rain forests	Avia	Melampitta	gigantea	Greater Melampitta
Central Range montane rain forests	Avia	Paradigalla	brevicauda	Short-tailed Paradigalla
Central Range montane rain forests	Avia	Paradigalla	carunculata	Long-tailed Paradigalla
Central Range montane rain forests	Avia	Paradisaea	rudolphi	Blue Bird-of-paradise
Central Range montane rain forests	Avia	Parotia	carolae	Carola's Parotia
Central Range montane rain forests	Avia	Parotia	lawesii	Lawes' Parotia
Central Range montane rain forests	Avia	Pteridophora	alberti	King-of-Saxony Bird-of-paradise
Central Range montane rain forests	Avia	Acanthiza	murina	Papuan Thornbill
Central Range montane rain forests	Avia	Archboldia	papuensis	Archbold's Bowerbird

Ecoregion	Class	Genus	Species	Common name
Central Range montane rain forests	Avia	Charmosyna	multistriata	Striated Lorikeet
Central Range montane rain forests	Avia	Neopsittacus	pullicauda	Orange-billed Lorikeet
Central Range montane rain forests	Avia	Psittacella	madaraszi	Madarasz's Tiger-Parrot
Central Range montane rain forests	Avia	Psittacella	modesta	Modest Tiger-Parrot
Central Range montane rain forests	Avia	Psittacella	picta	Painted Tiger-Parrot
Central Range sub-alpine grasslands	Avia	Aegotheles	archboldi	Archbold's Owlet-Nightjar
Central Range sub-alpine grasslands	Avia	Anurophasis	monorthonyx	Snow Mountain Quail
Central Range sub-alpine grasslands	Avia	Ifrita	kowaldi	Blue-capped Ifrita
Central Range sub-alpine grasslands	Avia	Amalocichla	sclateriana	Greater Ground-Robin
Central Range sub-alpine grasslands	Avia	Petroica	archboldi	Snow Mountain Robin
Central Range sub-alpine grasslands	Avia	Petroica	bivittata	Alpine Robin
Central Range sub-alpine grasslands	Avia	Oreostruthus	fuliginosus	Mountain Firetail
Central Range sub-alpine grasslands	Avia	Melidectes	belfordi	Belford's Honeyeater
Central Range sub-alpine grasslands	Avia	Melidectes	foersteri	Huon Wattled Honeyeater
Central Range sub-alpine grasslands	Avia	Melidectes	fuscus	Sooty Honeyeater
Central Range sub-alpine grasslands	Avia	Melidectes	nouhuysi	Short-bearded Honeyeater
Central Range sub-alpine grasslands	Avia	Melidectes	princeps	Long-bearded Honeyeater
Central Range sub-alpine grasslands	Avia	Melipotes	ater	Spangled Honeyeater
Central Range sub-alpine grasslands	Avia	Oreornis	chrysogenys	Orange-cheeked Honeyeater
Central Range sub-alpine grasslands	Avia	Ptiloprora	guisei	Rufous-backed Honeyeater
Central Range sub-alpine grasslands	Avia	Ptiloprora	perstriata	Black-backed Honeyeater
Central Range sub-alpine grasslands	Avia	Anthus	gutturalis	Alpine Pipit
Central Range sub-alpine grasslands	Avia	Daphoenositta	miranda	Black Sittella
Central Range sub-alpine grasslands	Avia	Pachycephala	lorentzi	
Central Range sub-alpine grasslands	Avia	Astrapia	mayeri	Ribbon-tailed Astrapia
Central Range sub-alpine grasslands	Avia	Astrapia	rothschildi	Huon Astrapia
Central Range sub-alpine grasslands	Avia	Astrapia	splendidissima	Splendid Astrapia
Central Range sub-alpine grasslands	Avia	Astrapia	stephaniae	Princess Stephanie's Astrapia
Central Range sub-alpine grasslands	Avia	Cnemophilus	macgregorii	Crested Bird-of-paradise
Central Range sub-alpine grasslands	Avia	Epimachus	meyeri	Brown Sicklebill
Central Range sub-alpine grasslands	Avia	Macgregoria	pulchra	MacGregor's Bird-of-paradise
Central Range sub-alpine grasslands	Avia	Acanthiza	murina	Papuan Thornbill
Central Range sub-alpine grasslands	Avia	Psittacella	picta	Painted Tiger-Parrot
Huon Peninsula montane rain forests	Avia	Aerodramus	papuensis	Papuan Swiftlet
Huon Peninsula montane rain forests	Avia	Eurostopodus	archboldi	Archbold's Nightjar

Ecoregion	Class	Genus	Species	Common name
Huon Peninsula montane rain forests	Avia	Ifrita	kowaldi	Blue-capped Ifrita
Huon Peninsula montane rain forests	Avia	Ptilorrhoa	geislerorum	Brown-capped Jewel-babbler
Huon Peninsula montane rain forests	Avia	Melidectes	foersteri	Huon Wattled Honeyeater
Huon Peninsula montane rain forests	Avia	Melidectes	ochromelas	Cinnamon-browed Honeyeater
Huon Peninsula montane rain forests	Avia	Melipotes	ater	Spangled Honeyeater
Huon Peninsula montane rain forests	Avia	Ptiloprora	guisei	Rufous-backed Honeyeater
Huon Peninsula montane rain forests	Avia	Ptiloprora	meekiana	Olive-streaked Honeyeater
Huon Peninsula montane rain forests	Avia	Anthus	gutturalis	Alpine Pipit
Huon Peninsula montane rain forests	Avia	Astrapia	rothschildi	Huon Astrapia
Huon Peninsula montane rain forests	Avia	Paradisaea	guilielmi	Emperor Bird-of-paradise
Huon Peninsula montane rain forests	Avia	Chalcopsitta	duivenbodei	Huon Peninsula montane
Huon Peninsula montane rain forests	Avia	Psittacella	madaraszi	Madarasz's Tiger-Parrot
Huon Peninsula montane rain forests	Avia	Psittaculirostris	edwardsii	Edwards' Fig-Parrot
Louisiade Archipelago rain forests	Avia	Cracticus	louisiadensis	Tagula Butcherbird
Louisiade Archipelago rain forests	Avia	Dicaeum	nitidum	Louisiade Flowerpecker
Louisiade Archipelago rain forests	Avia	Meliphaga	vicina	Tagula Honeyeater
Louisiade Archipelago rain forests	Avia	Myzomela	albigula	White-chinned Myzomela
Louisiade Archipelago rain forests	Avia	Pachycephala	leucogastra	White-bellied Whistler
Louisiade Archipelago rain forests	Avia	Zosterops	griseotinctus	Louisiade White-eye
Louisiade Archipelago rain forests	Avia	Zosterops	meeki	White-throated White-eye
New Britain-New Ireland lowland rain forests	Avia	Aerodramus	orientalis	Mayr's Swiftlet
New Britain-New Ireland lowland rain forests	Avia	Columba	pallidiceps	Yellow-legged Pigeon
New Britain-New Ireland lowland rain forests	Avia	Ducula	finschii	Finsch's Imperial-Pigeon
New Britain-New Ireland lowland rain forests	Avia	Ducula	melanochroa	Bismarck Imperial-Pigeon
New Britain-New Ireland lowland rain forests	Avia	Ducula	rubricera	Red-knobbed Imperial-Pigeon
New Britain-New Ireland lowland rain forests	Avia	Ducula	subflavescens	Yellow-tinted Imperial-Pigeon
New Britain-New Ireland lowland rain forests	Avia	Henicophaps	foersteri	New Britain Bronzewing
New Britain-New Ireland lowland rain forests	Avia	Ptilinopus	insolitus	Knob-billed Fruit-Dove
New Britain-New Ireland lowland rain forests	Avia	Ptilinopus	solomonensis	Yellow-bibbed Fruit-Dove
New Britain-New Ireland lowland rain forests	Avia	Reinwardtoena	browni	Pied Cuckoo-Dove
New Britain-New Ireland lowland rain forests	Avia	Alcedo	websteri	Bismarck Kingfisher
New Britain-New Ireland lowland rain forests	Avia	Todirhamphus	albonotatus	New Britain Kingfisher

