



# High Conservation Value Forest (HCVF) Toolkit for Malaysia:

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



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**High Conservation Value Forest (HCVF) Toolkit for Malaysia**  
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## Abbreviations

<b>CFS</b>	Central Forest Spine
<b>CITES</b>	Convention on International Trade in Endangered Species of Wild Fauna and Flora
<b>CR</b>	Critically Endangered
<b>DID</b>	Department of Irrigation and Drainage
<b>DTCP</b>	Department of Town and Country Planning
<b>DWNP</b>	Department of Wildlife and National Parks Malaysia (PERHILITAN)
<b>EN</b>	Endangered
<b>EPU</b>	Economic Planning Unit
<b>FDPM</b>	Forest Department Peninsular Malaysia
<b>FDRS</b>	Fire Danger Rating System
<b>FMP</b>	Forest Management Plan
<b>FMU</b>	Forest Management Unit
<b>FRC</b>	Forest Research Centre
<b>FRIM</b>	Forest Research Institute Malaysia
<b>FSC</b>	Forest Stewardship Council
<b>HCV</b>	High Conservation Value
<b>HCVF</b>	High Conservation Value Forest
<b>IBA</b>	Important Bird Area
<b>IUCN</b>	International Union for Conservation of Nature
<b>KDCA</b>	Kadazandusun Cultural Association Sabah
<b>LAC</b>	Limits of Acceptable Change
<b>LOAM</b>	Landscape Outcome Assessment Methodology
<b>MC&amp;I(2002)</b>	Malaysian Criteria and Indicators for Forest Management Certification
<b>MNS</b>	Malaysian Nature Society
<b>MTCC</b>	Malaysian Timber Certification Council
<b>MTCS</b>	Malaysian Timber Certification Scheme
<b>MMD</b>	Malaysian Meteorological Department
<b>NCS</b>	National Conservation Strategy
<b>NFC</b>	National Forestry Council
<b>NGO</b>	Non-Governmental Organisation
<b>NRE</b>	Ministry of Natural Resources and Environment
<b>NREB</b>	Natural Resources and Environment Board (Sarawak)
<b>PACOS</b>	Partners of Community Organisations
<b>PERHILITAN</b>	Jabatan Perlindungan Hidupan Liar dan Taman Negara (DWNP)
<b>PFE</b>	Permanent Forest Estate
<b>PM</b>	Peninsular Malaysia
<b>RIL</b>	Reduced Impact Logging
<b>SFC</b>	Sarawak Forestry Corporation
<b>STA</b>	Sarawak Timber Association
<b>TPA</b>	Totally Protected Area (Sarawak)
<b>UKM</b>	Universiti Kebangsaan Malaysia
<b>VU</b>	Vulnerable
<b>WCS</b>	Wildlife Conservation Society
<b>WWF</b>	World Wide Fund for Nature

## Introduction

### 1.1 Objective

The High Conservation Value Forest (HCVF) Toolkit for Malaysia aims to provide an overview of the practical guidance available to forest managers and other stakeholders to identify, manage, and monitor HCVFs in Malaysia as specified by various national and international standards of forest management. In particular, the toolkit is intended to help forest managers comply with Principle 9 in both the Forest Stewardship Council (FSC) and the Malaysian Criteria and Indicators for Forest Management Certification [MC&I(2002)], the standard adopted by the National Steering Committee for the certification of natural forests in Malaysia<sup>①</sup>.

### 1.2 Background

The HCVF concept is being promoted and applied by schemes involved in the certification of responsible forest management in Malaysia. However, it is generally felt that there is insufficient guidance on the implementation of the HCVF concept. A series of workshops and meetings were held to initiate and facilitate the development of a HCVF toolkit for Malaysia. These efforts were spearheaded by WWF-Malaysia who has formed a Technical Working Group to develop this toolkit.

This toolkit is the outcome of various stages of review and consultation. After internally reviewing the 1st Draft, an expert review (written feedback on the 2nd Draft was received from 12 individuals/organisations) and a two-day expert group discussion was held in May 2008 (see list of participants in **Appendix 12**) to produce the 3rd Draft. Separate stakeholder consultations for Peninsular Malaysia, Sabah and Sarawak provided input for the 4th Draft. Further comments resulted in a 5th Draft, and a final, national-level consultation, involving all stakeholders, produced the 6th and Final Draft (see **Appendix 13** for list of participants).

### 1.3 Overview of HCVF

Besides their economic value, forests also contain environmental and social values, such as wildlife habitat, watershed protection and cultural significance. Areas within forests where these values are considered to be of outstanding significance or of critical importance based on an agreed set of criteria can be defined as High Conservation Value Forest (HCVF) areas. Identifying these values, knowing to whom these values are considered important, and locating the forest areas which harbour these values is the essential first step for the effective assessment and management of these values.

The HCVF concept was initially developed by the Forest Stewardship Council (FSC) for use in forest management certification. Within FSC certification, forest managers are required to identify any HCVF attribute that occur within their individual forest management units and manage them in order to maintain or enhance the attributes identified. The FSC definition encompasses exceptional or critical ecological attributes, ecosystem services and social functions.

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<sup>①</sup> Lists of most of the relevant legislation and associated guidelines are included in the MC&I(2002).

The types of HCVF areas defined by FSC are listed below.

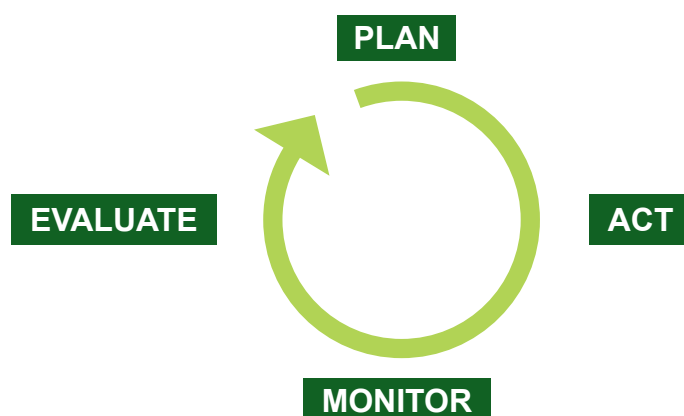
HCV	Element
1	Forest areas containing globally, regionally or nationally significant concentrations of biodiversity values
1.1	Protected areas
1.2	Threatened and endangered species
1.3	Endemic species
1.4	Critical temporal use
2	Globally, regionally or nationally significant large landscape-level forests
3	Forest areas that are in or contain rare, threatened or endangered ecosystems
4	Forest areas that provide basic services of nature in critical situations
4.1	Forests critical to water catchments
4.2	Forests critical to erosion control
4.3	Forests providing barriers to destructive fire
5	Forest areas fundamental to meeting basic needs of local communities (e.g. subsistence, health)
6	Forest areas critical to local communities' traditional cultural identity

The 'HCV' 1-6 numbering system used by the Global HCVF Toolkit (Jennings *et al.*, 2003) is generally accepted and is adopted for this toolkit.

The identification and management of HCVFs at the Forest Management Unit (FMU) level requires the following steps:

1. Interpret the global definition (this toolkit)
2. Identify potential HCVF (desktop "preliminary assessment")
3. Identify specific HCVF components in the field & through consultation
4. Zone HCVF areas, buffer zones and note compartments
5. Identify limits of acceptable change (LAC) for maintaining HCVF
6. Plan precautionary management prescriptions for HCVF compartments
7. Implement management activities
8. Monitor impact of management activities
9. Evaluate impact of management activities
10. Adapt management where appropriate

These steps fit into an adaptive management framework (**Figure 1**). Steps 1-6 involve planning, Step 7 action, 8 monitoring, 9 evaluation and 10 planning again.

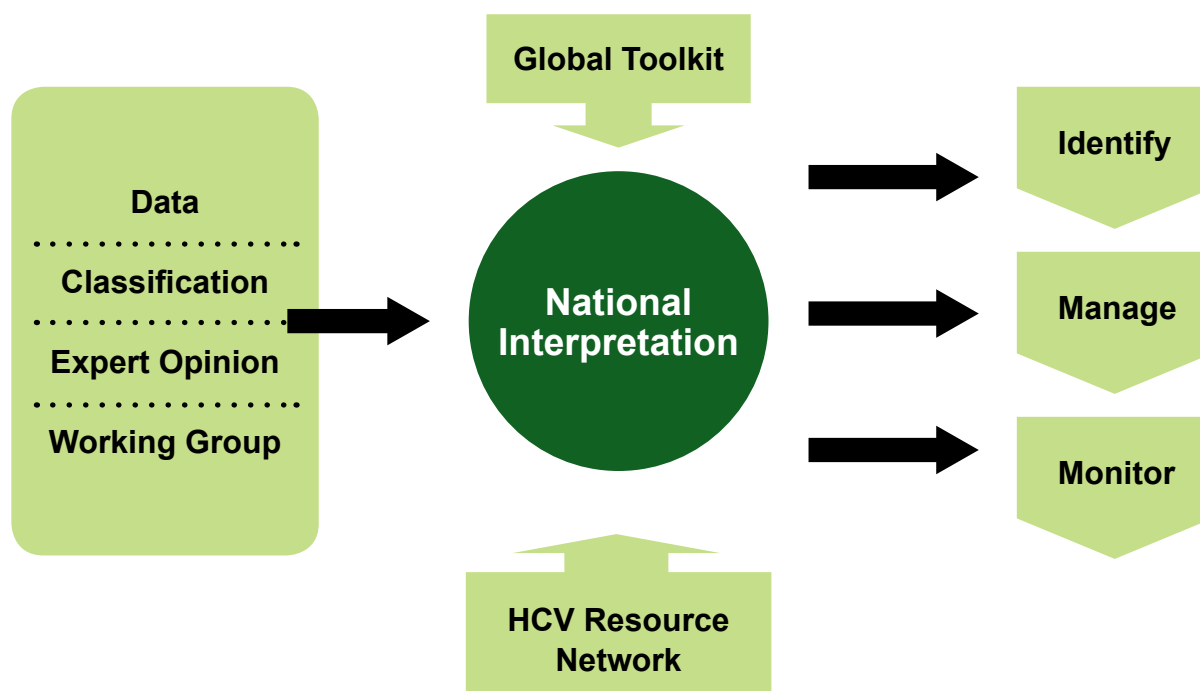


**Figure 1.** The Adaptive Management Cycle.

A detailed approach to managing and monitoring HCVFs is given by the Global Toolkit.

### 1.4 What is this toolkit?

The HCVF Toolkit for Malaysia is a National Interpretation of the FSC definition and is being developed in the context of the Global Toolkit and HCV Resource Network (see [www.hcvnetwork.org](http://www.hcvnetwork.org)). This national interpretation was derived through a consultative process involving expert input and feedback from stakeholders representing Peninsular Malaysia, Sabah and Sarawak. The toolkit will be used to identify, manage and monitor HCVF in the field following the general framework below:



**Figure 2.** The context of a National Interpretation of HCVF.

In addition, the development of the HCVF Toolkit for Malaysia takes into consideration existing initiatives in forest certification, in particular the Malaysian Timber Certification Scheme (MTCS), operated by the Malaysian Timber Certification Council (MTCC), and the FSC National Initiative.

### 1.5 How to use this toolkit

Section 2 (Interpretation of HCVF in Malaysia) provides step-by-step explanations and guidelines on how to identify potential HCVs in an area. The guidelines are presented in tabular format, with one table for identification and one table for management recommendations. Suggested tasks are outlined in the left column while information sources and guidance documents are listed in the right column. General national-level guidance is mentioned first, but where applicable, different information sources are then indicated for Peninsular Malaysia (PM), Sabah and Sarawak. Additional useful information is provided in the form of appendices at the end of this toolkit.

Although this toolkit includes useful practical information, much of the guidance on HCVs is necessarily general. It should be kept in mind that all surveys and monitoring protocols are necessarily site-specific, and one uniform approach cannot be recommended for all situations. As such this toolkit only functions as a guide, and is not intended to serve as a how-to manual for conducting fieldwork; forest managers are advised to seek appropriate input and further details from relevant experts.

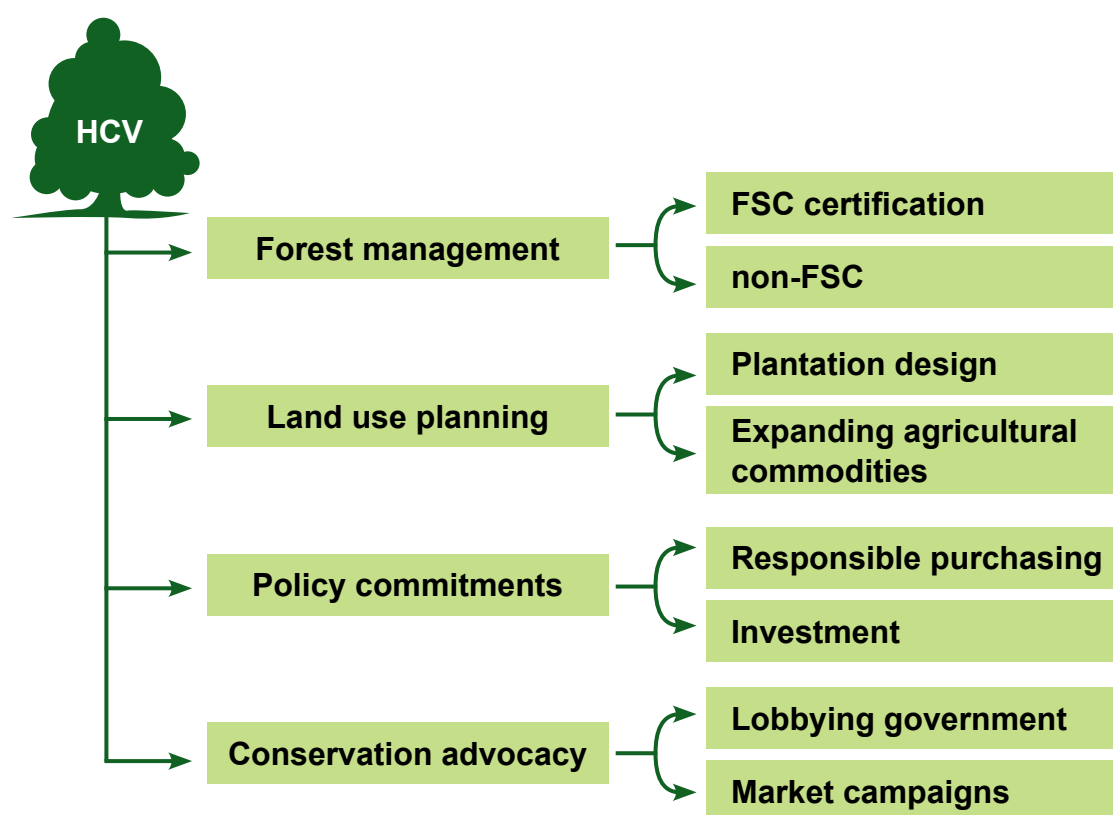
Please note that an area may contain several overlapping HCVs, which forest managers may want to use as an indication of higher conservation value when devising management prescriptions. Conversely, not all six HCVs will necessarily be relevant or present within a FMU, and forest managers are only required to manage whatever HCVs actually do exist there.