Ecoregion	Class	Genus	Species	Common name
New Britain-New Ireland lowland rain forests	Avia	Centropus	ateralbus	Pied Coucal
New Britain-New Ireland lowland rain forests	Avia	Centropus	violaceus	Violaceous Coucal
New Britain-New Ireland lowland rain forests	Avia	Accipiter	albogularis	Pied Goshawk
New Britain-New Ireland lowland rain forests	Avia	Accipiter	brachyurus	New Britain Sparrowhawk
New Britain-New Ireland lowland rain forests	Avia	Accipiter	luteoschistaceus	Slaty-mantled Sparrowhawk
New Britain-New Ireland lowland rain forests	Avia	Henicopernis	infuscatus	Black Honey-buzzard
New Britain-New Ireland lowland rain forests	Avia	Megapodius	eremita	Melanesian Scrubfowl
New Britain-New Ireland lowland rain forests	Avia	Gallirallus	insignis	New Britain Rail
New Britain-New Ireland lowland rain forests	Avia	Artamus	insignis	Bismarck Woodswallow
New Britain-New Ireland lowland rain forests	Avia	Dicaeum	eximium	Red-banded Flowerpecker
New Britain-New Ireland lowland rain forests	Avia	Dicrurus	megarhynchus	Ribbon-tailed Drongo
New Britain-New Ireland lowland rain forests	Avia	Lonchura	forbesi	New Ireland Munia
New Britain-New Ireland lowland rain forests	Avia	Lonchura	hunsteini	Mottled Munia
New Britain-New Ireland lowland rain forests	Avia	Lonchura	melaena	Bismarck Munia
New Britain-New Ireland lowland rain forests	Avia	Lonchura	nigerrima	New Hanover Munia
New Britain-New Ireland lowland rain forests	Avia	Myzomela	cineracea	Ashy Myzomela
New Britain-New Ireland lowland rain forests	Avia	Myzomela	erythromelas	Black-bellied Myzomela
New Britain-New Ireland lowland rain forests	Avia	Myzomela	pammelaena	Ebony Myzomela
New Britain-New Ireland lowland rain forests	Avia	Myzomela	pulchella	New Ireland Myzomela
New Britain-New Ireland lowland rain forests	Avia	Myzomela	sclateri	Scarlet-bibbed Myzomela
New Britain-New Ireland lowland rain forests	Avia	Philemon	cockerelli	New Britain Friarbird
New Britain-New Ireland lowland rain forests	Avia	Philemon	eichhorni	New Ireland Friarbird
New Britain-New Ireland lowland rain forests	Avia	Monarcha	menckei	White-breasted Monarch
New Britain-New Ireland lowland rain forests	Avia	Monarcha	verticalis	Black-tailed Monarch
New Britain-New Ireland lowland rain forests	Avia	Myiagra	hebetior	Dull Flycatcher
New Britain-New Ireland lowland rain forests	Avia	Rhipidura	dahli	Bismarck Fantail
New Britain-New Ireland lowland rain forests	Avia	Rhipidura	matthiae	Matthias Fantail
New Britain-New Ireland lowland rain forests	Avia	Aplonis	feadensis	Atoll Starling
New Britain-New Ireland lowland rain forests	Avia	Megalurulus	rubiginosus	Rusty Thicketbird
New Britain-New Ireland lowland rain forests	Avia	Zoothera	talaseae	New Britain Thrush
New Britain-New Ireland lowland rain forests	Avia	Zosterops	griseotinctus	Louisiade White-eye
New Britain-New Ireland lowland rain forests	Avia	Zosterops	hypoxanthus	Black-headed White-eye
New Britain-New Ireland lowland rain forests	Avia	Cacatua	ophthalmica	Blue-eyed Cockatoo

Ecoregion	Class	Genus	Species	Common name
New Britain-New Ireland lowland rain forests	Avia	Chalcopsitta	cardinalis	Cardinal Lory
New Britain-New Ireland lowland rain forests	Avia	Charmosyna	rubrigularis	Red-chinned Lorikeet
New Britain-New Ireland lowland rain forests	Avia	Lorius	albidinuchus	White-naped Lory
New Britain-New Ireland lowland rain forests	Avia	Geoffroyus	heteroclitus	Singing Parrot
New Britain-New Ireland lowland rain forests	Avia	Loriculus	tener	Green-fronted Hanging-Parrot
New Britain-New Ireland lowland rain forests	Avia	Micropsitta	finschii	Finsch's Pygmy-Parrot
New Britain-New Ireland lowland rain forests	Avia	Micropsitta	meeki	Meek's Pygmy-Parrot
New Britain-New Ireland lowland rain forests	Avia	Ninox	odiosa	Russet Hawk-Owl
New Britain-New Ireland lowland rain forests	Avia	Ninox	variegata	Bismarck Hawk-Owl
New Britain-New Ireland lowland rain forests	Avia	Tyto	aurantia	Bismarck Owl
New Britain-New Ireland montane rain forests	Avia	Aerodramus	orientalis	Mayr's Swiftlet
New Britain-New Ireland montane rain forests	Avia	Columba	pallidiceps	Yellow-legged Pigeon
New Britain-New Ireland montane rain forests	Avia	Ducula	finschii	Finsch's Imperial-Pigeon
New Britain-New Ireland montane rain forests	Avia	Ducula	melanochroa	Bismarck Imperial-Pigeon
New Britain-New Ireland montane rain forests	Avia	Ducula	rubricera	Red-knobbed Imperial-Pigeon
New Britain-New Ireland montane rain forests	Avia	Ptilinopus	insolitus	Knob-billed Fruit-Dove
New Britain-New Ireland montane rain forests	Avia	Ptilinopus	solomonensis	Yellow-bibbed Fruit-Dove
New Britain-New Ireland montane rain forests	Avia	Centropus	ateralbus	Pied Coucal
New Britain-New Ireland montane rain forests	Avia	Centropus	violaceus	Violaceous Coucal
New Britain-New Ireland montane rain forests	Avia	Accipiter	princeps	New Britain Goshawk
New Britain-New Ireland montane rain forests	Avia	Megapodius	eremita	Melanesian Scrubfowl
New Britain-New Ireland montane rain forests	Avia	Gallirallus	insignis	New Britain Rail
New Britain-New Ireland montane rain forests	Avia	Dicaeum	eximium	Red-banded Flowerpecker
New Britain-New Ireland montane rain forests	Avia	Dicrurus	megarhynchus	Ribbon-tailed Drongo
New Britain-New Ireland montane rain forests	Avia	Lonchura	melaena	Bismarck Munia
New Britain-New Ireland montane rain forests	Avia	Melidectes	whitemanensis	Bismarck Honeyeater
New Britain-New Ireland montane rain forests	Avia	Myzomela	pulchella	New Ireland Myzomela
New Britain-New Ireland montane rain forests	Avia	Philemon	cockerelli	New Britain Friarbird
New Britain-New Ireland montane rain forests	Avia	Philemon	eichhorni	New Ireland Friarbird
New Britain-New Ireland montane rain forests	Avia	Monarcha	verticalis	Black-tailed Monarch
New Britain-New Ireland montane rain forests	Avia	Myiagra	hebetior	Dull Flycatcher

Ecoregion	Class	Genus	Species	Common name
New Britain-New Ireland montane rain forests	Avia	Megalurulus	grosvenori	Bismarck Thicketbird
New Britain-New Ireland montane rain forests	Avia	Zoothera	talaseae	New Britain Thrush
New Britain-New Ireland montane rain forests	Avia	Zosterops	hypoxanthus	Black-headed White-eye
New Britain-New Ireland montane rain forests	Avia	Charmosyna	rubrigularis	Red-chinned Lorikeet
New Britain-New Ireland montane rain forests	Avia	Lorius	albidinuchus	White-naped Lory
New Britain-New Ireland montane rain forests	Avia	Geoffroyus	heteroclitus	Singing Parrot
New Britain-New Ireland montane rain forests	Avia	Ninox	odiosa	Russet Hawk-Owl
New Britain-New Ireland montane rain forests	Avia	Tyto	aurantia	Bismarck Owl
New Guinea mangroves	Avia	Aerodramus	papuensis	Papuan Swiftlet
New Guinea mangroves	Avia	Goura	cristata	Western Crowned-Pigeon
New Guinea mangroves	Avia	Ptilinopus	wallacii	Wallace's Fruit-Dove
New Guinea mangroves	Avia	Tanysiptera	nympha	Red-breasted Paradise-Kingfisher
New Guinea mangroves	Avia	Talegalla	cuvieri	Red-billed Brush-turkey
New Guinea mangroves	Avia	Dicaeum	pectorale	Olive-crowned Flowerpecker
New Guinea mangroves	Avia	Pitohui	incertus	White-bellied Pitohui
New Guinea mangroves	Avia	Chalcopsitta	atra	Black Lory
New Guinea mangroves	Avia	Chalcopsitta	duivenbodei	Brown Lory
New Guinea mangroves	Avia	Psittaculirostris	salvadorii	Salvadori's Fig-Parrot
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Aerodramus	papuensis	Papuan Swiftlet
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Tanysiptera	nympha	Red-breasted Paradise-Kingfisher
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Ptilorrhoa	geislerorum	Brown-capped Jewel-babbler
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Corvus	fuscicapillus	Brown-headed Crow
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Pachycephalopsis	hattamensis	Green-backed Robin
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Lichmera	alboauricularis	Silver-eared Honeyeater