*NB: For all HCVs that have been identified, periodic monitoring must be carried out where applicable to assess the effectiveness of the management activities. This can be done by referring to results of field surveys and Forest Management Plans (FMPs), consulting experts, and carrying out community consultations. Areas must be sampled periodically following methods that are designed professionally and yield meaningful results.*

### 1.6 Other potential uses of the toolkit

This document is primarily intended for application with the FSC Principles & Criteria, and also the MC&I(2002), which is relevant to the management of natural forest within the Permanent Reserved Forest (i.e. inside gazetted forest reserves). However, it is acknowledged that this document may be of interest and potential relevance to other sectors involved in defining/assessing HCVFs.

The HCV network notes that while forest management is the primary application, the concept also has a number of other uses (**Figure 3**).



**Figure 3.** Potential applications of the HCV concept

Source: [www.hcvnetwork.org](http://www.hcvnetwork.org)

This document covers the identification of HCVF and discusses potential management prescriptions associated with natural forest management. However the methodology employed for the identification of HCVF might potentially be used by sectors who are interested to conduct HCV assessments prior to forest conversion for development. Although it is recognised practice that the identification of HCVs does not differ from sector to sector, it is acknowledged that this document makes management prescriptions on HCVF areas from the point of view of the natural forest sector. Other sectors should consider developing additional management prescriptions for their respective purposes via a consultative stakeholder approach similar to that followed for the development of this toolkit.



## 2 Toolkit Proper: Interpretation of HCVF in Malaysia

### HCV 1 Biodiversity Values

Global Toolkit definition: *Forest area contains globally, regionally or nationally significant biodiversity values (e.g. endemism, endangered species, sites of critical temporal use).*

#### HCV 1.1 Protected Areas

All forest areas that have been legally gazetted as Protected Areas under Malaysian legislation (either federal or state), are HCV 1.1. The Master List of Protected Areas in Malaysia, commissioned by the Ministry of Natural Resources & Environment, has listed all areas that fall under this category, and should therefore be the first point of reference. However, it is noted that in Sarawak there is no overlap between FMUs and TPAs.

Identification of HCV 1.1

Task	Data sources & requirements
Determine if forest area is adjacent to a legally gazetted protected area listed in the Protected Areas Master List.	Protected Areas Master List (NRE, in prep), government gazette notifications for protected areas, protected area authorities. <b>Sabah:</b> Sabah Parks, Forestry Department. <b>Sarawak:</b> Forest Department, SFC

Management and Monitoring for HCV 1.1

Management Recommendations	Guidance
Determine the boundaries of the protected area, identify, comply with and enforce rules and regulations (if any) governing activities inside (or adjacent to) the protected area.	Government gazette notifications for protected areas, protected area authorities, forestry authorities. <b>PM:</b> National Forestry Act 1984, National Forestry Policy 1978, State Legal Advisor, Forestry Manual. <b>Sabah:</b> Forest Enactment 1968, Land Ordinance 1930 (Sabah Cap. 68), Wildlife Conservation Enactment 1997, Environmental Quality Act 1974, Environment Protection Enactment 2002. <b>Sarawak:</b> Wild Life Protection Ordinance 1998 (Cap. 26), Forests Ordinance 1954 (Cap. 126).
Determine buffer strip activities. Buffer zones should be defined according to state regulations or as described in the protected area management plans.	IUCN Guidelines for Management Planning of Protected Areas(2003,data.iucn.org/dbtw-wpd/edocs/PAG-010.pdf),Krau Management Plan (www.wildlife.gov.my/printed_material/misc/KrauWRManagementPlan.pdf), other protected area management plans, approved FMPs, other government-approved documents. <b>Sarawak:</b> Proposed Amendment of the Forests Ordinance.

## HCV 1.2 Threatened and Endangered Species

Any species categorised as either Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) on the IUCN Red List, Appendix I of CITES or listed as protected under Malaysian legislation (federal or state), is HCV 1.2. However, for practical reasons forest managers may want to limit field surveys of fauna to mammals (particularly large ones, over 20kg in weight), birds and herpetofauna, unless literature indicates that there are other species in the area which require specific attention. This does not mean that other taxa are unimportant, and wherever possible, if the expertise and survey protocols are available, these should be covered too. It is also recommended to cross-check the IUCN Red List with the Malaysian Red Data Book, once that is available. Where there may be differences between the Malaysian Red Data Book and the IUCN Red List, the Malaysian Red Data Book should always take precedence.

### Identification of HCV 1.2

Task	Data sources & requirements
Determine if forest area contains any species of flora and/or fauna categorised by IUCN as CR, EN or VU, CITES Appendix 1 or any species protected under Malaysian legislation.	<p>List of experts, IUCN Red List of Threatened Species (<a href="http://www.iucnredlist.org">www.iucnredlist.org</a>; for large mammals see <b>Appendix 1</b>), Malaysian Red Data Book (in prep; flora – FRIM, fauna – PERHILITAN), Appendix I of CITES (<a href="http://www.cites.org/eng/resources/species.html">www.cites.org/eng/resources/species.html</a>), distribution maps from South East Asian Mammal Databank (<a href="http://www.ieaitaly.org/samd/">www.ieaitaly.org/samd/</a>), herbaria and museum collections, databases, published reports, peer-reviewed journals, current expert opinion.</p> <p><b>PM:</b> Tiger Action Plan (<a href="http://www.wildlife.gov.my/webpagev4_en/printed_material/misc/TAP.pdf">www.wildlife.gov.my/webpagev4_en/printed_material/misc/TAP.pdf</a>), Elephant Habitat map (<a href="http://www.wildlife.gov.my/webpagev4_en/printed_material/kmaklumat/gajah.pdf">www.wildlife.gov.my/webpagev4_en/printed_material/kmaklumat/gajah.pdf</a>), Schedule I &amp; II of the Protection of Wild Life Act 1972.</p> <p><b>Sabah:</b> Wildlife Conservation Enactment 1997, Sabah Wildlife Department listing.</p> <p><b>Sarawak:</b> Wild Life Protection Ordinance 1998, Forests Ordinance 1954 (Cap. 126), Sarawak Totally Protected, Protected Species and Schedules.</p>
Carry out a baseline survey to confirm the presence/absence of identified CR, EN or VU flora and fauna in forest area. This should include consultation with local communities for traditional ecological knowledge.	<p>Malaysian Red Data Book (<i>in prep</i>), published guides,<sup>2</sup> reports, peer-reviewed journals, current expert opinion, local communities. Also see <b>Appendix 3</b> and <b>Appendix 18</b> for further guidance.</p> <p><b>Sabah:</b> Consult FRC, Agricultural Park in Tenom.</p>

<sup>2</sup> Examples of such guides include Langhammer *et al.* (2007, [data.iucn.org/dbtw-wpd/edocs/PAG-015.pdf](http://data.iucn.org/dbtw-wpd/edocs/PAG-015.pdf)), Kanjanavanit (1997, **Appendix 9**), Kanchanasakha *et al.* (1998), Shariff & Mark Rayan (2009), Payne *et al.* (1998), Robson (2005), MacKinnon & Phillipps (1993), Cox *et al.* (1998) and Das (2006).

## Management and Monitoring for HCV 1.2

Management Recommendations	Guidance
Develop a management plan that makes specific reference to the threatened species, if found to exist in the area. Specific management measures for these species should be identified.	FRIM, PERHILITAN & NGOs (see <b>Appendix 11</b> for list of organisations). Also see <b>Appendix 3</b> and <b>18</b> and refer to current expert opinion/ available scientific data. <b>Sabah:</b> Sabah Wildlife Conservation Enactment 1997. <b>Sarawak:</b> Wildlife Master Plan (Forest Department).
Obtain input from specialists in determining appropriate management prescriptions. Where possible this should include balanced representation from the government, academia and NGOs.	List of biodiversity experts <sup>3</sup> . Also see <b>Appendix 11</b> . <b>Sabah:</b> Sabah Wildlife Enactment.

## HCV 1.3 Endemism

Any forest containing endemic species as identified by FRIM, MNS, SFC, Forestry Departments and published literature, particularly in high concentrations or highly restricted distribution, can be considered HCV 1.3.

### Identification of HCV 1.3

Task	Data sources & requirements
Determine if forest area contains endemic species of flora or fauna.	List of endemic tree & mammal species ( <b>Appendix 2</b> , attached), published guides <sup>4</sup> , reports, peer-reviewed journals, current expert opinion. <b>PM:</b> Ng <i>et al.</i> (1990), Flora of Peninsular Malaysia Online ( <a href="http://www.tfbc.frim.gov.my/gettingstarted.asp">www.tfbc.frim.gov.my/gettingstarted.asp</a> ), Checklist of Birds of Malaysia (MNS), PERHILITAN, Forest Departments. <b>Sabah:</b> Soepadmo <i>et al.</i> (2006), FRC, Wildlife Department. <b>Sarawak:</b> Soepadmo <i>et al.</i> (2006), Forest Department, SFC.

## Management and Monitoring for HCV 1.3

Management Recommendations	Guidance
Obtain input from specialists in determining appropriate management prescriptions. Where possible this should include balanced representation from the government, academia and NGOs.	List of biodiversity experts <sup>5</sup> (also see <b>Appendix 11</b> ), published literature. <b>Sabah:</b> FRC, Wildlife Department. <b>Sarawak:</b> SFC, Forest Department.

<sup>3</sup> A list of mammal experts in Malaysia is maintained by the Mammals Sub-Committee of the Faunal Biodiversity Technical Committee of the National Biodiversity and Biotechnology Council; they can be contacted c/o the Department of Wildlife and National Parks, Peninsular Malaysia (PERHILITAN).

<sup>4</sup> See Footnote 2 (under 'Identification of HCV 1.2, pg. 6), for a list of recommended guides.

<sup>5</sup> In addition to the list of mammal experts (above), a list of botanists in Malaysia is maintained by the Floral Biodiversity Technical Committee of the National Biodiversity and Biotechnology Council; they can be contacted c/o the Forest Research Institute Malaysia (FRIM). For Sabah, also consult FRC and the Agricultural Park.

## HCV 1.4 Critical Temporal Use

Any forest area which is important to wildlife for feeding<sup>6</sup>, nesting, roosting, migration or contains saltlicks is HCV 1.4. Limestone hills, although important as habitat, are captured under HCV 3 (Ecosystems).

### Identification of HCV 1.4

Task	Data sources & requirements
Determine if forest area is used by endangered wildlife as critical feeding, nesting/roosting sites, pathways or contains saltlicks.	MNS Important Bird Areas (IBAs – see <b>Appendix 4.</b> ), published guides <sup>7</sup> , reports, peer-reviewed journals, maps, field surveys, local communities (through interviews), wildlife survey results from NGOs e.g. WCS, WWF. Literature should always be ground-truthed and supplemented by referring to local communities/guides for traditional ecological knowledge. Also, see Langhammer <i>et al.</i> (2007, data.iucn.org/dbtw-wpd/edocs/PAG-015.pdf) for discussion on quantitative thresholds, primarily for global significance.

### Management and Monitoring for HCV 1.4

Management Recommendations	Guidance
Identify critical sites for protection (e.g. saltlicks, fruit trees, hollow logs, nesting/roosting sites etc.) and prohibit tree-felling and disturbance in these areas.	Stevens (1968) gives an overview of the habitat requirements of the main mammal species. Community consultation, NGOs, published reports, peer-reviewed journals, current expert opinion, local communities. Also see <b>Appendix 5.</b> Chong <i>et al.</i> (2005, WWF). <b>PM:</b> Protection of Wild Life Act 1972, Forestry Manual, FDPM List of Protected Trees for Wildlife. <b>Sabah:</b> FRC, List of Prohibited Tree Species (Forest Department)
Obtain input from specialists in determining appropriate management prescriptions. Where possible this should include balanced representation from the government, academia and NGOs.	List of biodiversity experts (also see <b>Appendix 11</b> ), literature review/maps/field surveys/community consultation for traditional ecological knowledge.

<sup>6</sup> An example of this are trees in Sabah and Sarawak known as Kogoapon (*Castanopsis* spp.) and Tikalod (*Lithocarpus* spp.) whose fruits are an important food source for wild pigs (*Sus scrofa* or *S. barbatus*).

<sup>7</sup> See Footnote 2 (under 'Identification of HCV 1.2', pg. 6), for a list of recommended guides.

## HCV 2 Landscape-level Forest

Global Toolkit definition: *Forest area contains or is part of a globally, regionally or nationally significant large landscape level forest where significant populations of most if not all naturally occurring wildlife species exist in natural patterns of distribution and abundance.*

Any forest area that forms or is part of a linkage between larger forest complexes, and can thus provide connectivity between fragments or act as a wildlife corridor for the movement of animals from one complex to another, is considered HCV 2. This HCVF can serve as a buffer zone to protected areas. Its identification and management should be tailored towards the needs of umbrella species i.e. sensitive, wide-ranging wildlife that are particularly susceptible to forest fragmentation and human population pressures. Refer to **Appendix 1** for a list of large mammals.