Ecoregion	Class	Genus	Species	Common name
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Philemon	brassi	Brass' Friarbird
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Arses	insularis	Rufous-collared Monarch
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Monarcha	rubiensis	Rufous Monarch
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Pachycephala	leucogastra	White-bellied Whistler
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Epimachus	bruijnii	Pale-billed Sicklebill
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Epimachus	fastuosus	Black Sicklebill
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Manucodia	jobiensis	Jobi Manucode
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Melampitta	gigantea	Greater Melampitta
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Chalcopsitta	duivenbodei	Brown Lory
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Psittaculirostris	edwardsii	Edwards' Fig-Parrot
Northern New Guinea lowland rain and freshwater swamp forests	Avia	Psittaculirostris	salvadorii	Salvadori's Fig-Parrot
Northern New Guinea montane rain forests	Avia	Rallina	mayri	Mayr's Rail
Northern New Guinea montane rain forests	Avia	Ptilorrhoa	geislerorum	Brown-capped Jewel-babbler
Northern New Guinea montane rain forests	Avia	Pachycephalopsis	hattamensis	Green-backed Robin
Northern New Guinea montane rain forests	Avia	Peneothello	cryptoleucus	Smoky Robin
Northern New Guinea montane rain forests	Avia	Melidectes	ochromelas	Cinnamon-browed Honeyeater
Northern New Guinea montane rain forests	Avia	Ptiloprora	guisei	Rufous-backed Honeyeater
Northern New Guinea montane rain forests	Avia	Ptiloprora	mayri	Mayr's Honeyeater
Northern New Guinea montane rain forests	Avia	Melampitta	gigantea	Greater Melampitta
Northern New Guinea montane rain forests	Avia	Parotia	carolae	Carola's Parotia
Northern New Guinea montane rain forests	Avia	Parotia	wahnesi	Wahnes' Parotia

Ecoregion	Class	Genus	Species	Common name
Northern New Guinea montane rain forests	Avia	Amblyornis	flavifrons	Golden-fronted Bowerbird
Northern New Guinea montane rain forests	Avia	Sericulus	bakeri	Fire-maned Bowerbird
Southeastern Papuan rain forests	Avia	Aerodramus	nuditarsus	Bare-legged Swiftlet
Southeastern Papuan rain forests	Avia	Eurostopodus	archboldi	Archbold's Nightjar
Southeastern Papuan rain forests	Avia	Tanysiptera	danae	Brown-headed Paradise-Kingfisher
Southeastern Papuan rain forests	Avia	Ifrita	kowaldi	Blue-capped Ifrita
Southeastern Papuan rain forests	Avia	Ptilorrhoa	geislerorum	Brown-capped Jewel-babbler
Southeastern Papuan rain forests	Avia	Cormobates	placens	Papuan Treecreeper
Southeastern Papuan rain forests	Avia	Amalocichla	sclateriana	Greater Ground-Robin
Southeastern Papuan rain forests	Avia	Petroica	bivittata	Alpine Robin
Southeastern Papuan rain forests	Avia	Lonchura	caniceps	Grey-headed Munia
Southeastern Papuan rain forests	Avia	Lonchura	monticola	Alpine Munia
Southeastern Papuan rain forests	Avia	Oreostruthus	fuliginosus	Mountain Firetail
Southeastern Papuan rain forests	Avia	Melanocharis	arfakiana	Obscure Berrypecker
Southeastern Papuan rain forests	Avia	Lichmera	alboauricularis	Silver-eared Honeyeater
Southeastern Papuan rain forests	Avia	Melidectes	belfordi	Belford's Honeyeater
Southeastern Papuan rain forests	Avia	Melidectes	fuscus	Sooty Honeyeater
Southeastern Papuan rain forests	Avia	Melidectes	ochromelas	Cinnamon-browed Honeyeater
Southeastern Papuan rain forests	Avia	Melidectes	rufocrissalis	Yellow-browed Honeyeater
Southeastern Papuan rain forests	Avia	Meliphaga	mimikae	Spot-breasted Meliphaga
Southeastern Papuan rain forests	Avia	Ptiloprora	guisei	Rufous-backed Honeyeater
Southeastern Papuan rain forests	Avia	Ptiloprora	meekiana	Olive-streaked Honeyeater
Southeastern Papuan rain forests	Avia	Ptiloprora	perstriata	Black-backed Honeyeater
Southeastern Papuan rain forests	Avia	Ptiloprora	plumbea	Leaden Honeyeater
Southeastern Papuan rain forests	Avia	Anthus	gutturalis	Alpine Pipit
Southeastern Papuan rain forests	Avia	Daphoenositta	miranda	Black Sittella
Southeastern Papuan rain forests	Avia	Eulacestoma	nigropectus	Wattled Ploughbill
Southeastern Papuan rain forests	Avia	Pachycephala	leucogastra	White-bellied Whistler
Southeastern Papuan rain forests	Avia	Astrapia	stephaniae	Princess Stephanie's Astrapia
Southeastern Papuan rain forests	Avia	Cnemophilus	loriae	Loria's Bird-of-paradise
Southeastern Papuan rain forests	Avia	Cnemophilus	macgregorii	Crested Bird-of-paradise
Southeastern Papuan rain forests	Avia	Epimachus	meyeri	Brown Sicklebill
Southeastern Papuan rain forests	Avia	Loboparadisea	sericea	Yellow-breasted Bird-of-paradise
Southeastern Papuan rain forests	Avia	Macgregoria	pulchra	MacGregor's Bird-of-paradise

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Ecoregion	Class	Genus	Species	Common name
Southeastern Papuan rain forests	Avia	Melampitta	gigantea	Greater Melampitta
Southeastern Papuan rain forests	Avia	Paradisaea	rudolphi	Blue Bird-of-paradise
Southeastern Papuan rain forests	Avia	Parotia	helenae	Eastern Parotia
Southeastern Papuan rain forests	Avia	Parotia	lawesii	Lawes' Parotia
Southeastern Papuan rain forests	Avia	Acanthiza	murina	Papuan Thornbill
Southeastern Papuan rain forests	Avia	Amblyornis	subalaris	Streaked Bowerbird
Southeastern Papuan rain forests	Avia	Psittacella	madaraszi	Madarasz's Tiger-Parrot
Southeastern Papuan rain forests	Avia	Psittacella	picta	Painted Tiger-Parrot
Southern New Guinea freshwater swamp forests	Avia	Goura	cristata	Western Crowned-Pigeon
Southern New Guinea freshwater swamp forests	Avia	Ptilinopus	wallacii	Wallace's Fruit-Dove
Southern New Guinea freshwater swamp forests	Avia	Tanysiptera	hydrocharis	Little Paradise-Kingfisher
Southern New Guinea freshwater swamp forests	Avia	Talegalla	cuvieri	Red-billed Brush-turkey
Southern New Guinea freshwater swamp forests	Avia	Dicaeum	pectorale	Olive-crowned Flowerpecker
Southern New Guinea freshwater swamp forests	Avia	Lonchura	nevermanni	Grey-crowned Munia
Southern New Guinea freshwater swamp forests	Avia	Lonchura	stygia	Black Munia
Southern New Guinea freshwater swamp forests	Avia	Pitohui	incertus	White-bellied Pitohui
Southern New Guinea freshwater swamp forests	Avia	Paradisaea	apoda	Greater Bird-of-paradise
Southern New Guinea freshwater swamp forests	Avia	Megalurus	albolimbatus	Fly River Grassbird
Southern New Guinea freshwater swamp forests	Avia	Chalcopsitta	atra	Black Lory
Southern New Guinea lowland rain forests	Avia	Tanysiptera	hydrocharis	Little Paradise-Kingfisher
Southern New Guinea lowland rain forests	Avia	Talegalla	cuvieri	Red-billed Brush-turkey
Southern New Guinea lowland rain forests	Avia	Meliphaga	mimikae	Spot-breasted Meliphaga
Southern New Guinea lowland rain forests	Avia	Paradisaea	apoda	Greater Bird-of-paradise
Southern New Guinea lowland rain forests	Avia	Charmosyna	multistriata	Striated Lorikeet
Trans Fly savanna and grasslands	Avia	Dacelo	tyro	Spangled Kookaburra
Trans Fly savanna and grasslands	Avia	Tanysiptera	hydrocharis	Little Paradise-Kingfisher
Trans Fly savanna and grasslands	Avia	Lonchura	nevermanni	Grey-crowned Munia
Trans Fly savanna and grasslands	Avia	Lonchura	stygia	Black Munia
Trans Fly savanna and grasslands	Avia	Megalurus	albolimbatus	Fly River Grassbird
Trobriand Islands rain forests	Avia	Manucodia	comrii	Curl-crested Manucode
Trobriand Islands rain forests	Avia	Paradisaea	decora	Goldie's Bird-of-paradise