### Identification of HCV 2

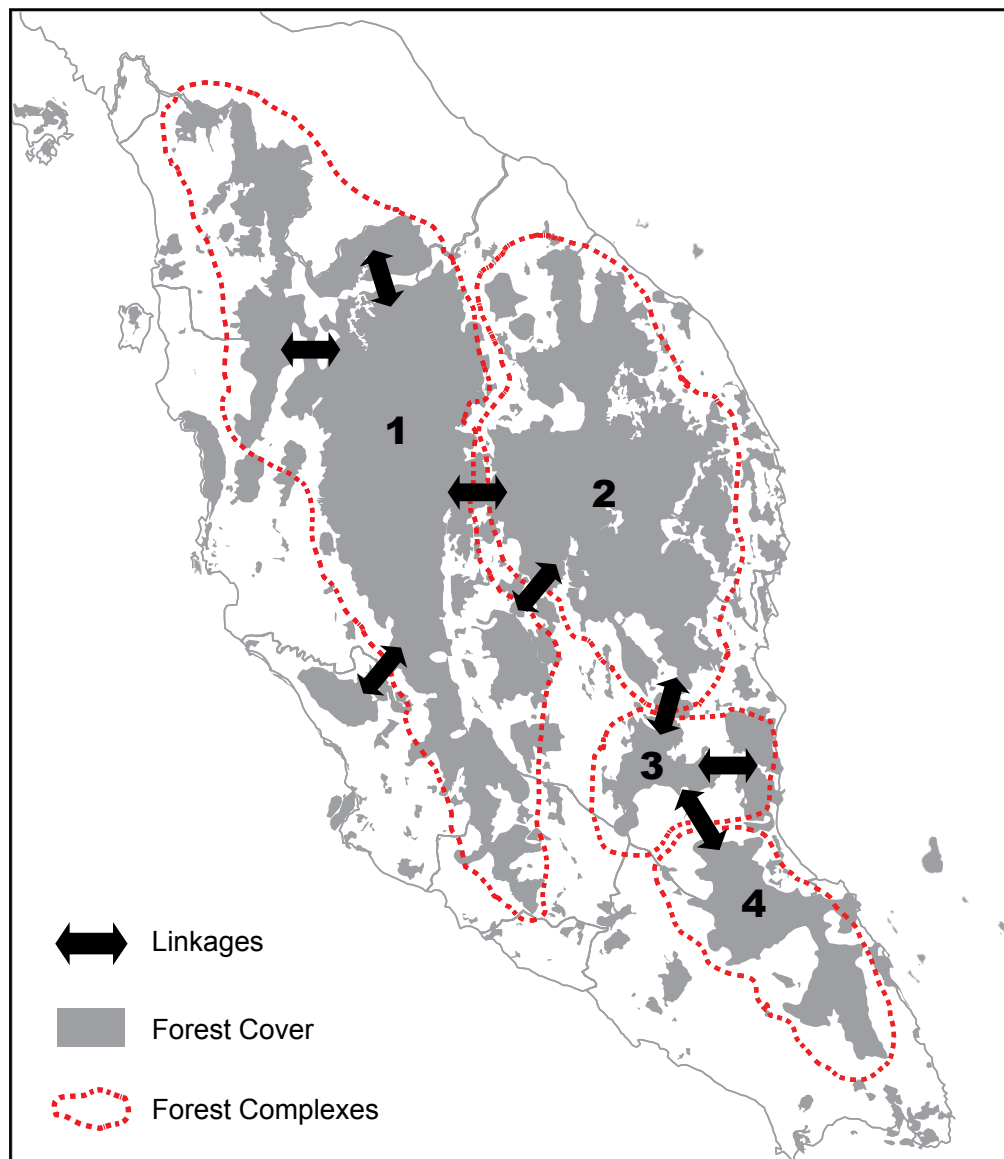
Task	Data sources & requirements
Determine if forest area falls within or next to a large forest complex, or forms a critical linkage between large forest complexes.	<p>Proceedings of Regional Workshop on Biodiversity Conservation in Planted Forest 2007 (MTCC), other published materials.</p> <p><b>PM:</b> National Physical Plan (<b>Figure 4</b>, below, DTCP), Final Report of the CFS Master Plan for Ecological Linkages (DTCP, in prep, <a href="http://www.townplan.gov.my/">www.townplan.gov.my/</a>), Tiger Action Plan (<a href="http://www.wildlife.gov.my/webpagev4_en/printed_material/misc/TAP.pdf">www.wildlife.gov.my/webpagev4_en/printed_material/misc/TAP.pdf</a>).</p> <p><b>Sabah:</b> EPU, Sabah Biodiversity Centre, Kinabatangan Corridor of Life (WWF).</p> <p><b>Sarawak:</b> Forest Department, SFC, Map of TPAs &amp; PFEs.</p>
Determine the presence, abundance and persistence of umbrella species in the area, if possible and data is available.	<b>Appendix 1</b> , List of Experts <sup>8</sup> , published guides <sup>9</sup> , reports, peer-reviewed journals, maps, field surveys, community consultation for traditional ecological knowledge.
Obtain input from government agencies and NGOs that are identifying and managing linkages.	DTCP, NRE, PERHILITAN, WWF, WCS.

### Management and Monitoring for HCV 2

Management Recommendations	Guidance
Effective wildlife corridors should remain under forest cover of at least 500m in width (protected as forest reserves or as protected areas to prevent a change in land use). Wildlife corridors should be wide enough for identified umbrella species. Any linear developments (such as roads, railways or pipelines) should incorporate appropriate wildlife crossings and associated mitigation measures. Disturbed areas no longer under forest cover should be reforested or allowed to regenerate.	<p>Final Report of the CFS Master Plan for Ecological Linkages (DTCP, in prep, <a href="http://www.townplan.gov.my/">www.townplan.gov.my/</a>), Bond (2003), Bennett (2003), WWF-Malaysia (2007a).</p> <p><b>PM:</b> DTCP (2009), PERHILITAN.</p> <p><b>Sabah:</b> Wildlife Department.</p> <p><b>Sarawak:</b> SFC</p>

<sup>8</sup> See Footnotes 3 and 5 (pg. 7).

<sup>9</sup> See Footnote 2 (under 'Identification of HCV 1.2', pg. 6), for a list of recommended guides.



**Figure 4.** Forest Complexes and Linkages identified by the National Physical Plan (DTCP, 2005: 5-38)

### HCV 3 Ecosystems


Global Toolkit definition: *Forest area contains or is part of a threatened or endangered ecosystem.*

Any forest area that contains an ecosystem/habitat type identified as a priority for protection by the National Conservation Strategy (NCS), PERHILITAN Ecosystem Assessment report, Forestry Departments, FRIM, or SFC, and/or is confirmed as such by current expert opinion, is HCV 3. Some ecosystems are naturally rare, but some others are becoming increasingly threatened by pressure from human activities. Due to rapid changes, existing data may be outdated and some particularly threatened ecosystems may already need to be considered Priority 1. A good example of this would be lowland dipterocarp forests, peat swamps and limestone habitats. Always refer to current expert opinion for confirmation.

Identification of HCV 3

Task	Data sources & requirements
Determine if forest area contains or is part of a threatened or endangered ecosystem.	<p>Priority Habitats Table of the NCS (<b>Table 1</b>, below), National Assessment of Biodiversity (PERHILITAN). However, this data may be outdated and it is advisable to cross-reference with current expert opinion e.g. FRIM, PERHILITAN, FRCs (Sabah &amp; Sarawak). Also, for limestone see Price (2001) and Lim &amp; Kiew (1997).</p> <p><b>PM:</b> PERHILITAN ecosystem assessment report (2004, summary in <b>Appendix 6</b>).</p> <p><b>Sabah:</b> Forestry Department. Also see <b>Appendix 7</b>.</p> <p><b>Sarawak:</b> SFC, Forest Department. Also see <b>Appendix 8</b>.</p>

**Table 1:** NCS Priority Habitats.

 Forest Type	Johor	Kedah	Kelantan	Melaka	Negeri Sembilan	Pahang	Perak	Perlis	Pulau Pinang	Selangor	Terengganu	Kuala Lumpur	Sabah	Sarawak
Extreme lowland	1		1	1	1	2	1				1		1	2
Lowland dipterocarp	2	1	1	1	1	2	2	1	2	2	2	2	2	2
Hill dipterocarp	3	2	3	3	3	3	3	1	1	3	3		3	3
Upper dipterocarp	2	2	2		2	2	2			2	2		2	2
Montane oak	2	2	2		2	2	2			2	2		2	2
Montane ericaceous	2	2	2		2	2	2			2	2		2	2
Heath	2		1	1		2	2	2			1		2	1
Limestone	2	1	2			2	1	1		2	2		2	2
Ultrabasic						3							3	
Quartz ridge						3				1				
River (montane)	3	3	3		2	3	3			3	3		3	3
River (sarace)	3	3	2	3	3	3	3	3	2	3	3		3	3
River (neram)	2	2	2			1	2				2		2	2
River (rasau)	3	3	2			3	3			1	2		3	3
Freshwater swamp	1					2	1				2		1	1
Peal swamp	2					1	1			1	2		2	1
Mangrove	3	1	2	3	2	3	2	2	2	1	3		3	3
Nipah	3	3	3			3	3			3	3		3	3
Scrub	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Lake		2				1			2				2	2

1=Highest priority; 2=Medium priority; 3=Least priority

Source: EPU (1993: III 156 Table 7.1).

## Management and Monitoring for HCV 3

Management Recommendations	Guidance
Determine the forest habitat type and its level of threat, and identify the boundaries on maps.	<p><b>PM:</b> Forest Resources Reconnaissance Survey (Available from FDPM Headquarters and FRIM), report on National Forest Inventories. See also <b>Appendix 6</b>, attached.</p> <p><b>Sabah:</b> Detailed maps from FRC, Forestry Department &amp; Biodiversity Council (an overview is given in <b>Appendix 7</b>).</p> <p><b>Sarawak:</b> Biodistrict map (Sarawak Biodiversity Centre) detailed maps from SFC, Forest Department (an overview is given in <b>Appendix 8</b>)</p>
Zone compartments containing undisturbed HCV3 ecosystems for protection and disturbed HCV3 ecosystems for restoration.	Field assessment/remote sensing/consultation with the relevant forest authorities.

## HCV 4 Services of Nature

Global Toolkit definition: *Forest area provides basic services of nature in critical situations.*

### HCV 4.1 Watershed Protection

HCV 4.1 includes dam catchment areas and any forest area legally gazetted as a Protection Forest for water catchment under the National Forestry Act 1984, water protection area under the Sabah Water Resources Enactment 1998 or Class I Protection Forest Reserve under the Sabah Forest Enactment 1968, water catchment areas under the Sarawak Water Ordinance 1994 or areas classified as Terrain 4 in Sarawak's First Schedule: Forest Management Plan, and Forest Timber License, or areas gazetted for watershed protection under any other state or federal legislation e.g. the National Land Code 1965.

#### Identification of HCV 4.1

Task	Data sources & requirements
<p>Determine if forest area:</p> <ol style="list-style-type: none"> <li>1) Has been legally gazetted as protection area under the National Forestry Act (PM), Sabah Forest Enactment or Water Resources Enactment (Sabah) or Sarawak Water Ordinance, or classified as Terrain 4 (Sarawak); or</li> <li>2) Has been legally gazetted for watershed protection under any other federal or state legislation; or</li> <li>3) Is a dam catchment area.</li> </ol>	<p>Government gazette notifications, FMPs, forest authorities, dam management agencies.</p> <p><b>Sabah:</b> Forestry Department, DID.</p> <p><b>Sarawak:</b> Forest Department, JKR, Sarawak Rivers Board, Department of Health, Water Resources Council.</p>



#### Management and Monitoring for HCV 4.1

Management Recommendations	Guidance
Identify and mark catchment boundaries on maps and include in FMPs, establishing a 'no logging' buffer zone outside the catchment area.	FMPs, topographic maps, gazette notifications. Also refer to NFC decisions.
Timber harvesting activities within the water catchment and buffer areas should be prohibited unless permitted by law.	<p><b>PM:</b> Forestry Department guidelines (e.g. Forestry Manual 1995), National Physical Plan.</p> <p><b>Sabah:</b> Sabah Water Resources Enactment 1998, RIL guidelines (Forestry Department).</p> <p><b>Sarawak:</b> Sarawak Water Ordinance 1994, guidelines from local authorities, including Forest Department &amp; Department of Health.</p>

#### HCV 4.2 Erosion Control

HCV 4.2 includes forest areas that have been legally gazetted for soil protection or conservation under federal and state laws e.g. the National Forestry Act 1984 (Peninsular Malaysia), forest areas which lie on slopes over 25 degrees (Sabah), areas classified as Terrain 4 in First Schedule: Forest Management Plan, Forest Timber License (Sarawak), and riparian areas covered under the DID guidelines.

#### Identification of HCV 4.2

Task	Data sources & requirements
<p>Determine if forest contains riparian area covered under DID guidelines.</p> <p><b>PM:</b> Determine if steep forest area has been officially classified as soil protection forest.</p> <p><b>Sabah:</b> Determine if forest area is on a slope over 25 degrees and covers more than 2 ha.</p> <p><b>Sarawak:</b> Determine if forest area is classified as Terrain 4.</p>	<p>Government Gazette Notifications, RIL guidelines (Forest departments), DID guidelines, FMPs, fine-scale topography maps (if available), FRIM Soil Erosion Study.</p> <p><b>Sabah:</b> Sabah Water Resources Enactment 1998.</p> <p><b>Sarawak:</b> Forest Engineering Plan, Management Plan Prescription (Forest Department), EIA report (NREB).</p>

#### Management and Monitoring for HCV 4.2

Management Recommendations	Guidance
Avoid the construction of skid trails inside steep areas. Ground-based timber harvesting activities should be prohibited unless permitted by the relevant authority.	<p>RIL guidelines, FMPs, FRIM Soil Erosion Study, <b>Appendix 11</b>.</p> <p><b>PM:</b> Forestry Manual (FDPM).</p> <p><b>Sabah:</b> RIL guidelines (Forestry Department).</p> <p><b>Sarawak:</b> Forest Engineering Plan, Management Plan Prescription (Forest Department), EIA report (NREB).</p>

### HCV 4.3 Barriers to Destructive Fire

Any specific areas that can act as barriers to provide protection of forests, especially forests with high conservation values, from fire, in areas that are generally fire-prone and where the consequences are potentially severe, can be considered HCV 4.3.

#### Identification of HCV 4.3

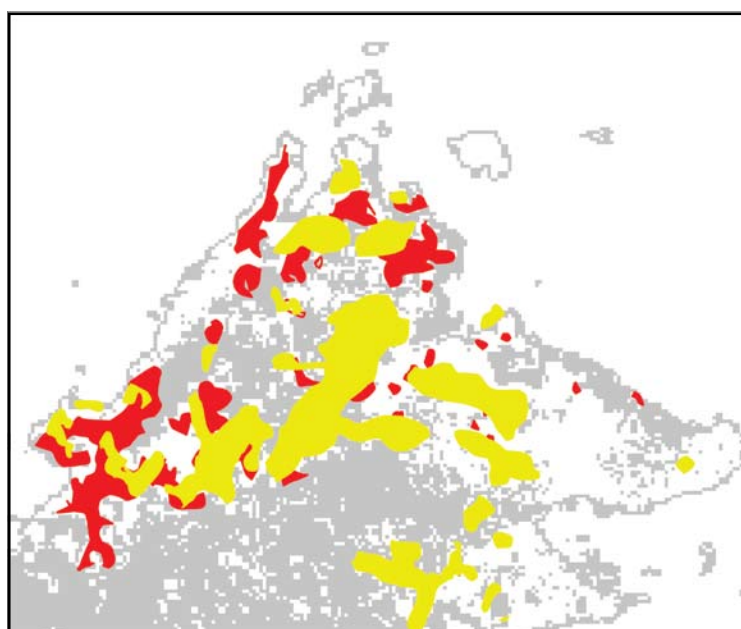
Task	Data sources & requirements
Determine if area is prone to fire e.g. peat swamps and forest areas which have been subject to fire previously. Include other examples of fire-prone areas (e.g. podzolic or edaphic soils)	State Forestry Department records of forest fire occurrences.
Determine if area is adjacent to any forests containing any other HCVs.	Maps, satellite imagery and data on other HCVFs in FMU (Forest Departments, Malaysian Remote Sensing Agency, data from HCVF assessments).
Determine if forest area is adjacent to plantations (any plantation-forest edge is susceptible to fire during long dry periods) or settlements (Sarawak: 'temuda').	Maps and satellite imagery of settlements and land use in and adjacent to the FMU (Forest Departments, Malaysian Remote Sensing Agency), community consultation for traditional ecological knowledge. <b>Sabah:</b> Forest Fire Rating (Forestry Department).