Ecoregion	Class	Genus	Species	Common name
Central Range montane rain forests	Mammalia	Emballonura	furax	New Guinea Sheath-tailed Bat
Central Range montane rain forests	Mammalia	Otomops	secundus	Mantled Mastiff Bat
Central Range montane rain forests	Mammalia	Syconycteris	hobbit	Moss-forest Blossom Bat
Central Range montane rain forests	Mammalia	Hipposideros	corynophyllus	Telefomin Roundleaf Bat
Central Range montane rain forests	Mammalia	Hipposideros	muscinus	Fly River Roundleaf Bat
Central Range montane rain forests	Mammalia	Kerivoula	muscina	Fly River Trumpet-eared Bat
Central Range montane rain forests	Mammalia	Nyctophilus	microdon	Small-toothed Long-eared Bat
Central Range montane rain forests	Mammalia	Dorcopsulus	macleayi	Papuan Forest Wallaby
Central Range montane rain forests	Mammalia	Dactylopsila	megalura	Great-tailed Triok
Central Range montane rain forests	Mammalia	Phalanger	matanim	Telefomin Cuscus
Central Range montane rain forests	Mammalia	Phalanger	vestitus	Stein's Cuscus
Central Range montane rain forests	Mammalia	Pseudocheirus	mayeri	Pygmy Ringtail
Central Range montane rain forests	Mammalia	Antechinus	wilhelmina	Lesser Antechinus
Central Range montane rain forests	Mammalia	Neophascogale	lorentzi	Speckled Dasyure
Central Range montane rain forests	Mammalia	Phascolosorex	doriae	Red-bellied Marsupial Shrew
Central Range montane rain forests	Mammalia	Microperoryctes	murina	Mouse Bandicoot
Central Range montane rain forests	Mammalia	Echymipera	clara	Clara's Echymipera
Central Range montane rain forests	Mammalia	Coccymys	albidens	White-toothed Brush Mouse
Central Range montane rain forests	Mammalia	Crossomys	moncktoni	Earless Water Rat
Central Range montane rain forests	Mammalia	Hydromys	habbema	Mountain Water Rat
Central Range montane rain forests	Mammalia	Hydromys	hussoni	Western Water Rat
Central Range montane rain forests	Mammalia	Hydromys	shawmayeri	Shaw Mayer's Water Rat
Central Range montane rain forests	Mammalia	Hyomys	dammermani	Western White-eared Giant Rat
Central Range montane rain forests	Mammalia	Leptomys	elegans	Long-footed Water Rat
Central Range montane rain forests	Mammalia	Macruromys	elegans	Western Small-toothed Rat
Central Range montane rain forests	Mammalia	Mayermys	ellermani	One-toothed Shrew Mouse
Central Range montane rain forests	Mammalia	Melomys	fellowsi	Red-bellied Mosaic-tailed Rat
Central Range montane rain forests	Mammalia	Melomys	gracilis	Slender Mosaic-tailed Rat
Central Range montane rain forests	Mammalia	Melomys	lanosus	Large-scaled Mosaic-tailed Rat
Central Range montane rain forests	Mammalia	Neohydromys	fuscus	Mottled-tailed Shrew Mouse
Central Range montane rain forests	Mammalia	Paraleptomys	wilhelmina	Short-haired Water Rat
Central Range montane rain forests	Mammalia	Pogonomelomys	bruijni	Lowland Brush Mouse

Ecoregion	Class	Genus	Species	Common name
Central Range montane rain forests	Mammalia	Pogonomelomys	mayeri	Shaw Mayer's Brush Mouse
Central Range montane rain forests	Mammalia	Pogonomys	championi	Champion's Tree Mouse
Central Range montane rain forests	Mammalia	Pseudohydromys	murinus	Eastern Shrew Mouse
Central Range montane rain forests	Mammalia	Rattus	giluwensis	Giluwe Rat
Central Range montane rain forests	Mammalia	Rattus	novaeguineae	New Guinean Rat
Central Range montane rain forests	Mammalia	Xenuromys	barbatus	Rock-dwelling Giant Rat
Central Range sub-alpine grasslands	Mammalia	Antechinus	wilhelmina	Lesser Antechinus
Central Range sub-alpine grasslands	Mammalia	Mallomys	gunung	Alpine Woolly Rat
Central Range sub-alpine grasslands	Mammalia	Stenomys	richardsoni	Glacier Rat
Huon Peninsula montane rain forests	Mammalia	Dendrolagus	matschiei	Huon Tree Kangaroo
Huon Peninsula montane rain forests	Mammalia	Melomys	gracilis	Slender Mosaic-tailed Rat
Huon Peninsula montane rain forests	Mammalia	Pogonomelomys	mayeri	Shaw Mayer's Brush Mouse
Huon Peninsula montane rain forests	Mammalia	Rattus	novaeguineae	New Guinean Rat
Louisiade Archipelago rain forests	Mammalia	Nyctimene	major	Island Tube-nosed Fruit Bat
Louisiade Archipelago rain forests	Mammalia	Kerivoula	agnella	St. Aignan's Trumpet-eared Bat
New Britain-New Ireland lowland rain forests	Mammalia	Dobsonia	praedatrix	New Britain Naked-backed Fruit Bat
New Britain-New Ireland lowland rain forests	Mammalia	Melonycteris	melanops	Black-bellied Fruit Bat
New Britain-New Ireland lowland rain forests	Mammalia	Nyctimene	major	Island Tube-nosed Fruit Bat
New Britain-New Ireland lowland rain forests	Mammalia	Pteropus	admiralitatum	Admiralty Flying Fox
New Britain-New Ireland montane rain forests	Mammalia	Dobsonia	praedatrix	New Britain Naked-backed Fruit Bat
New Britain-New Ireland montane rain forests	Mammalia	Melonycteris	melanops	Black-bellied Fruit Bat
New Britain-New Ireland montane rain forests	Mammalia	Nyctimene	major	Island Tube-nosed Fruit Bat
New Britain-New Ireland montane rain forests	Mammalia	Pteropus	admiralitatum	Admiralty Flying Fox
New Guinea mangroves	Mammalia	Emballonura	furax	New Guinea Sheath-tailed Bat
Northern New Guinea lowland rain and freshwater swamp forests	Mammalia	Emballonura	furax	New Guinea Sheath-tailed Bat
Northern New Guinea lowland rain and freshwater swamp forests	Mammalia	Otomops	secundus	Mantled Mastiff Bat

Ecoregion	Class	Genus	Species	Common name
Northern New Guinea lowland rain and freshwater swamp forests	Mammalia	Nyctimene	draconilla	Dragon Tube-nosed Fruit Bat
Northern New Guinea lowland rain and freshwater swamp forests	Mammalia	Hipposideros	wollastoni	Wollaston's Roundleaf Bat
Northern New Guinea lowland rain and freshwater swamp forests	Mammalia	Kerivoula	muscina	Fly River Trumpet-eared Bat
Northern New Guinea lowland rain and freshwater swamp forests	Mammalia	Dorcopsis	hageni	White-striped Dorcopsis
Northern New Guinea lowland rain and freshwater swamp forests	Mammalia	Dorcopsis	muelleri	Brown Dorcopsis
Northern New Guinea lowland rain and freshwater swamp forests	Mammalia	Echymipera	clara	Clara's Echymipera
Northern New Guinea lowland rain and freshwater swamp forests	Mammalia	Echymipera	echinista	Menzies's Echymipera
Northern New Guinea lowland rain and freshwater swamp forests	Mammalia	Hydromys	hussoni	Western Water Rat
Northern New Guinea lowland rain and freshwater swamp forests	Mammalia	Paraleptomys	rufilatus	Northern Water Rat
Northern New Guinea lowland rain and freshwater swamp forests	Mammalia	Pogonomelomys	mayeri	Shaw Mayer's Brush Mouse
Northern New Guinea montane rain forests	Mammalia	Dendrolagus	scottae	Tenkile Tree Kangaroo
Northern New Guinea montane rain forests	Mammalia	Petaurus	abidi	Northern Glider
Northern New Guinea montane rain forests	Mammalia	Echymipera	clara	Clara's Echymipera
Northern New Guinea montane rain forests	Mammalia	Paraleptomys	rufilatus	Northern Water Rat
Northern New Guinea montane rain forests	Mammalia	Xenuromys	barbatus	Rock-dwelling Giant Rat
Southeastern Papuan rain forests	Mammalia	Otomops	papuensis	Big-eared Mastiff Bat
Southeastern Papuan rain forests	Mammalia	Otomops	secundus	Mantled Mastiff Bat
Southeastern Papuan rain forests	Mammalia	Syconycteris	hobbit	Moss-forest Blossom Bat
Southeastern Papuan rain forests	Mammalia	Hipposideros	muscinus	Fly River Roundleaf Bat
Southeastern Papuan rain forests	Mammalia	Kerivoula	muscina	Fly River Trumpet-eared Bat
Southeastern Papuan rain forests	Mammalia	Pharotis	imogene	New Guinea Big-eared Bat
Southeastern Papuan rain forests	Mammalia	Dorcopsis	luctuosa	Gray Dorcopsis
Southeastern Papuan rain forests	Mammalia	Dorcopsulus	macleayi	Papuan Forest Wallaby