#### Management and Monitoring for HCV 4.3

Management Recommendations	Guidance
Include in FMP the identification of any specific features that may act as barriers to fire, and prescriptions for managing these areas. Natural barriers could include water courses, ridges or gullies. Intact natural forest may also act as a natural barrier. Particular attention should be paid to the maintenance of the water table in vulnerable peat swamp forests.	Malaysian Meteorological Department Fire Danger Rating System ( <a href="http://www.met.gov.my">www.met.gov.my</a> ) <sup>10</sup> . <b>Sabah:</b> Fire Risk map (plantations, <a href="http://www.forest.sabah.gov.my/conservation/nfire%20prevention.pdf">http://www.forest.sabah.gov.my/conservation/nfire%20prevention.pdf</a> ) Fire Danger Rating System (FDRS), community consultation for traditional ecological knowledge. <b>Sarawak:</b> Applicable for License Planted Forest holders where Fire Management Plan is outlined in Tree Planting Plan.
Monitor the frequency of fires in previously identified fire-prone areas.	Field surveys.

<sup>10</sup> The Malaysian Meteorological Department (MMD) maintains a fire danger rating system for the whole of the country. MMD uses a number of indicators of the potential for fires to start and spread throughout Malaysia at any time.

The Sabah Forestry Department has records of the extent of forest fire damage in the state (a very simplified version is shown in **Figure 6**; the Department should be consulted for more specific maps relevant to sites undergoing HCV assessments). Areas which have burned in the past are particularly vulnerable to burning again.



**Figure 6.** Forest fires in Sabah during 1983 (yellow) and 1997/1998 (red) areas that burned in both years are shaded orange; forest cover c. 2000 is shown in grey (adapted from Stibig *et al.*, 2002).

### HCV 5 Basic Needs of Local Communities

Global Toolkit definition: *Forest area is fundamental to meeting basic needs of local communities.*

A forest area may be considered HCV 5 if it contains or is adjacent to settlements which depend on produce from that forest for basic subsistence or health needs. Examples include hunting grounds or areas from which minor forest products such as bamboo, rattan and medicinal plants are collected, and which are regularly visited by community members for this purpose. The community may be living either in or adjacent to the forest. However, identification and management of this HCV must always involve participation of the communities themselves. \*

#### Identification of HCV 5

Task	Data sources & requirements
Determine if forest area contains or is adjacent to any settlements. Identify and consult with the relevant communities.	Map/list of villages from District Office/Resident's Office, FMPs, community consultation. <b>PM:</b> Department of Orang Asli Affairs. <b>Sarawak:</b> Native Customs Council, Leigh (2002).
Determine the level of dependence of identified local communities on forest produce (e.g. minor forest products) and services for basic subsistence/health needs. Identify and map out specific locations through a participatory approach with the communities in question.	Site-specific community survey ( <b>Appendix 9</b> , attached). LOAM (Aldrich & Sayer, 2007, <b>Appendix 10</b> ), Conflict Resolution Guidelines for Sustainable Forest Management (WWF, SFC). <b>Sabah:</b> Council of Elders (refer to KDCA for details). <b>Sarawak:</b> Native Customs Council, Forest Ordinance (communal forest), Land Code.

\* This HCV does not apply to recently migrated communities.

## Management and Monitoring for HCV 5

Management Recommendations	Guidance
<p>Conduct multi-stakeholder consultations between local communities and forest and local authorities to identify and protect specific forest compartments/zones/ components according to the basic needs they support. Examples to follow would be the Landscape Outcome Assessment Methodology (LOAM, Aldrich &amp; Sayer, 2007). It is recommended that a credible, neutral independent party be present during consultations, followed by a desktop review of the findings. If the consultation itself is conducted by a third party, the desktop review is not required.</p>	<p>Aldrich &amp; Sayer (2007, <b>Appendix 10</b>), Dudley &amp; Stolton (2008, <a href="http://www.equilibriumresearch.com/upload/document/PA_BAT_-_Final_Feb_2008.pdf">www.equilibriumresearch.com/upload/document/PA_BAT_-_Final_Feb_2008.pdf</a>), Conflict Resolution Guidelines for Sustainable Forest Management (WWF, SFC).</p> <p><b>Sabah:</b> PACOS Trust, KDCA &amp; other cultural associations. For mapping of ethnic groups refer to the Sabah Cultural Board &amp; Sabah Museum.</p> <p><b>Sarawak:</b> Native Customs Council, Resident's Office.</p>

## HCV 6 Cultural Identity of Local Communities

Global Toolkit definition: *Forest area is critical to local communities' traditional cultural identity.*

A forest is considered HCV 6 if it has been important for a local (particularly indigenous) community's cultural, ecological, or religious activities. The community may be living either in or adjacent to the forest. Examples of such sites within a forest include burial grounds or sacred areas which cannot be replaced with alternatives and/or would cause drastic cultural change within the community. Identification and management of this HCV must always involve participation of the communities themselves. \*

### Identification of HCV 6

Task	Data sources & requirements
<p>Determine if forest contains areas and/or sites important to a local community's cultural, ecological, or religious activity.</p>	<p>Site-specific community survey (<b>Appendix 9</b>). Conflict Resolution Guidelines for Sustainable Forest Management (WWF, SFC).</p> <p><b>Peninsula:</b> Jabatan Hal-Ehwal Orang Asli</p> <p><b>Sabah:</b> Cultural Board, Pejabat Hal-Ehwal Anak Negeri, Sabah Museum, Sabah cultural associations – listing of registered ones can be obtained from the Registrar of Societies.</p> <p><b>Sarawak:</b> Museum Department, Native Customs Council.</p>

\* This HCV does not apply to recently migrated communities.

## Management and Monitoring for HCV 6

Management Recommendations	Guidance
<p>Conduct multi-stakeholder consultations between local communities and forest and local authorities to identify and protect specific forest compartments/zones/ components according to their traditional cultural, ecological, economic or religious importance. Examples to follow would be the Landscape Outcome Assessment Methodology (LOAM, Aldrich &amp; Sayer, 2007). It is recommended that consultations are carried out by an independent party, consistent with recognised HCV good practice.</p>	<p>Aldrich &amp; Sayer (2007, <b>Appendix 10</b>), Dudley &amp; Stolton (2008, <a href="http://www.equilibriumresearch.com/upload/document/PA_BAT_-_Final_Feb_2008.pdf">www.equilibriumresearch.com/upload/document/PA_BAT_-_Final_Feb_2008.pdf</a>). Conflict Resolution Guidelines for Sustainable Forest Management (WWF, SFC).</p> <p><b>PM:</b> District Office, Department of Orang Asli Affairs.</p> <p><b>Sabah:</b> Native Courts, KDCA, PACOS Trust &amp; other cultural associations. For mapping of ethnic groups refer to the Sabah Cultural Board &amp; Sabah Museum.</p> <p><b>Sarawak:</b> Native Customs Council, Resident's Office.</p>

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## Appendix 1. Threatened & Endangered Species of large mammal in Malaysia.

Global Status	Regional Status		
	P. Malaysia	Sabah	Sarawak
<b>CRITICALLY ENDANGERED (CR)</b>			
<i>Dicerorhinus sumatrensis</i> Sumatran Rhinoceros, Badak Sumatera	<b>CR</b> (ssp. <i>sumatrensis</i> )	<b>CR</b> (ssp. <i>harrissoni</i> )	<b>RE?</b> (ssp. <i>harrissoni</i> )
<b>ENDANGERED (EN)</b>			
<i>Bos javanicus</i> Banteng/Tembadau	<b>RE?</b>	<b>EN</b> (ssp. <i>lowi</i> )	<b>RE?</b> (ssp. <i>lowi</i> )
<i>Cuon alpinus</i> Dhole, Wild Dog, Serigala	<b>EN</b>	<b>NA</b>	<b>NA</b>
<i>Elephas maximus</i> Asian Elephant, Gajah	<b>EN</b>	<b>EN</b> (ssp. <i>borneensis</i> )	<b>NE/NA</b>
<i>Panthera tigris</i> Tiger, Harimau Belang	<b>EN</b>	<b>NE/NA</b>	<b>NE/NA</b>
<i>Pongo pygmaeus</i> Orang Utan/Mawas	<b>RE/NA</b>	<b>EN</b> (ssp. <i>pygmaeus</i> )	<b>EN</b> (ssp. <i>morio</i> )
<i>Tapirus indicus</i> Tapir/Tenuk/Cipan	<b>EN</b>	<b>NA</b>	<b>NA</b>
<b>VULNERABLE (VU)</b>			
<i>Bos gaurus</i> Gaur, Seladang	<b>VU</b>	<b>NA</b>	<b>NA</b>
<i>Capricornis sumatraensis</i> Serow, Kambing Gurun	<b>VU</b>	<b>NA</b>	<b>NA</b>
<i>Rusa unicolor</i> Sambar Deer, Rusa/Payau	<b>VU</b>	<b>VU</b>	<b>VU</b>
<i>Helarctos malayanus</i> Sun Bear, Beruang Madu	<b>VU</b>	<b>VU</b>	<b>VU</b>
<i>Neofelis nebulosa/diardi</i> Clouded Leopard Harimau Dahan	<b>VU</b>	<b>VU</b>	<b>VU</b>
<i>Sus barbatus</i> Bearded Pig Babi Hutan	<b>VU</b>	<b>VU</b>	<b>VU</b>

Mammal species are classified as large if their body weight is more than 20kg (Morrison *et al.*, 2007).  
 Source: www.iucnredlist.org (2009); NA=Not Applicable; RE=Regionally Extinct; NE=Not Evaluated.

## Appendix 2. Selected localities with endemic tree or mammal species

(adapted from Ng *et al.*, 1990; Soepadmo *et al.*, 2006; Francis, 2008; as well as Payne *et al.*, 1985).

### A. Tree Species

1. Bako, Sarawak: *Shorea bakoensis*
2. Bau, Sarawak: *Shorea calcicola*
3. Belaga, Sarawak: *Gonystylus decipiens*, *Hopea longirostrata*, *Microtropis argentea*, *Payena grandistipula*
4. Bintang Range, Perak: *Abdulmajidia maxwelliana*, *Brownlowia kleinhovoidea*, *Chisocheton perakensis*, *Eugenia gageana*, *E. quadrata*, *E. swettenhamiana*, *E. taipingensis*, *Glycosmis perakensis*, *Knema retusa*, *Kokoona coriacea*, *Pentace perakensis*, *Pseudovaria taipingensis*, *Sterculia microphylla*
5. Bota Kiri, Perak: *Ptychopyxis triradiata*
6. Bukit Bauk, Dungun, Terengganu: *Dacryodes breviracemosa*, *Pseudovaria cerina*
7. Bukit Fraser (Gunung Ulu Semangkok: Pahang, Selangor): *Ardisia nurii*, *Diospyros selangorensis*, *Endiandra scrobiculata*, *Glochidion stylosum*, *Goniothalmus holttumii*, *Lithocarpus burkii*, *Pithecellobium cuneadenum*, *Styrax fraserensis*, *Talauma oblanceolata*, *Saurauia mahmudii*, *S. malayana*
8. Bukit Goh, Pahang: *Shorea kuantanensis*
9. Bukit Keledang, Perak: *Cleistanthus glaucus*, *Diospyros gambleana*, *Diplodiscus scortechinii*
10. Bukit Kulong/Bukit Tampurango, Sabah: *Dipterocarpus ochraceus*
11. Bukit Tawai, Sabah: *Lithocarpus tawaiensis*, *Madhuca engkikiana*, *Payena khoonmengiana*
12. Cameron Highlands (Kelantan, Pahang, Perak): *Ardisia glanduligera*, *Castanopsis scortechinii*, *Chionanthus caudifolius*, *Cinnamomum pubescens*, *Mesua purseglovei*, *Nothaphoebe pahangensis*, *Schefflera wrayi*
13. Danum Valley, Sabah: *Engelhardia danumensis*
14. Dindings, Perak (Pulau Pangkor/Lumut): *Ardisia calophylla*, *Eugenia auriculata*, *Homalium spathulatum*, *Hydnocarpus scortechinii*, *Shorea lumutensis*
15. Endau-Rompin (Pahang, Johore): *Anisophyllea reticulata*, *Ptychopyxis watsonii*, *Schoutenia furfuracea*, *Trigonostemon wetriifolius*
16. Genting Highlands (Gunung Ulu Kali: Pahang, Selangor): *Ardisia mystica*, *A. viminea*, *Neolitsea coccinea*, *Sauropus elegantissimus*
17. Gunung Batu Puteh (Pahang, Perak): *Ardisia longepedunculata*, *Eugenia plumbea*, *Neolitsea mollissima*
18. Gunung Belumut, Johore: *Fordia incredibilis*, *Garcinia holttumii*
19. Gunung Inas, Selama, Perak: *Diplospora velutina*, *Eugenia inasensis*, *Mallotus smilaciformis*
20. Gunung Jerai, Kedah: *Casearia flexula*, *Neolitsea kedahense*, *Talauma gracilior*
21. Gunung Kinabalu, Sabah: *Chionanthus kinabaluensis*, *Ficus paramorpha*, *Helicia symplocoides*, *H. maxwelliana*, *Ilex mesilauensis*, *Illicium kinabaluense*, *Microtropis ovata*, *Payena kinabaluensis*, *Symplocos buxifolia*, *S. buxifolioides*, *S. colombonensis*
22. Gunung Ledang, Johore: *Cleistanthus lanuginosus*, *Fordia ophirensis*, *Garcinia montana*, *Glycosmis monticola*
23. Gunung Mulu, Sarawak: *Ilex megaphylla*, *Lithocarpus muluensis*
24. Gunung Nuang (Pahang, Selangor, Negri Sembilan): *Glycosmis tomentella*
25. Gunung Pulai, Johore: *Ardisia ferox*, *Croton lucidus*, *Eugenia johorensis*, *Tristania pontianensis*
26. Gunung Tapis, Pahang: *Microtropis tenuis*
27. Jerangau, Terengganu: *Dipterocarpus sarawakensis* (Peninsular Malaysia population)
28. Kaki Bukit, Perlis: *Canarium perlisanum*
29. Kapit, Sarawak: *Ficus chailii*, *Gonystylus eximus*, *Payena kapitensis*, *Shorea dispar*, *S. rotundifolia*, *S. woodii*
30. Kedah-Perlis Ridge: *Atuna latifolia*, *Kostermanthus malayana*
31. Kemaman, Terengganu: *Ardisia tumida*, *Cleistanthus major*, *Eugenia rostadonis*
32. Kinabatangan, Sabah: *Crudia venenosa*
33. Kinta Valley, Perak: *Alphonsea kingii*, *Castanopsis catappaefolia*, *Cleistanthus parvifolius*, *Crudia glauca*, *Diplodiscus hookerianus*, *Dipterocarpus semivestitus* (Malaysian population), *Drypetes nervosa*, *Eugenia camptophylla*, *Homalium kunstleri*, *Kopsia scortechinii*
34. Klang Gates Ridge, Selangor (Bukit Batu Tabur): *Ilex praetermissa*
35. Kuala Teriang, Pahang: *Drypetes detersibilis*
36. Labis, Johore: *Xanthophyllum pubescens*
37. Lawas, Sarawak: *Diospyros parabuxifolia*
38. Lebir Valley, Kelantan: *Aporusa isabellina*

39. Lesong, Pahang: *Trigonostemon wetriifolius*
40. Lundu, Sarawak: *Gonystylus augescens*
41. Malacca: *Glycosmis crassifolia*, *Koilocedrus ferrugineum*, *Lasiococca malaccensis*, *Mezzetia herveyana*, *Popowia pauciflora*
42. Marudi/Niah, Sarawak: *Madhuca ochracea*
43. Matang, Sarawak: *Palaquium ferrugineum*, *P. multiflorum*, *Ilex beccariana*
44. Mendalom, Keningau, Sabah: *Engelhardia mendalomensis*
45. Mukah, Sarawak: *Horsfieldia sessilifolia*
46. Panti/Kota Tinggi, Johore: *Diospyros johorensis*, *Dryobalanops beccarii*
47. Penang Island: *Horsfieldia penangiana*, *Ilex pauciflora*, *Koilocedrus wallichianum*, *Polyalthia hirtifolia*
48. Pulau Langkawi, Kedah: *Ardisia langkawiensis*, *Lagerstroemia langkawiensis*, *Madhuca calcicola*, *Nothaphoebe condensa*
49. Pulau Tioman: *Diospyros insidiosa*, *Eugenia tiumanensis*, *Trigonostemon arboreus*
50. Rajang, Sarawak: *Kopsia rajangensis*
51. Rawang, Selangor: *Chionanthus spiciferus*, *Hopea subalata*
52. Rengam/Keluang, Johore: *Melanochyla fasciculiflora*
53. Sandakan, Sabah: *Parartocarpus spinulosus*, *Lithocarpus sandakanensis*
54. Seri Iskandar, Perak: *Dipterocarpus semivestitus*
55. Sri Aman, Sarawak: *Aulandra beccarii*
56. Sungai Bantang, Johore: *Dipterocarpus tempehes*
57. Sungai Nal, Kelantan: *Hopea coriaceae*
58. Taman Negara (Gunung Tahan: Kelantan, Pahang, Terengganu): *Adinandra angulata*, *Agathis flavescens*, *Aquilaria rostrata*, *Ardisia biniflora*, *Ar. cardiophylla*, *Ar. retinervia*, *Bridelia whitmorei*, *Dacryodes multijuga*, *Eugenia clypeolata*, *E. cyrtophylloides*, *E. pseudoclaviflora*, *E. tahanensis*, *E. tekuensis*, *Garcinia clusiaefolia*, *Lindera montana*, *Polyosma robusta*, *Talauma peninsularis*, *Terminthodia viridiflora*, *Tristania fruticosa*
59. Tasek Glugor, Seberang Perai, Penang: *Crudia brevipes*
60. Klang, Selangor: *Croton macrocarpus*
61. Ulu Brang-Tersat, Terengganu: *Pseuduvaria nervosa*
62. Ulu Segan, Sarawak: *Dipterocarpus cuspidatus*, *Gonystylus nobilis*

## B. Mammal Species

1. Baram, Sarawak: *Herpestes hosei*, *Petaurillus emiliae*
2. Danum Valley, Sabah: *Pithecheirops otion*
3. Gunung Benom (Pahang; Selangor): *Pipistrellus societatis*
4. Gunung Inas, Perak: *Maxomys inas*
5. Gunung Kinabalu, Sabah: *Crocidura baluensis* (*C. fuliginosa baluensis*), *Melogale everetti* (*M. personata everetti*), *Suncus ater*
6. Klang, Selangor: *Hipposideros nequam*, *Petaurillus kinlochii*
7. Krau, Pahang: *Hipposideros 'bicolor'* (142 kHz), *Kerivoula krauensis*
8. Sandakan/Tabin, Sabah: *Hesperoptenus tomesi*
9. Sepilok, Sabah: *Pipistrellus cuprosus*

### Appendix 3. Management of HCV1 (Biodiversity Values - Wildlife).

There are a number of general guidance documents related to wildlife management in production forest (e.g. Meijaard *et al.* (2005); Higman *et al.* (2005); Shamsudin *et al.* (2003)<sup>11</sup>). Some preliminary questions can be asked in the development of a specific wildlife management plan for HCV1:

#### 1) What expertise is needed?

In Malaysia, a trained biologist is recommended for managing and monitoring wildlife (especially if this involves handling protected species)<sup>12</sup>. If in-house expertise is not available, survey work can be outsourced to other organisations (e.g., government wildlife agencies, university researchers, commercial consultants or non-government organisations);

#### 2) How do I identify endangered species?

There are formal checklists as well as field guidebooks for identifying mammals in all parts of Malaysia. The latest checklist is given by Davison and Zubaid (2007) with field guides available for both Peninsular Malaysia (Francis, 2008) as well as Borneo (Payne *et al.*, 1985)<sup>13</sup>. Natural history sections of museums could also be visited to examine skins to confirm the identification of the specimens if in doubt.

#### 3) How can I monitor the populations of these species?

There are numerous manuals available on conducting such wildlife surveys. Among the most relevant are the following: Designing Field Studies for Biodiversity Conservation (Feinsinger, 2001); Ecological Census Techniques (Sutherland, 1996), Guidelines for Monitoring and Evaluation for Biodiversity Projects (GEF, 1998) and Measuring and Monitoring Biological Diversity: Standard Methods for Mammals (Ed. Wilson, 1996). These textbooks highlight a number of methods for surveying large mammals including line transects, camera traps and sign surveys (observations of tracks, wallows, scent locations, scratches, burrows, etc.). Other methods are used for surveying birds, bats and other small mammals.

Wildlife surveys can be included within pre-felling inventories however it should be noted that compared with timber inventories they require different skills, different lengths of time, different travel patterns through the concession, and attention to different components of the ecosystem.

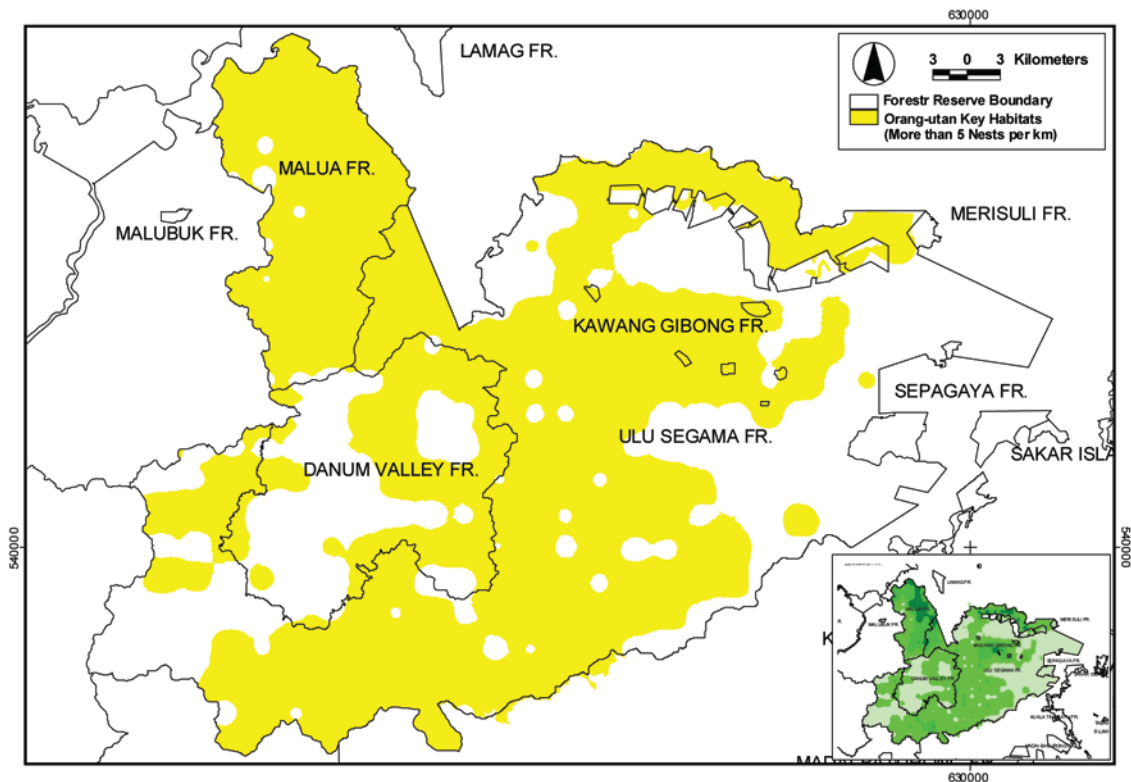
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<sup>11</sup> Shamsudin *et al.* (2003) provide recommendations on formulation and implementation of wildlife action plans for Peninsular Malaysia; this should be supplemented to include reference to the threatened species identified; additional modifications may be required for adapting the approach to Sabah and Sarawak.

<sup>12</sup> Refer to the Protection of Wild Life Act 1972 (Peninsular Malaysia); the Wildlife Conservation Enactment 1997 (Sabah); and the Wild Life Protection Ordinance 1998 (Sarawak).

<sup>13</sup> Some species are difficult to distinguish in the field so care must be taken when identifying them (e.g. Kinabalu squirrel *Callosciurus baluensis* (which is endemic to Sabah and Sarawak) vs Prevost's squirrel *Callosciurus prevostii* (common species in most part of SEA); Asian small-clawed otter *Aonyx cinereus* vs smooth-coated otter *Lutrogale perspicillata* (a vulnerable species)).

For example, a helicopter nest-count and ground survey was used to identify key orangutan habitat in Ulu Segama (see **Figure 1**, below).



**Figure 1.** Orang-utan Key Habitats (> 5 nests per km) in Ulu Segama.  
Source: WWF-Malaysia (2007).

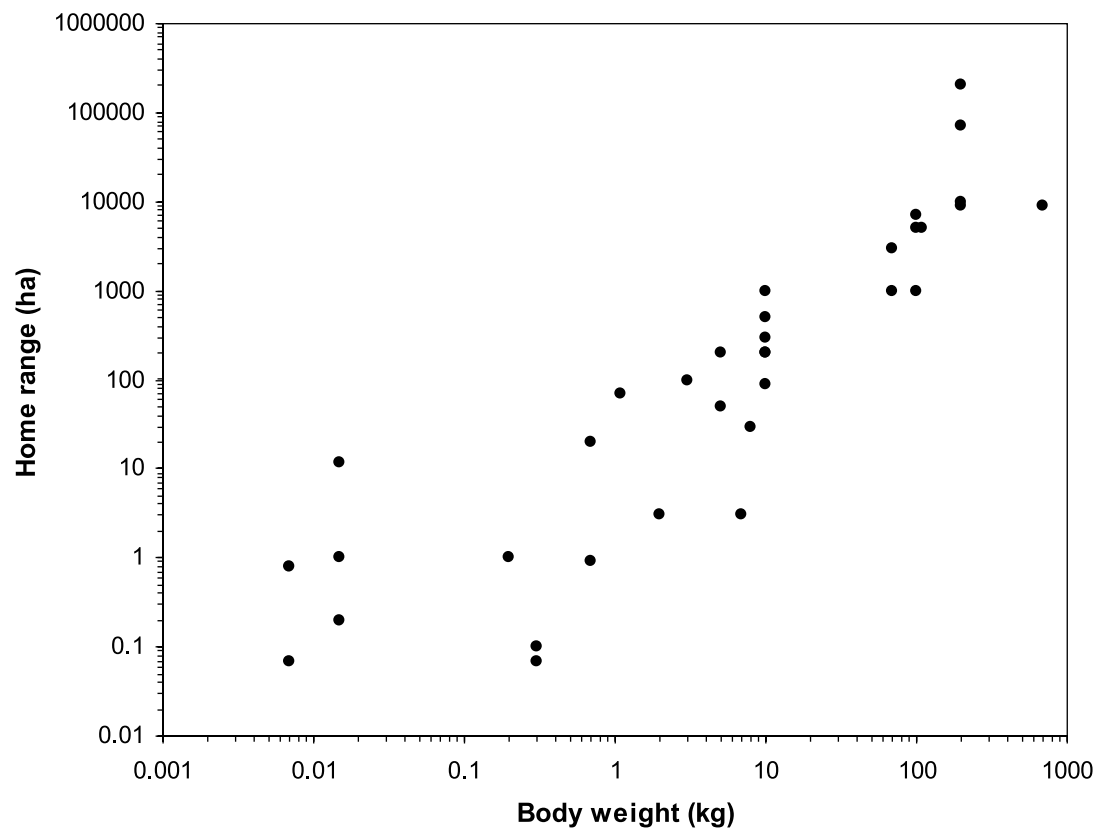
Specific HCV areas for orang-utans within USM were originally defined by marking zones wherever more than four orang-utan nests per kilometre were recorded by aerial or ground transects. However, a workshop on 21 June 2007 concluded that the entire USM FMU was significant for orang-utans because areas supporting high numbers may vary with time and cannot be mapped objectively. Therefore a generic prescription of “reduced impact logging” and/or “rehabilitation where appropriate” was put forward (WWF-Malaysia, 2007b).

#### **4) What is the global and national status of these species?**

If you are able to identify the animal via the field guidebooks, refer to their international conservation status on websites such as the IUCN Red List of Threatened Species ([www.iucnredlist.org](http://www.iucnredlist.org)). Malaysia is also preparing its Red List of Threatened Species and this should be available in due time.

### 5) What is the long-term viability of the local populations of these species?

When you have carried out surveys of the key endangered species in your FMU you will have quantitative data that can be used to estimate their abundance in your FMU. As a rule, to prevent genetic inbreeding, at least 50 breeding animals are needed to make up a viable population. The space needed by 50 breeding mice is very different from that of 50 breeding tigers. As a guide, larger animals generally require much larger areas of forest over which to roam (see Figure 2 below). However, it is recognised that population boundaries will seldom co-incide with FMU boundaries (with the FMU containing more than one population of many species and only part of a population of some species).