Ecoregion	Class	Genus	Species	Common name
Southeastern Papuan rain forests	Mammalia	Thylogale	brunii	Dusky Pademelon
Southeastern Papuan rain forests	Mammalia	Murexia	rothschildi	Broad-striped Dasyure
Southeastern Papuan rain forests	Mammalia	Planigale	novaeguineae	New Guinean Planigale
Southeastern Papuan rain forests	Mammalia	Peroryctes	broadbenti	Giant Bandicoot
Southeastern Papuan rain forests	Mammalia	Chiruromys	forbesi	Greater Tree Mouse
Southeastern Papuan rain forests	Mammalia	Chiruromys	lamia	Broad-headed Tree Mouse
Southeastern Papuan rain forests	Mammalia	Crossomys	moncktoni	Earless Water Rat
Southeastern Papuan rain forests	Mammalia	Hydromys	shawmayeri	Shaw Mayer's Water Rat
Southeastern Papuan rain forests	Mammalia	Leptomys	elegans	Long-footed Water Rat
Southeastern Papuan rain forests	Mammalia	Mayermys	ellermani	One-toothed Shrew Mouse
Southeastern Papuan rain forests	Mammalia	Melomys	gracilis	Slender Mosaic-tailed Rat
Southeastern Papuan rain forests	Mammalia	Melomys	levipes	Long-nosed Mosaic-tailed Rat
Southeastern Papuan rain forests	Mammalia	Neohydromys	fuscus	Mottled-tailed Shrew Mouse
Southeastern Papuan rain forests	Mammalia	Pseudohydromys	murinus	Eastern Shrew Mouse
Southeastern Papuan rain forests	Mammalia	Rattus	novaeguineae	New Guinean Rat
Southeastern Papuan rain forests	Mammalia	Stenomys	vandeuseni	Van Deusen's Rat
Southeastern Papuan rain forests	Mammalia	Xenuromys	barbatus	Rock-dwelling Giant Rat
Southern New Guinea freshwater swamp forests	Mammalia	Kerivoula	muscina	Fly River Trumpet-eared Bat
Southern New Guinea freshwater swamp forests	Mammalia	Dendrolagus	spadix	Lowland Tree Kangaroo
Southern New Guinea freshwater swamp forests	Mammalia	Dorcopsis	luctuosa	Gray Dorcopsis
Southern New Guinea freshwater swamp forests	Mammalia	Thylogale	brunii	Dusky Pademelon
Southern New Guinea freshwater swamp forests	Mammalia	Echymipera	echinista	Menzies's Echymipera
Southern New Guinea freshwater swamp forests	Mammalia	Leptomys	signatus	Fly River Water Rat
Southern New Guinea lowland rain forests	Mammalia	Emballonura	furax	New Guinea Sheath-tailed Bat
Southern New Guinea lowland rain forests	Mammalia	Otomops	papuensis	Big-eared Mastiff Bat
Southern New Guinea lowland rain forests	Mammalia	Aproteles	bulmerae	Bulmer's Fruit Bat
Southern New Guinea lowland rain forests	Mammalia	Nyctimene	draconilla	Dragon Tube-nosed Fruit Bat
Southern New Guinea lowland rain forests	Mammalia	Hipposideros	muscinus	Fly River Roundleaf Bat

Ecoregion	Class	Genus	Species	Common name
Southern New Guinea lowland rain forests	Mammalia	Hipposideros	wollastoni	Wollaston's Roundleaf Bat
Southern New Guinea lowland rain forests	Mammalia	Kerivoula	muscina	Fly River Trumpet-eared Bat
Southern New Guinea lowland rain forests	Mammalia	Dendrolagus	spadix	Lowland Tree Kangaroo
Southern New Guinea lowland rain forests	Mammalia	Dorcopsis	luctuosa	Gray Dorcopsis
Southern New Guinea lowland rain forests	Mammalia	Dorcopsis	muelleri	Brown Dorcopsis
Southern New Guinea lowland rain forests	Mammalia	Melomys	gracilis	Slender Mosaic-tailed Rat
Southern New Guinea lowland rain forests	Mammalia	Pogonomelomys	bruijni	Lowland Brush Mouse
Trans Fly savanna and grasslands	Mammalia	Dorcopsis	luctuosa	Gray Dorcopsis
Trans Fly savanna and grasslands	Mammalia	Thylogale	brunii	Dusky Pademelon
Trans Fly savanna and grasslands	Mammalia	Dasyurus	spartacus	Bronze Quoll
Trans Fly savanna and grasslands	Mammalia	Planigale	novaeguineae	New Guinean Planigale
Trans Fly savanna and grasslands	Mammalia	Sminthopsis	archeri	Chestnut Dunnart
Trobriand Islands rain forests	Mammalia	Nyctimene	major	Island Tube-nosed Fruit Bat
Trobriand Islands rain forests	Mammalia	Kerivoula	agnella	St. Aignan's Trumpet-eared Bat
Trobriand Islands rain forests	Mammalia	Dorcopsis	atrata	Black Dorcopsis
Trobriand Islands rain forests	Mammalia	Dactylopsila	tatei	Tate's Triok
Trobriand Islands rain forests	Mammalia	Phalanger	lullulae	Woodlark Cuscus
Trobriand Islands rain forests	Mammalia	Echymipera	davidi	David's Echymipera
Trobriand Islands rain forests	Mammalia	Chiruromys	forbesi	Greater Tree Mouse

Note that some of these ecoregions extend into West Papua

Appendix 4 -

A list of recognized species that may act as indicators of large-scale ecological processes

Note: ideally species that are sensitive to impact (i.e., primary forest species), require relatively large ranging areas and are at a minimum PNG endemics.

- New Guinea Harpy Eagle (*Harpyopsis novaeguineae*)
- Goura ground pigeons (*Goura spp.*)
- Sicklebill Bird of Paradise (*Epimachus spp.*)
- Cassowaries (*Casuarius spp.*)
- Tree Kangaroos (*Dendrolagus spp.*)
- Vulturine Parrot (*Psittrichas fulgidus*)
- Blue-Collared Parrot (*Geoffroyus simplex*)
- Gurney's Eagle (*Aquila gurneyi*)
- New Britain Sparrowhawk (*Accipiter brachyurus*)
- Wedge-tailed Eagle (*Aquila audax*)
- Manus Pitta (*Pitta superba*)

Appendix 5 -

Water Control Districts identified under the Environment Act 2000

[Refer to PNG Department of Environment and Conservation for detailed information about the Water Control Districts, Water Resources Act almagated into Environment Act 2000].

BWR	21/0	**WATER CONTROL DISTRICTS**
	21/1	DECLARATION OF LALOKI CATCHMENT
	21/2	KUM RIVER CATCHMENT - MOUNT HAGEN
	21/3	ALABULE RIVER CATCHMENT - TAPINI
	21/4	ZOKOZOI RIVER CATCHMENT - GOROKA
	21/5	MENDI
	21/6	ALOTAU CATCHMENT - ALOTAU
	21/7	BULOLO - WATUT CATCHMENT
	21/8	YONKI
	21/9	WAHGI CATCHMENT
	21/10	RABAUL CALDERA CATCHMENT AND WATER CONTROL DISTRICT
	21/11	BEWANI/WEST SEPIK INT. DEVELOPMENT
BWR	22/0	**DECLARATION WATER CONTROL AREAS DECLARATION OF UNDERGROUND WATER CONTROL AREAS**
	22/1	LAE
	22/2	RABAUL - TOWN & VUVU AREA
	22/3	DARU - DARU ISLAND
	22/4	KWIKILA
	22/5	MADANG
	22/6	KAVIENG - KAVIENG TOWN
	22/7	GOGOL RIVER CATCHMENT - MADANG
	22/8	VANIMO UNDERGROUND WATER CONTROL DISTRICT
	22/9	KIMBE UNDERGROUND WATER CONTROL DISTRICT
	22/10	KOKOPO GROUNDWATER CONTROL DISTRICT

Appendix 6 -

List of Expert Consultants for Onsite Assessments

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Appendix 7 -

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Appendix 8 -

The Vegetation Types of Papua New Guinea

Table 1: Classification of structural formations of the vegetation

Structural formation	Description
Forest	Tree canopy is greater than 5 m in height Crowns are touching or overlapping. Crown class is based on average crown diameter of canopy trees: Large crowned> 15 m Medium crowned 8-15 m Small crowned 4-8 m Very small crowned < 4 m Ground layer is not visible on airphotos. Canopy closure (horizontal projection): In-regularly open Open Almost closed Dense - tightly packed Canopy profile (vertical projection): In-regularly uneven Uneven Even Degree of disturbance: Nil disturbance Slight disturbance 8-9 Moderate disturbance 6-7 Heavy disturbance 4-5 Very heavy disturbance < 5
Woodland	Trees with separated crowns. Generally low, up to 10m tall, rarely to 20 m, but lower in the case of non-tree life-fonns e.g. sago palm and Pandanus. A clearly visible ground layer of shrubs, herbs and/or grasses.
Savanna	Scattered to moderately dense layer of trees. Generally less than 6 m tall. A clearly visible ground layer of herbs and/or grasses.
Scrub	Dense shrubs with or without scattered low trees. Generally less than 6 m tall.
Grassland	Grasses, sedges, herbs and very low woody shrubs. Generally less than 3 m tall. Scattered trees may be present.
Mangrove	All vegetation of the saline or brackish communities tidal zone. Ranges from forest over 30 m tall, to low halophytic herbs.

Table 2 Classification of vegetation types

Alpha code	Vegetation type
Forest	
Low Altitude Forest On Plains And Fans - below 1000 m	
Pl	Large to medium crowned forest
Po	Open forest
Ps	Small crowned forest
Low Altitude Forest On Uplands - below 1000 m	
Hl	Large crowned forest
Hm	Medium crowned forest
HrnAr	Medium crowned forest with Araucaria common
Hmd	Medium crowned depauperate/damaged forest
Hme	Medium crowned forest with an even canopy
Hs	Small crowned forest
Hse	Small crowned forest with an even canopy
HsAr	Small crowned forest with Araucaria common
HsCa	Small crowned forest with Castanopsis
HsCp	Small crowned forest with Casuarina papuana
HsN	Small crowned forest with Nothofagus
HsRt	Small crowned forest with Rhus taitensis
Lower Montane Forest - above 1000 m	
L	Small crowned forest
LAr	Small crowned forest with Araucaria common
LN	Small crowned forest with Nothofagus
Lc	Small crowned forest with conifers
Ls	Very small crowned forest
LsCp	Very small crowned forest with Casuarina papuana
LsN	Very small crowned forest with Nothofagus
Montane Forest- above 3000 m	
Mo	Very small crowned forest
Dry Seasonal Forest	
D	Dry evergreen forest
Littoral Forest	
B	Mixed forest
BCe	Forest with Casuarina equisetifolia
BMl	Forest with Melaleuca leucadendron
Seral Forest	

(continued)

Fri	Riverine mixed successions
FriCg	Riverine successions with Casuarina grandis
FriK	Riverine successions with Eucalyptus deglupta
FriTb	**Riverine successions with Terminalia brassii**
Fv	**Volcanic successions**

Swamp Forest

Fsw	Mixed swamp forest
FswC	Swamp forest with Campnosperma
FswMl	Swamp forest with Melaleuca leucadendron
FswTb	**Swamp forest with Terminalia brassii**

Woodland

W	Woodland
Wri	Riverine successions dominated by woodland
WriCg	Riverine successions with Casuarina grandis woodland
Wv	Volcanic successions dominated by woodland Wsw Swamp woodland
WswMl	Swamp woodland with Melaleuca leucadendron

Savanna

Sa	Savanna
Saf	Savanna with gallery forest
SaMl	Savanna with Melaleuca leucadendron

Scrub

Sc	Scrub
ScBc	Scrub with Bambusa and Cyathea
Scv	Volcanic successions dominated by scrub

Grassland and Herbland

G	Grassland
Ga	Alpine grassland
Gi	Subalpine grassland
Gf	Grassland with some forest
Gr	Grassland reverting to forest
Grf	Grassland reverting to forest with some forest
Gsw	Swamp grassland
Gri	Riverine successions dominated by grass
Gv	Volcanic successions dominated by grass
Hsw	Herbaceous swamp

(continued)

Estuarine Communities

M Mangrove

Other Non-vegetation And Areas Dominated By Land Use

O Land use intensity classes 0-4 (low to very high)
E Lakes and larger rivers
Z Bare areas
U Larger urban centers

Some of the above forest types may have a comment added to their code. These do not constitute a separate type:
.f Flush of leaves or flowers noted
.l Landslips very common
.Ar Presence of Araucaria noted
.N Presence of Nothofagus noted or suspected

Source: Hammermaster E.T & Saunders J.C 1995 " Forest Resources and Vegetation Mapping of Papua New Guinea" PNGRIS Publication No. 4 Australian Agency for International Development, Canberra Australia 2601 page 7-22

Appendix 9 -

Threatened Trees of Papua New Guinea

(Source: www.unep-wcmc.org)

Species	Family	Status	Description
1. Hopea inexpectata	Dipterocarpaceae	CR A1cd, B1+2c	
2. Madhuca boerlageana	Sapotaceae	CR A1cd, C2ab, D1	A tree of primary lowland forest in NewGuinea and the Moluccas. In Papua New Guinea, this species is extremely rare and known from a single sterile collection made from the Vanimo area, West Sepik province. This part of Papua New Guinea is heavily logged and there is grave doubt as to its continuing existence in this country. The above threat category applies to the situation in Papua New Guinea only.
3. Calophyllum acutiputamen	Guttiferae	CR B1+2abcde	Known only from Rossel Island, this canopy species is found on ridges in colline forest. The fragile ecosystem of Rossel Island is possibly threatened by logging and mining for copper and gold.
4. Helicia peltata	Proteaceae	CR B1+2abcde	Known only from a single location, Bisiatabu in the Central Province, this tree occurs in forest at 450m. The habitat is threatened by logging and the increasing settlement.
5. Helicia polyosmoides	Proteaceae	CR B1+2abcde	This small tree, restricted to Manus Island in the Bismarck Archipelago, occurs in ridge forest between the elevations of 100 and 550m. This species may face extinction through the commercial logging of its habitat.
6. Helicia subcordata	Proteaceae	CR B1+2abcde	A tall tree found only once in mid-montane open forest at 1350m near Wagau in the Morobe province.
7. Guioa grandifoliola	Sapindaceae	CR B1+2c	An extremely localised species known only from four collections from lowland rainforest and advanced secondary forest near the Buso River. Large areas of lowland forest in Papua New Guinea are threatened by increased logging activity.
8.	Diospyros lolinopsis	Ebenaceae	CR B1+2c, C2b
9.	Halfordia papuana	Rutaceae	CR C2a

Species	Family	Status	Description
10. Diospyros benstonei	Ebenaceae	CR C2b	Apparently confined to Misima Island in Milne Bay Province, this small rare tree occurs in streamside rainforest in a gorge. The population is threatened by mining and cutting for local use.
11. Nothofagus nuda	Fagaceae	CR D1	A tree known from a single collection found in mixed lower montane forest near the Tauri River in the Gulf province, which is outside the general range of Nothofagus in New Guinea. A future taxonomic revision may change the status of this species.
12. Aglaia mackiana	Meliaceae	CR D1	A canopy tree most commonly found in mid-elevation forest. Trees may be easily overlooked as this dioecious species is only identified from the fruit. It is only definitely known from the type locality. Additional collections, which differ from the type specimen but may represent the same species, have been gathered from three localities. Forest fragmentation is likely to impede reproduction as it has been found that pollination is most efficient when individuals are less than 250m apart. The enormous seeds are dispersed by cassowaries.
13. Guioa hospita	Sapindaceae	CR D1	The only record of this species is the type specimen collected in 1890 in Gulf Province. Despite the area being relatively well studied, it has not been recorded since.
14. Ptychosperma gracile	Palmae	EN A1a+2c	Confined to New Ireland and New Britain, this palm tree is scattered in rainforest on both limestone and volcanic soils. Populations have declined because of rapid and extensive deforestation for plantation agriculture. This species can survive in open vegetation or in secondary forest if it is allowed to regenerate.
15. Ptychosperma hentyi	Palmae	EN A1a+2c	A taxonomically unique palm tree of lowland forest, restricted to eastern New Britain. Rapid and extensive deforestation for plantation agriculture has caused population decline.
16. Santalum macgregorii	Santalaceae	EN A1cd, C1	A parasitic or semi-parasitic species found in open savannah vegetation and in savannah forest in gullies in the eastern part of Western Province and possibly also in south-east Irian Jaya. As with all other sources of sandalwood, this species is overexploited for its scented wood, which is used for incense, perfume, essential oil and carving. In Papua New Guinea the exploitation began at the turn of the last century; now the resource is greatly depleted as there are few mature trees or virgin stands.
17. Diospyros insularis	Ebenaceae	EN A1cd+2cd, B1+2c	A tree of primary lowland rainforest found in only a few localities in the Solomon Islands and New Ireland of the Bismarck Archipelago. Overexploitation and logging have resulted in the species becoming highly endangered, possibly critically endangered.