**Figure 2.** Home range size of selected tropical forest animals plotted as a function of body weight (adapted from Marcot *et al.*, 2001).

### 6) What area of the FMU influences the maintenance/restoration of this animal?

A knowledge of the ecology of endangered species is needed to ascertain particular locations within an FMU which are critical for the survival of species. Using GIS, you can then overlay a logging plan on the wildlife base layer and see if there are areas of impending conflict, such as logging operations or roads that will be built too near to or may destroy important sites for wildlife (such as the planned creation of a log-landing area at a breeding site). Generally, the conservation of endangered species of mammals (such as orangutans) can be aided by conserving certain “keystone” species of tree (such as figs<sup>14</sup>).

Depending on the scale of the FMU, at least 10% of the total area is recommended for strict protection (Blockhus *et al.*, 1992; Bennett & Gumal, 2001). The following patch sizes refer to the minimum area of undisturbed primary forest to be retained as refugia, assuming it is within a larger area (at least one logging compartment) of managed/logged forest.

<sup>14</sup> As a generic conservation strategy, emphasis should be put on retaining figs (*Ficus* spp.) within the species mix for enrichment planting.

- Conserve herbaceous plants within plots of not less than 1 ha undisturbed forest, within the larger forest area.
- Conserve animals within plots of not less than 5 ha undisturbed forest, within the larger forest area.
- Conserve wallows within plots of not less than 2.5 ha undisturbed forest, within the larger forest area. The larger forest area may be defined by drawing a circle of radius about 1 km from the wallow, and then finding natural or man-made features close to that radius to define the boundaries of a wildlife protection zone (similar prescriptions can be made for salt-licks, see below).
- Conserve understorey trees within plots of not less than 2.5 ha undisturbed forest, within the larger forest area.
- Conserve canopy trees within plots of not less than 5 ha undisturbed forest, within the larger forest area<sup>15</sup>.

It would be pragmatic to consolidate tiny forest pockets into fewer but larger protected zones. Corridors of unlogged forest should be left between unlogged patches (e.g. Shamsudin *et al.* (2003) recommend that selected areas of riverine buffer should be extended to a width of 500m or 1000m, like beads along a chain). Where there is conservation forest at the edge of one forest concession/compartiment, it should ideally abut conservation forest in the neighbouring concession/compartiment. Where a stream or river flows from one forest compartment into another, the upstream and downstream zoning should be compatible; logging upstream reduces the effectiveness of a conservation zone downstream.

### 7) What population changes are acceptable, if logging is to proceed?

A precautionary approach should be taken towards determining the limit of acceptable change of endangered species. In the long term there should be no decline – however short term declines in local populations might be tolerable for some species. A decline in local density of more than 20% immediately following logging is generally considered to be a significant decline for mammal and bird species in tropical Asia (Meijaard *et al.*, 2006). An adaptive precautionary approach should be taken whilst logging so as to ensure that local extinctions do not occur.

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<sup>15</sup> There have been a number of studies looking at the minimum area necessary for genetic resource conservation of typical tree species. Ashton (1976), from species number-area curves for Sarawak, set a standard of 2000 ha containing 200 trees as the area necessary. For species with wide latitudinal and altitudinal ranges, one location is inadequate, and several sites should be obtained, which take into account ecological variation (Yamada 1997: 308). Minimum population size is not definite; however the figures of 50 trees in the short term and 500 in the long term have emerged (Palmborg 1987). Because of edge effects, a buffer zone should be established around a tree conservation area (Yamada 1997: 309). Examples of tree species conservation recommendations for Peninsular Malaysia are also available from FRIM.

**Box 1** identifies the key questions to be considered when developing a programme for the management of HCV1.

### **Box 1. Key Questions for Wildlife Monitoring in FMUs**

In general, the WHY, WHAT, WHERE and HOW questions need to be answered before one proceeds on wildlife monitoring. A strategic approach will determine what aspects of wildlife are important in the broader context of managing an FMU.

<b>WHY</b>	are you creating a monitoring program? What are your objectives? Are they scientific or management objectives? To identify rare, endangered, and protected wildlife in your FMU? How about endemics, keystone species, indicator species? Responsible management will consider all these aspects.
<b>WHAT</b>	are you going to measure? Mere presence or some quantitative or qualitative value? Or relative abundance, or putting more emphasis on rare species?
<b>WHERE</b>	are you going to put your sampling points? Randomly located or in areas where these animals are found? What about temporal sampling? Different sampling points in space and time yield different answers. This depends on the variables we want to monitor.
<b>HOW</b>	are you going to measure? Mere presence or some quantitative or qualitative value? Or relative abundance, or putting more emphasis on rare species?

*Contributed by:* Melvin Gumal and Jason Hon, Wildlife Conservation Society (WCS), Malaysia. For further information please contact WCS Malaysia.



#### Appendix 4. List of Important Bird Areas (IBAs) for Malaysia.

No.	Site	State	Habitat Type(s)
1.	Nakawan Range	Perlis	Lowland forest, hill forest, secondary forest
2.	Ulu Muda	Kedah	Lowland forest, hill forest, sub-montane forest, secondary forest
3.	Teluk Air Tawar-Kuala Muda Coast	Pulau Pinang	Mangrove forest, intertidal habitats, farmland
4.	Bintang Range	Perak	Lowland forest, hill forest, sub-montane forest, montane forest
5.	Matang Coast	Perak	Mangrove forest, intertidal habitat
6.	Pondok Tanjung Forest Reserve	Perak	Peat swamp forest, freshwater swamp forest, lowland forest, hill forest
7.	Belum-Temengor	Perak	Lowland forest, hill forest, sub-montane forest
8.	Kledang Range	Perak	Lowland forest, hill forest, sub-montane forest, montane forest
9.	Central Titiwangsa Range	Perak/ Pahang	Lowland forest, hill forest, sub-montane forest, montane forest
10.	Selangor Heritage Park	Selangor	Lowland forest, hill forest, sub-montane forest
11.	North-Central Selangor Coast	Selangor	Mangrove forest, intertidal habitat, secondary forest
12.	Tanjung Tuan	Melaka	Mangrove forest, intertidal habitat, hill forest, beach forest, secondary forest
13.	Endau-Rompin	Johor, Pahang	Lowland forest, hill forest, sub-montane forest, tropical heath forest
14.	Panti Forest	Johor	Lowland forest, hill forest
15.	South-West Johor Coast	Johor	Mangrove forest, intertidal habitat
16.	Krau Wildlife Reserve	Pahang	Freshwater swamp forest, lowland forest, hill forest, sub-montane forest, montane forest
17.	Taman Negara National Park	Pahang, Terengganu, Kelantan	Lowland forest, hill forest, sub-montane, montane forest
18.	South-east Pahang peat swamp forest	Pahang	Peat swamp forest, freshwater swamp forest, lowland forest
19.	Pulau Layang-Layang	Putrajaya Federal Territory	Offshore island, coral reefs, open sea, grassland
20.	Crocker Range	Sabah	Hill forest, sub-montane forest, montane forest
21.	Mount Kinabalu	Sabah	Hill forest, sub-montane forest, montane forest
22.	Trus Madi Range	Sabah	Hill forest, sub-montane forest, montane forest
23.	Kinabatangan Floodplain	Sabah	Mangrove forest, intertidal habitat, peat swamp forest, freshwater swamp forest, floodplain lakes, lowland forest, karst/caves
24.	Danum Valley Conservation Area	Sabah	Lowland forest, hill forest, sub-montane forest
25.	Maliau Basin Conservation Area	Sabah	Lowland forest, hill forest, sub-montane forest, montane forest, tropical heath forest
26.	Tawau Hills Park	Sabah	Lowland forest, hill forest, sub-montane forest
27.	Tabin Wildlife Reserve	Sabah	Lowland forest, hill forest
28.	Klias Peninsula	Sabah	Mangrove forest, intertidal habitat, peat swamp forest, freshwater swamp forest, lowland forest, tropical heath forest

29.	Kabili-Sepilok	Sabah	Mangrove forest, lowland forest, hill forest, tropical heath forest
30.	Kulamba Wildlife Reserve	Sabah	Freshwater swamp forest, lowland forest
31.	Sipadan Islands	Sabah	Offshore islands, coral reefs, beach forest
32.	Mantanani Islands	Sabah	Offshore islands, open sea, beach forest, karst/caves
33.	Tempasuk Plain	Sabah	Mangrove forest, freshwater swamp forest, lowland forest, open sea, secondary forest, farmland
34.	Tanjung Datu-Samunsam Protected Area	Sarawak	Coral reefs, seagrass beds, mangrove forest, peat swamp forest, lowland forest, hill forest, sub-montane forest, open sea, beach forest, tropical heath forest
35.	Gunung Pueh	Sarawak	Hill forest, sub-montane forest, montane forest
36.	Talang-Satang National Park	Sarawak	Offshore islands, coral reefs, seagrass beds, hill forest, open sea, beach forest
37.	Bako-Buntal Bay	Sarawak	Offshore islands, mangrove forest, intertidal habitats, peat swamp forest, lowland forest, hill forest, sub-montane forest, beach forest, tropical heath forest
38.	Bau Limestone	Sarawak	Karst/caves
39.	Bungo Range	Sarawak	Hill forest, sub-montane forest, karst/caves
40.	Gunung Penrissen	Sarawak	Hill forest, sub-montane forest
41.	Sadong-Saribas Coast	Sarawak	Mangrove forest, intertidal habitats, peat swamp forest, beach forest
42.	Pulau Bruit	Sarawak	Mangrove forest, intertidal habitats, peat swamp forest, open sea, farmland
43.	Lanjak-Entimau Wildlife Sanctuary	Sarawak	Lowland forest, hill forest, sub-montane forest, tropical heath forest
44.	Hose-Laga Mountains	Sarawak	Lowland forest, hill forest, sub-montane forest, montane forest, tropical heath forest
45.	Baleh Headwaters	Sarawak	Hill forest, sub-montane forest
46.	Danum-Linau	Sarawak	Hill forest, sub-montane forest, tropical heath forest, grassland
47.	Usun Apau Plateau	Sarawak	Hill forest, sub-montane forest, montane forest
48.	Dulit Range	Sarawak	Hill forest sub-montane forest, montane forest
49.	Similajau National Park	Sarawak	Coral reefs, mangrove forest, freshwater swamp forest, lowland forest, open sea, beach forest, tropical heath forest
50.	Niah National Park	Sarawak	Freshwater swamp forest, lowland forest, karst/caves
51.	Lambir Hills National Park	Sarawak	Hill forest, tropical heath forest
52.	Loagan Bunut National Park	Sarawak	Peat swamp forest, floodplain lakes, hill forest
53.	Mulu-Buda Protected Area	Sarawak	Freshwater swamp forest, lowland forest, hill forest, sub-montane forest, montane forest, karst/caves, tropical heath forest
54.	Kelabit Highlands	Sarawak	Hill forest, sub-montane forest, montane forest
55.	Brunei Bay	Sarawak	Mangrove forest, intertidal habitats

Source: 'A Handbook of Important Bird Areas in Malaysia' (2005). For further details, information and maps please refer to this Handbook, available from the Malaysian Nature Society (MNS).

**Appendix 5. Habitat preferences of Malaysian mammals by related groups**  
(adapted from Stevens, 1968).

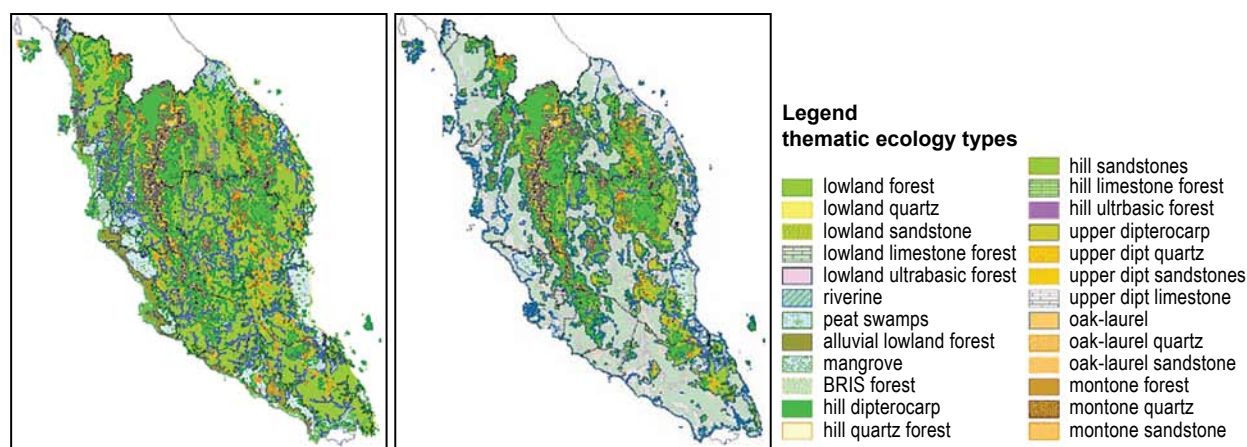
		LIVING HABITS				USUAL HABITAT				ELEVATION				ABUNDANCE		
		T	G	T/G	W	P	P/B	C	P/B/C	L	L/I	H	L/I/H	A	C	R
INSECTIVORA DERMOPTERA PHOLIDOTA	No.	1	6	1	1	4	2	2	1	3	2	3	1	2	4	3
	%	11	67	11	11	45	22	22	11	33	22	33	12	22	45	33
PRIMATES	No.	9	0	4	0	5	4	0	4	2	7	2	2	7	3	3
	%	69	0	31	0	38	31	0	31	15	55	15	15	54	23	23
RODENTIA (Squirrels)	No.	22	3	0	0	18	3	0	4	12	10	3	0	7	11	7
	%	88	12	0	0	72	12	0	16	48	40	12	0	28	44	28
RODENTIA (Rats & mice)	No.	5	21	0	0	11	6	9	0	14	4	4	4	10	7	9
	%	19	81	0	0	42	23	25	0	55	15	15	15	38	27	35
RODENTIA (Porcupines)	No.	0	3	0	0	2	0	0	1	2	1	0	0	1	1	1
	%	0	100	0	0	67	0	0	33	67	33	0	0	34	33	33
CARNIVORA	No.	5	15	4	4	10	1	2	21	6	0	1	3	3	8	17
	%	18	54	14	14	54	36	3	7	75	21	0	4	10	29	61
UNGULATES (incl. elephant)	No.	0	11	0	0	6	3	0	2	6	3	0	2	2	5	4
	%	0	100	0	0	54	27	0	19	54	27	0	19	19	45	36

**Legend:**

- T = Trees
- G = Ground
- T/G = Trees and Ground
- W = Water
- P/B = Primary and Belukar Forest
- C = Cultivated Land
- P/B/C = Primary and Secondary Forest and Cultivated Land
- L = Lowland
- I = Intermediate
- H = Highland
- L = Lowland
- I = Intermediate
- H = Highland
- L/I/H = all altitudes
- A = Abundant
- C = Common
- R = Rare

## Appendix 6. PERHILITAN Ecosystem Assessment for Peninsular Malaysia.

An ecosystem assessment of 27 model ecological types in Peninsular Malaysia has been made by PERHILITAN (DWNP, 2004)<sup>16</sup>. This assessment examined the extent of the original area of the types that remained in 1992 (Figure 1) and also assessed the risk to the types based on the number of protected areas containing each type (Table 1).