Species	Family	Status	Description
18. Terminalia archipelagi	Combretaceae	EN A1cd+2cd, C2a	Occurring on the islands of the Bismarck Archipelago, this large well-formed tree can be locally dominant in lowland primary rainforest. It has been and still is heavily exploited through intensive logging practices. It is much sought-after for the production of plywood.
19. Diospyros gillisonii	Ebenaceae	EN A1cd+2cd, C2a	A tree scattered throughout the small coral islands in the Kiriwina (Trobriand) Group and the Louisiade Archipelago, where it occurs in beach scrub on coral limestone at sea level. It is heavily exploited by the local people for its black heartwood, which is used in carvings, native hair combs and ceremonial pieces. Very few mature trees, if any, remain.
20. Manilkara kanosiensis	Sapotaceae	EN A1cd+2cd, C2a	Relatively widespread but uncommon, this timber tree is scattered in primary lowland rainforest. It occurs mainly in areas where intense logging is being carried out, such as New Britain and New Ireland in the Bismarck Archipelago and the north-west of Papua New Guinea.
21. Alloxylon brachycarpum	Proteaceae	EN A2cd	Confined to Western Province in south Papua New Guinea and adjacent Digul District, Irian Jaya, extending into the Aru Islands, this tree is scattered in lowland rainforest and monsoon forest. The population around the Oriomo River in Western Province, is a relatively restricted and confined to a fragile ecosystem, which is under pressure from logging and destructive activities. It is expected that the population across the border into Irian Jaya is similarly threatened.
22. Flindersia ifflaina	Rutaceae	EN A2cd, B1+2c	In Papua New Guinea, this tree is found in monsoon and gallery forest up to 50m. The species occurs in the Oriomo River ecosystem in Western Province, which is relatively restricted, fragile and threatened by logging activities. The above threat category applies only to the population in Papua New Guinea. More information is needed from Queensland.
23. Calophyllum waliense	Guttiferae	EN B1+2abcde	A species restricted to lowland rainforest on ridges on Manus Island. The habitat has been heavily logged and degraded.
24. Helicia insularis	Proteaceae	EN B1+2abcde	A small tree found in mossy forest on ridge crests at 800 to 950m on Normanby and Fergusson Islands of the D'Entrecasteaux Group.
25. Calophyllum morobense	Guttiferae	EN B1+2c	Endemic to Morobe Province, this tree occurs in lowland rainforest on alluvium, where it is under threat mainly from logging.
26. Xanthostemon - oppositifolius	Myrtaceae	EN B1+2c, C2a	In Papua New Guinea, this tree is thought to be restricted to coastal rainforest in Milne Bay Province. It was heavily exploited in the early days of colonisation and harvested continually throughout the Second World War. It is poor at regenerating and has now become rare in Papua New Guinea; very few, if any, mature individuals remain. The Queensland population is considered threatened but more up-to-date information is required to consolidate the present IUCN category.

Species	Family	Status	Description
27. Bleasdalea papuana	Proteaceae	EN C2a	An uncommon species of isolated occurrence in lower montane forest on serpentine soils. It has been recorded from the Vogelkop Peninsula and Jayapura in Irian Jaya and the East Sepik and Morobe provinces in Papua New Guinea. It is threatened by habitat destruction.
28. Flindersia pimenteliana	Rutaceae	EN C2a	A large tree found mainly in lower montane rainforest or in foothill rainforest. In Papua New Guinea, the species is widespread but uncommon and sporadic. It has been heavily exploited in the Bulolo/Wau region of Morobe Province. Populations on spurs and ridges of mountain ranges may be spared from future exploitation. The population status in Australia is not taken into consideration in this evaluation.
29. Pentaspadon motleyi	Anacardiaceae	DD	In Papua New Guinea, this species occurs mainly in primary forest on the banks of streams and rivers in the Gulf and Madang Provinces and Bougainville in the North Solomons. It is under great threat from habitat destruction in these areas and is considered to be endangered (EN C2a). The situation is likely to be similar elsewhere.
30. Hopea aptera	Dipterocarpaceae	DD	Endemic to Papua New Guinea, this species forms pure stands in secondary forest and is a locally important timber species.
31. Hopea glabrifolia	Dipterocarpaceae	DD	
32. Hopea scabra	Dipterocarpaceae	DD	
33. Hopea ultima	Dipterocarpaceae	DD	There is a possibility that this dipterocarp is extinct in the wild.
34. Elaeocarpus homalioides	Elaeocarpaceae	DD	A New Guinea endemic recorded from a few locations. It has not been collected in recent years.
35. Calophyllum brassii	Guttiferae	DD	A montane forest tree known only from the Western district in Papua New Guina and Irian Jaya mainly between 400 and 900m altitude. Sterile material may be incorrectly assigned to this species.
36. Calophyllum collinum	Guttiferae	DD	Endemic to New Guinea, this species is found in lowland and hill forest up to an elevation of 500 m in the Snow Mountains, Irian Jaya and the Western and Morobe districts of Papua New Guinea. These areas are poorly collected. It is suspected that the timber is traded as `Calophyllum' in Papua New Guinea.
37. Calophyllum heterophyllum	Guttiferae	DD	This species is so far known from the Vogelkop Peninsula and the Snow Mountains in Irian Jaya and in the Western province in Papua New Guinea. This species appears to grow into canopy trees on low ridges at 100m altitude but forms only shrubs and treelets on poor loam soils at 1200 to 1300m. This species is very poorly known and probably undercollected. The taxonomic limits of this species are also unknown.

Species	Family	Status	Description
38. Calophyllum laticostatum	Guttiferae	DD	A large tree found in well-drained lowland or lower montane rainforest. This species is possibly traded for its 'Calophyllum' timber from Papua New Guinea.
39. Calophyllum persimile	Guttiferae	DD	A rainforest tree occurring up to 560 m altitude near Kiunga. This species is poorly known and variation is seen in the sterile material. The timber is probably traded as 'Calophyllum' by Papua New Guinea.
40. Calophyllum piluliferum	Guttiferae	DD	A tree found in forest in or near swamps below 40 m altitude in Digul, Irian Jaya and the Western district of Papua New Guinea; this area is poorly collected.
41. Calophyllum streimannii	Guttiferae	DD	Known only from Morobe district, the species is rarely collected, occurring on ridges and hillsides between 30 and 300m, often associated with dipterocarps.
42. Mammea novoguineensis	Guttiferae	DD	A tree that occurs in primary well-drained forest between 60 and 420m. It is known from a few scattered localities in an area that is poorly known.
43. Fagraea carstensensis	Loganiaceae	DD	A poorly understood species, collected twice from forest between 200 and 860m on Mt. Carstensz and Mt. Tamrau, Mimika District.
44. Horsfieldia crux-melitensis	Myristicaceae	DD	A small tree or shrub, which is restricted to mixed lowland rainforest in Morobe Province. It has been collected only six times.
45. Horsfieldia leptantha	Myristicaceae	DD	This tree is known from six or seven collections from primary and secondary forest areas in Vogelkop in Irian Jaya and West Sepik in Papua New Guinea.
46. Myristica filipes	Myristicaceae	DD	This tree is locally endemic to the Buso River area of the Morobe Province. It has been collected six times in coastal swamp forest, river flat forest and lowland secondary forest.
47. Dacrydium cornwalliana	Podocarpaceae	DD	The species grows in some abundance in confined patches of cloud forest or mossy heath forest above 1430m. Collections are few, largely because the area is poorly explored.
48. Podocarpus atjehensis	Podocarpaceae	DD	The species occurs in the Gajo Lands in northern Sumatra and the Wissel Lakes in Papua New Guinea.
49. Podocarpus spathoides	Podocarpaceae	DD	The species is known from occurrences on Mt. Ophir in Peninsular Malaysia, Morotai in the north Moluccas, Rossel Island in the Louisiade Archipelago of Papua New Guinea, and the Solomon Islands.