**Figure 1.** Extent of Original and Current (c. 1992) Thematic Ecology Types in Peninsular Malaysia (DWNP, 2004).

The Peninsular Malaysia Protected Areas Master Plan (Anon., 1999) sets a threshold of 10% of each ecosystem to be protected. It is therefore possible to use this threshold in combination with the PERHILITAN assessment in order to formulate an enhanced interpretation for HCV 3 in Peninsular Malaysia:

“*Threatened ecosystems*” should be considered to be all forest types having less than 10% of its original area in a designated protected area AND not rated as being at “low risk of external threat” (i.e. not rated or rated at “high risk of external threat” due to having less than four replicants in totally protected areas):

**Table 1.** Extent of Protection for each Ecological Type in Peninsular Malaysia.

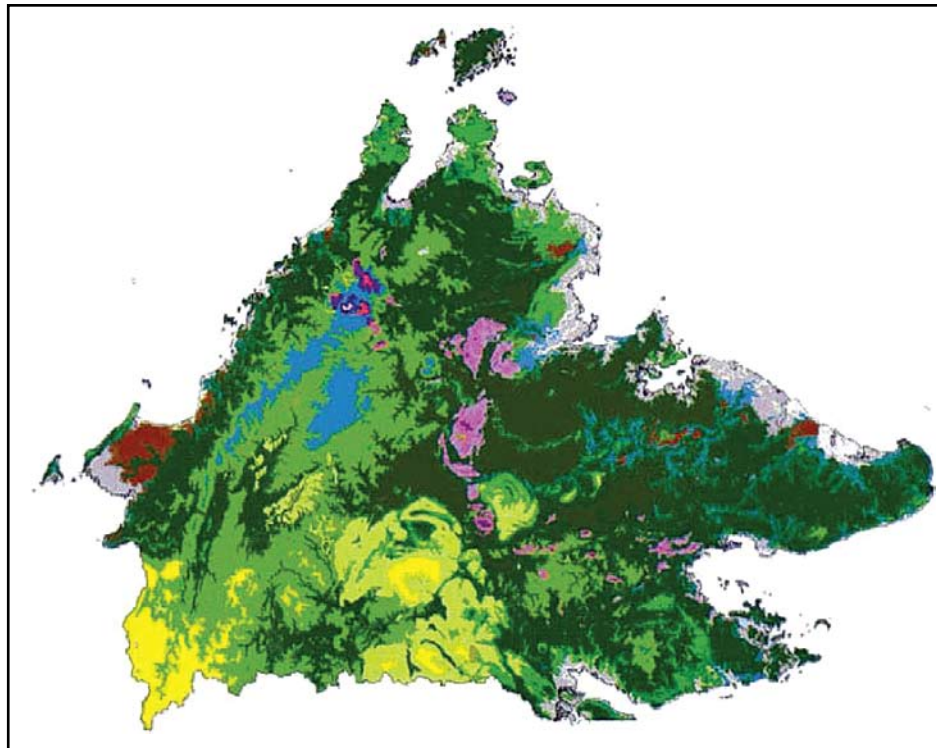
Ecological	%PA	Risk	Status
Marine alluvial	0%	n/a	HCV3
Lowland dry ultrabasic	0%	n/a	HCV3
Hill dipterocarp ultrabasic	0%	n/a	HCV3
Montane quartz	0%	High	HCV3
Montane sandstone	0%	High	HCV3
BRIS forest	0%	High	HCV3
Peat swamp	0%	Low	
Mangrove	1%	High	HCV3
Riverine	1%	Low	
Lowland dry limestone	2%	Low	
Burmese lowland forest	2%	High	HCV3
Coastal forest	2%	Low	
Hill dipterocarp quartz	3%	High	HCV3
Lowland dry sandstone	5%	Low	
Lowland dry neutral	5%	Low	
Lowland dry quartz	7%	High	HCV3
Oak-laurel neutral	9%	Low	
Montane neutral	10%	Low	
Oak-laurel sandstone	11%	Low	
Hill dipterocarp sandstone	13%	Low	
Upper dipterocarp neutral	15%	Low	
Hill dipterocarp neutral	19%	Low	
Upper dipterocarp sandstone	28%	Low	
Upper dipterocarp quartz	38%	High	HCV3
Hill dipterocarp limestone	49%	High	HCV3
Oak-laurel quartz	95%	High	HCV3
Upper dipterocarp limestone	99.8%	High	HCV3

Note: ‘%PA’ – the percentage of the original area of each ecological type that was in a protected area in 2004 (type is endangered if %PA < 10%); ‘Risk’ – the risk of external threat to each ecological type covered by a protected area in terms of the number of protected areas existing that contain each ecological type (‘Low’ if n > 4); the column on ‘Status’ has been added.

Source: DWNP (2004).

<sup>16</sup> Similar assessments for ecosystems in Sabah and Sarawak could be made in future. Starting points include an unpublished ecological map produced by the Sarawak Biodiversity Centre; as well as the “Map of Sabah: Natural Forest Formation” (1:1,300,000) developed by the Forest Research Centre of the Sabah Forestry Department.

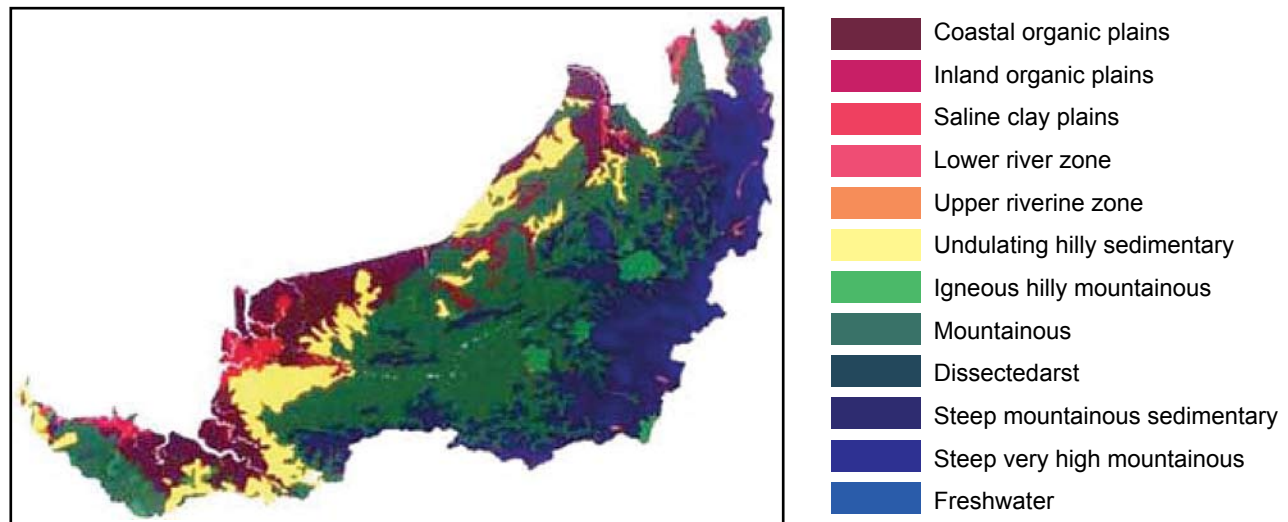
## Appendix 7. Forest type classifications and assessments in Sabah.



**Figure 1.** “Map of Sabah: Natural Forest Formation” (original scale was 1:1,300,000) (Anon., 2005: 27)

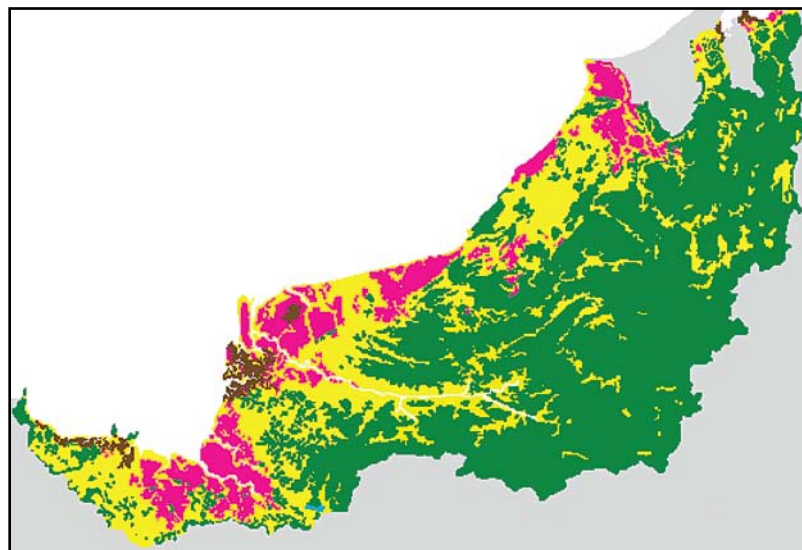


## Appendix 8. Forest type classifications and assessments in Sarawak.



**Figure 1.** Ecological zones in Sarawak  
*Source: FAO (Anon., 2004)*

*Note:* Ecological zones correspond to natural vegetation: organic plains (coastal organic plains, inland organic plains) – peat swamp forest, marsh; saline clay plains – mangroves and mud-flats; riverine zones (lower riverine zone, upper riverine zone) – riverine forest; steep very high mountainous – alpine forest; other zones (undulating hilly sedimentary, igneous hilly mountainous, mountainous, dissected karst, steep mountainous sedimentary) – various classes of dry inland forest.



**Figure 2.** Distribution of major forest types in Sarawak: Mangrove forest – purple; peat swamp forest – pink; mixed dipterocarp forest – green; secondary forest – yellow; land outside Sarawak – grey.

## Appendix 9. Guide to identifying forest areas fundamental to meeting basic needs of local communities (HCV 5) and/or critical to local communities' traditional cultural identity (HCV 6)<sup>17</sup>.

The following four steps can be used as part of a facilitated participatory approach to identifying HCV 5 and HCV 6 for a particular community. Facilitators should preferably have experience in Participatory Rural Appraisal (PRA), speak the local language and be accepted by the local communities.

### STEP 1: Identify sub-groups in each village based on their livelihood pattern

Villages may comprise several sub-groups with different ethnic origins, livelihood patterns, age and gender. Before starting to identify the importance of forest values, facilitators need to divide each village into sub-groups along the lines of **Table 1**. This information can be obtained by conducting a rapid appraisal to identify these key informants in order to avoid relying on a group whose views may be biased.

**Table 1** – Identification of sub-groups within one village community<sup>18</sup>

No.	Ethnic group/origin	Main sources of livelihood	Other key characteristics (e.g. history, location of dwelling, etc.)	Approximate No. of Households	% of village population

Any group which belongs to indigenous groups and/or represents at least 15% of the village population should be considered as a significant sub-group and should be interviewed separately – either through individual interviews or through group interviews in which care is taken to make sure that only one sub-group is represented.

Regarding gender, it is important to obtain the participation of women, since they usually have a different share in the resource use. Women may be more involved in the gathering of particular forest products, such as medicinal plants, and may then have a different perspective on how fundamental they are. In Malaysia, mixed gender group discussions tend to be dominated by men. In order to get an appropriate representation of women's point of view, separate group discussions with women only can be organised. In such cases, the facilitator should be female.

### STEP 2: Identify how each sub-group meets its basic needs

For each sub-group, **Table 2** is proposed as a guide for individual or group interviews. The purpose of this table is to identify how each of the basic needs of the sub-group is met by different types of sources, including forest and alternative sources such as agriculture, the sea, the market, or aid by the government, forest company development programs or other third parties, such as NGOs.

This table can be used in individual interviews. However, conducting such interviews can take a long time. It is more efficient in terms of time to use the table with small groups of villagers gathered for a group consultation. The ideal size would be between 5 to 15 people. About one hour should be enough to fill the table with a small group of participants (5 to 15).

<sup>17</sup> Adapted from 'Identifying, Managing and Monitoring High Conservation Value Forests in Indonesia: A Toolkit for Forest Managers and other Stakeholders (2003). Available from [www.hcvnetwork.org](http://www.hcvnetwork.org)

<sup>18</sup> These tables are generic guides: local groups or researchers should modify the approach where appropriate.

**Table 2 – Fulfillment of Basic Needs**

<b>Village:</b>	<b>Sub-Group (based on table 1):</b>						
Needs	Sources						Explanation
	FOREST		Agriculture (non-forest land)	Purchased	Aid	Other (e.g.sea)	
	FMU	Other					
<b>Food:</b> Carbohydrates (rice, sago...)							
animal protein (meat, fish)							
fruits, vegetables							
<b>Materials:</b> housing boats furniture, household equipt, handicraft, tools...							
<b>Fuel:</b>							
<b>Medicines:</b>							
<b>Water:</b> for drinking and daily needs							
<b>Cash income:</b>							
<b>Cultural/spiritual/ religious needs:</b>							
<b>Others:</b>							

**Table 2** can be reproduced on a large piece of paper and put up on display where the consultation is taking place. The facilitator then explains the purpose of the consultation and proceeds to ask villagers where they derive each of the main resources in the table below, and the respective importance of each source. For example, the facilitator will start asking the community what is their staple food, i.e. their main source of carbohydrate such as rice. Then they will ask them where they obtain it. Villagers will usually list the most important source first, and then other sources. For each source (for example: shifting cultivation), the facilitator then asks the villagers whether they derive all their rice from this source (ranking: 4); most of their needs from it (ranking : 3), a significant part of their needs (2), only a tiny, marginal part of their needs (ranking : 1), or none at all (0). In each cell, the facilitator then indicates its ranking from 0 to 4 as explained below, and list the corresponding resources, e.g. “river fish”, “well”, “rice”, “rattan”, etc. The determination of the importance of each source for each need is done using the following levels:

- 4 - **Essential** = 100% of a given need is fulfilled by one source (for example, if all the water used by the community comes from the forest’s rivers, put “4 (all)” in the “forest” column in the “water” row).
- 3 - **Critical** = more than 50% of a given need is fulfilled by one source
- 2 - **Important** = between about 15% and 50%
- 1 - **Not important** = less than 15%
- 0 - **Non existent** = 0%



Not all the cells need to be filled, but at least all the ones with a value above 2 should be filled. Likewise, all cells in the column “forest” should be filled to make sure that the importance of the forest is carefully evaluated. Depending on the circumstances, the column “forest” can be split in two or not. If the group interviewed lives in the middle of the Forest Management Unit under evaluation, then everything they derive from the forest is likely to be from the FMU (unless they have migratory or hunting/ foraging patterns that go beyond the FMU’s borders). If the community is near the border of the FMU or often moves beyond its borders, then it may be necessary to clarify which percentage of their resources they draw from the FMU and which ones from another forest.