Appendix 10 -

Highly Threatened Species in Endemic Bird Areas of PNG

(Source: Stattersfield et al., 1998)

EBA	Scientific Name	Common Name	Status
Admiralty Islands	*Tyto manusi*	Manus masked-owl	Vulnerable
	Pitta superba	Superb pitta	Vulnerable
	Rhipidura semirubra	Manus fantail	Vulnerable
St Matthias Islands	*Monarcha menchi*	White-breated monarch	Data deficient
	Rhipidura matthiae	Matthias fantail	Data deficient
New Britain and New Ireland	*Accipiter brachyurus*	New Britain sparrowhawk	Vulnerable
	Columba pallidiceps	Yellow-legged pigeon	Critically endangered
	Tyto aurantia	Bismark masked-owl	Vulnerable
	Collocalia orientalis	Mayr's swiftlet	Data deficient
	Megalurus grosvenori	Bismarck thicketbird	Vulnerable
D'Entrecasteux and Trobriand Islands	*Paradisaea decora*	Goldie's bird of paradise	Vulnerable
Louisiade Archipelago	*Zosterops meeki*	White-throated white-eye	Data deficient
	Myzomela albigula	White-chinned myzomela	Data deficient
	Meliphaga vicina	Tagula honeyeater	Data deficient
	Cracticus louisiadensis	Tagula butcherbird	Data deficient
Solomon Group (including Bougainville)	*Haliaeetus sanfordi*	Sanford's fish-eagle	Vulnerable
	Accipiter imitator	Imitator sparrowhawk	Endangered
	Nesoclopeus woodfordi	Woodford's rail	Endangered
	Columba pallidiceps	Yellow-legged pigeon	Critically endangered
	Nesasio solomonensis	Fearful owl	Vulnerable
	Collocalia orientalis	Mayr's swiftlet	Data deficient

EBA	Scientific Name	Common Name	Status
	Actenoides bougainvillea	Moustached kingfisher	Vulnerable
	Pitta anerythra	Black-faced pitta	Vulnerable
	Megalurus llaneae	Bougainville thicketbird	Data deficient
	Aplonis brunneicapilla	White-eyed starling	Endangered
175. North Papuan Mountains	*Rallina mayri*	Mayr's forest-rail	Data deficient
176. North Papuan Lowlands	*Psittaculirostis salvadorii*	Salvador's fig-parrot	Vulnerable
	Poecilodryas placens	Olive-yellow robin	Data deficient
	Philemon brassi	Brass's friarbird	Data deficient
177. Adelbert and Huon Ranges	*Sericulus bakeri*	Fire-maned bowerbird	Vulnerable
	Parotia wahnsei	Wahne's parotia	Vulnerable
178. Central Papua Mountains	*Androphobus viridus*	Papuan whipbird	Data deficient
	Melidectes princeps	Long-bearded melidectes	Vulnerable
	Archboldia papuensis	Archibold's bowerbird	Vulnerable
	Loboparadisaea sericea	Yell-breasted bird of paradise	Data deficient
	Macgregoria pulchra	Macgregor's bird of paradise	Vulnerable
	Astrapia mayeri	Ribbon-tailed astrapia	Vulnerable
	Paradisaea rudolphi	Blue bird-of-paradise	Vulnerable
179. Southern Papuan Lowlands	*Poecilodryas placens*	Olive-yellow robin	Data deficient
180. TransFly	*Tanyiptera hydrocharis*	Little paradise-kingfisher	Data deficient
	Megalurus albolimbatus	Fly river grass-bird	Vulnerable

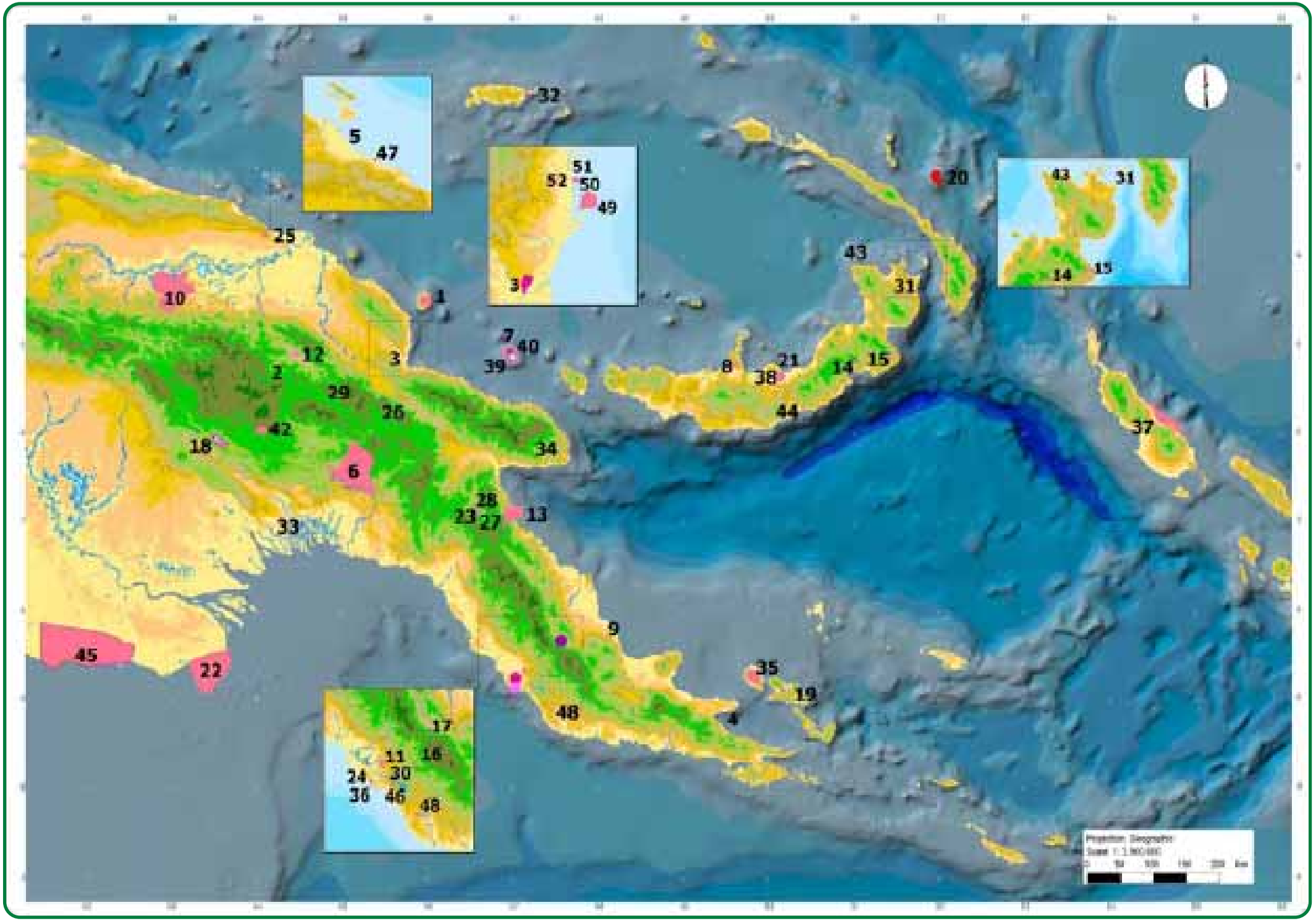
Appendix 11 -

Map of Protected Areas in Papua New Guinea

[Source: RAPPAM Report (in press), 2005]

Id	Name	Area (ha)	Id	Name	Area (ha)
1	Bagiai WMA	13,760.00	27	Mt Kaindi WMA	1,502.80
2	Baiyer River Sanctuary	64.00	28	Mt Susu National Reserve Park	49.00
3	Balek Wildlife Sanctuary	470.00	29	Mt Wilhelm National Reserve	817.00
4	Baniara Island Protected Area	37.28	30	Namanatabu Reserve	27.44
5	Cape Wom Memorial Park	2.00	31	Nanuk Island Districk Park	12.00
6	Crater Mountain WMA	270,000.00	32	Ndrolowa WMA	5,850.00
7	Crown Island Wildlife Sanctuary	58,969.00	33	Neiru (Aird Hills) WMA	3,984.00
8	Garu WMA	8,700.00	34	Nuraseng WMA	22.23
9	Hombareta WMA	130.00	35	Oi Mada Wara WMA	22,840.00
10	Hunstein Range WMA	220,000.00	36	Paga Hill National Park Scenic Reserve	17.44
11	Iomare WMA	3,827.50	37	Pirung WMA	43,200.00
12	Jimi Valley National Park	4,180.00	38	Pokili WMA	9,840.00
13	Kamiali WMA	65,541.00	39	Randa WMA	41,922.00
14	Kavakuna Caves	GAM	40	Randa Wildlife Sanctuary	15,724.00
15	Klampun WMA	5,200.00	41	Sawataetae WMA	700.00
16	Kokoda Historic Track Reserve	GAM	42	Siwi-Utame WMA	12,540.00
17	Kokoda Memorial Park	GAM	43	Talele Is. National Park Reserve	12.00
18	Lake Kutubu WMA	24,100.00	44	Tavalo WMA	2,000.00
19	Lake Lavu WMA	2,640.00	45	Tonda WMA	590,000.00
20	Lihir Island Protected Area	20,207.85	46	Variarata Nat. Park	1,063.00
21	Loroko National Park	100.00	47	Wewak Peace Memorial Park	2.00
22	Maza WMA	184,230.00	48	Zo-oimaga WMA	1,510.00
23	McAdams National Park	1,821.00	49	Taab WMA	984.30
24	Moitaka Wildlife Sanctuary	44.00	50	Tabad WMA	16.20
25	Mojirau WMA	5,079.00	51	Sinub WMA	11.80
26	Mt Gahavisuka Provincial Park	77.40	52	Laugum WMA	72.95

Note: Please crossreference the above table with the map on the back cover of this toolkit.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