It is important to realise that it is not necessary to ask the communities for percentages. If they are ready to give such percentages, they can be used to classify the importance of each resource in the categories 0 to 4 above. However, it should be remembered that communities are not always used to keeping quantified records of their needs and resource uses, so percentage given during interviews can be very misleading. Rather than trying to obtain figures, which would require much more intensive data collecting, it is recommended to base the identification of fundamental resources on the qualitative perception of the people, which should be an adequate indicator.

The levels 0 to 4 above can be obtained during individual or group discussions. In ordinary speech, the following could be used by farmers to qualify the importance of a source to fulfill a particular need, for example the following questions can be asked: “Do you get all your fruits from the forests or are there other sources?” → if the answer is “all” then the level is 4 for the forest in the line “fruits”. If there are other sources, like for example a garden, then the question can be asked as such: “Do you get more fruits from the forest or from the garden?” → if the answer is “more from the forest”, then the level is 3. If the answer is “more from the garden” then the following question can be asked: “Do you get a significant portion of fruits from the forest or just very little, seldom, and not in an important way?” If the answer is “significant, rather important” then the answer is 2, if the answer is “marginal, occasional, or not important” then the answer is 1.

Some resources may become critical only at certain times of the year, or during crop failures, as replacement. For example, tubers collected in the forest may replace rice during shortages between two seasons. If the community qualifies a certain forest resource as marginal, always check that this applies all year long and all the time, for example by asking “are there certain times when this becomes more important?” If the answer is yes, then the importance of the resource should be moved to 2 (significant) and if there is no replacement during that period, then this resource meets the requirements for HCV 5.

### **STEP 3: Identify fundamental forest functions**

For any need for which the forest has been ranked between 2 and 4 as a source (important, critical or essential), the consultation needs to be pursued more in detail by filling the **Table 3** below, which will establish the readiness of alternatives and whether they are within the reach of the people.

Changes are important to consider. Communities' livelihood patterns evolve. If a given resource from the forest is being used less and often replaced by alternatives, this may disqualify a resource as fundamental. This is especially true when people are investing in alternative sources, for example if they are developing cash crop plantations that will make them less dependant on forest produce for cash needs. This criterion is especially important for 'ambiguous' cases where it is difficult to decide whether a resource is fundamental or not.

Questions in the table below will help to find out whether the resource is fundamental or not. It provides an indicator of whether the community has access to replacements to the forest resources or not. Each resource for which there is no access to satisfying replacement qualifies as HCV 5.

**Table 3 – Identifying fundamental forest resources**

<b>Village: XXX.....</b>	<b>Sub-Group: (based on Table 1) ...</b>
<b>Resource (based on Table 2)</b>	<b>Ranking of importance of the forest in meeting this need (2 to 4), based on Table 2:</b>
(1.) If this need cannot be met from the corresponding forest resource, are there available alternatives?	List the alternatives here. If there are none, this resource is HCV 5. If there are alternatives, go to (2.)
(2.) Are these alternatives available <ul style="list-style-type: none"> <li>• all year long every year,</li> <li>• in sufficient quantities to replace the forest resources</li> <li>• and in an accessible location by available means of transportation</li> </ul>	If the answer is no to one of these questions: there may be HCV 5. If the answer is yes to all questions, go to (3.)
(3.) Can the alternatives be obtained for free or would there be a cost involved? (e.g. cash needed to buy and transport a replacement, labour and land needed to start new agricultural activities?)	If the replacement is available for free (for example, free medicine at village dispensary), this is not HCV 5. If there is a cost, go to (4.).
(4.) Is the cost of alternatives within the reach of all the people? (e.g. do they have enough cash to buy it, or do they have enough labour and land to start new agricultural production as replacement?)	If no, then there is HCV 5; if yes, then the need is not fundamental. If there is ambiguity, go to (5.)
(5.) Is there a trend of change in the dependency of the people over this resource? For example, are they less and less using the rivers for water, or is the collection of forest produce declining? If there is a trend of change, are the people investing in substitutes (e.g. developing cash crops, animal husbandry, etc.) Are they actively trying to protect the existing resources? Are all the members of the community concerned by these trends or just a minority?	In case of hesitation over the importance of a resource, obvious declining trends in the use of the forest, affecting the community as a whole may disqualify the forest from being considered as fundamental, especially if people are actively investing in new, alternative resources such as agriculture. If the community is actively protecting the forest resources, then it is HCV 5.

If the forest is fundamental in meeting at least one of the basic needs, this is sufficient to qualify the forest as HCVF under HCV 5.

**STEP 4: Identify areas of critical traditional cultural, ecological, economic or religious significance (HCV 6)**

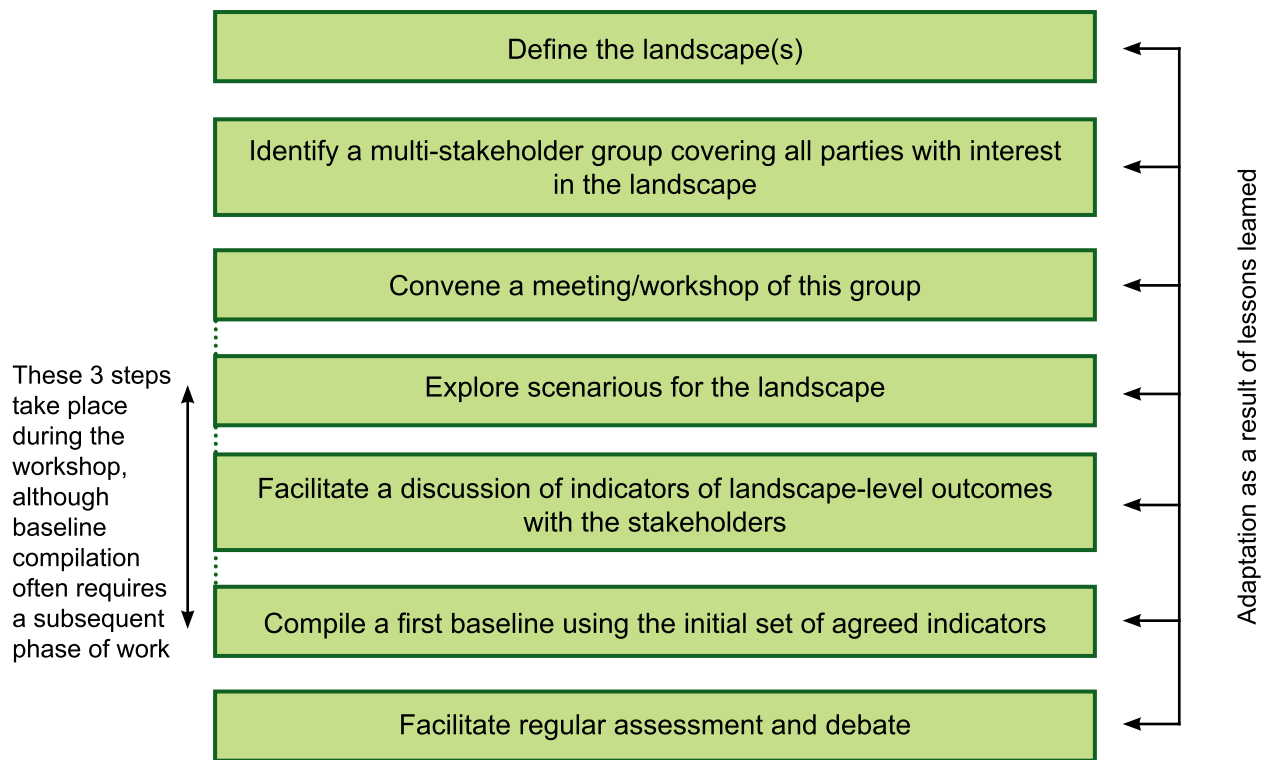
If a community has been using a forest area for more than two generations then the area is of potential traditional cultural value. The economic and cultural values identified in Table 2, above, therefore can therefore be linked with forest areas that are potentially HCV 6. A specific set of interview questions are needed to determine whether these economic (i.e. sources of income) and cultural (e.g. religious) values have formed a central role for the community over at least two generations. This information could be tabulated along the lines laid out in **Table 4**, below.

**Table 4 – Identifying areas of critical traditional cultural significance**

<b>Village: XXX.....</b>	<b>Sub-Group: (based on Table 1) ...</b>	
<b>Resource (based on Table 2)</b>	<b>Number of generations the resource has been used</b>	<b>Ranking of importance of the resource to the community over the last two generations (Rank 2/3/4)</b>
Economic resources: ...		
Cultural/religious resources: ...		

Resources that have been used for more than two generations and have consistently ranked as critical (3) or essential (4) over this time qualify as HCV 6.

## Appendix 10. How to implement the LOAM process.



**Note** that there are no arrows between the boxes; **the order given is one possibility but in practice many stages may take place simultaneously**, or at different times in different landscapes.

Source: Aldrich & Sayer (2007).

## Appendix 11. Relevant organisations to contact.

<b>Government agencies</b>	
<p><b>Department of Irrigation &amp; Drainage</b>                      Jalan Sultan Salahuddin                      50626 Kuala Lumpur                      Tel 03-2697-2828                      Fax 03-2698-7973                      Email pro@water.gov.my                      www.water.gov.my</p>	<p><b>Department of Orang Asli Affairs Malaysia</b>                      Level 10, 20 &amp; 20M, West Block                      Wisma Selangor Dredging                      142-C Jalan Ampang                      50450 Kuala Lumpur                      Tel 03-2161-0577                      Fax 03-2162-1470                      www.jheoa.gov.my</p>
<p><b>Department of Town &amp; Country Planning Peninsular Malaysia</b>                      Jalan Cenderasari                      50646 Kuala Lumpur                      Tel 03-2698-9211                      Fax 03-2698-9994                      www.townplan.gov.my</p>	<p><b>Department of Wildlife &amp; National Parks (PERHILITAN)</b>                      KM 10, Jalan Cheras                      56100 Kuala Lumpur                      Tel 03-9075-2872                      Fax 03-9075-2873                      www.wildlife.gov.my</p>
<p><b>Economic Planning Unit Prime Minister's Department</b>                      Block B5 &amp; B6                      Federal Government Administrative Centre                      62502 Putrajaya                      Tel 03-8888-33333                      Fax 03-8888-3755                      www.epu.jpm.my</p>	<p><b>Forest Department Peninsular Malaysia</b>                      Jalan Sultan Salahuddin                      50660 Kuala Lumpur                      Tel 03-2616-4488                      Fax 03-2692-5657                      www.forestry.gov.my</p>
<p><b>Johor National Parks Corporation (JNPC)</b>                      JKR 475, Jalan Bukit Timbalan                      80000 Johor Bahru, Johor                      Tel 07-223-7471 / 224-2525                      Fax 07-223-7472                      Email jnpc@johorparks.com                      www.johorparks.com.my</p>	<p><b>Malaysian Meteorological Department</b>                      Jalan Sultan                      Petaling Jaya, Selangor                      Tel 03-7967-8000                      Fax 03-7955-0964                      Email email@met.gov.my                      www.met.gov.my</p>
<p><b>Minerals &amp; Geoscience Department Malaysia</b>                      19th-22nd Floor, Bangunan Tabung Haji                      Jalan Tun Razak                      50658 Kuala Lumpur                      Tel 03-2161-1033                      Fax 03-2161-1036                      www.jmg.gov.my</p>	<p><b>Ministry of Natural Resources &amp; Environment</b>                      Wisma Sumber Asli                      25 Persiaran Perdana                      Precint 4, 62574 Putrajaya                      Tel 03-8886-1111                      Fax 03-8886-1512                      www.nre.gov.my</p>
<p><b>Perak State Parks Corporation (PSPC) / Perbadanan Taman Negeri Perak</b>                      Kompleks Pejabat Kerajaan Negeri                      Daerah Hulu Perak                      33000 Gerik, Perak                      Tel 05-791-4543                      Fax 05-791-2641</p>	

**Sabah****Bornean Biodiversity & Ecosystems  
Conservation Programme Phase II (BBEC II)  
c/o Natural Resources Office**

14th Floor, Menara Tun Mustapha  
88502 Kota Kinabalu  
WDT 235, 88902 Kota Kinabalu  
Tel 088-422-120  
Fax 088-422-129  
Email [bbec@sabah.gov.my](mailto:bbec@sabah.gov.my)  
[www.bbec.sabah.gov.my](http://www.bbec.sabah.gov.my)

**Department of Irrigation & Drainage**

Level 5, Wisma Pertanian Sabah  
Jalan Tasik Luyang  
Off Jalan Maktab Gaya  
Locked Bag 2052  
88767 Kota Kinabalu  
Tel 088-280-500  
Fax 088-242-770  
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**Forest Research Centre  
Sabah Forestry Department**

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[www.mzm.sabah.gov.my](http://www.mzm.sabah.gov.my)

**Sabah Agricultural Park**

WDT 28  
89909 Tenom  
Tel 087-737-952  
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Email [agripark@sabah.net.my](mailto:agripark@sabah.net.my)  
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**Sabah Cultural Board**

Wisma Budaya Building  
Tunku Abdul Rahman Road  
Locked Bag 132  
88740 Kota Kinabalu  
Tel 088-268-890  
Fax 088-264-235  
Email [borneosiff@gmail.com](mailto:borneosiff@gmail.com)  
[www.sabah.gov.my/lks/](http://www.sabah.gov.my/lks/)

**Sabah Parks**

Lot 1-3, Block K, G Floor  
Sinsuran Complex  
P.O. Box 10626  
88806 Kota Kinabalu  
Tel 088-211-881/212-719  
Fax 088-221-001 / 088-211-585  
Email [sparkshq@tm.net.my](mailto:sparkshq@tm.net.my)  
[www.sabahparks.org.my](http://www.sabahparks.org.my)

**Sabah Wildlife Department**

5th Floor, B Block, Wisma MUIS  
88100 Kota Kinabalu  
Tel 088-215-353  
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[www.sabah.gov.my/jhl/](http://www.sabah.gov.my/jhl/)

**Sabah Forestry Department**

KM 10, Labuk Road  
Locked Bag 68  
90009 Sandakan  
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Fax 089-669-170  
Email [htan@sabah.gov.my](mailto:htan@sabah.gov.my)  
[www.forest.sabah.gov.my](http://www.forest.sabah.gov.my)

**Pejabat Hal-Ehwal Anak Negeri Sabah**

Level 2 Block C  
Wisma Tun Fuad Stephens  
Locked Bag No. 209  
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**Sarawak****Natural Resources & Environment Board**

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Petra Jaya, 93050 Kuching  
Tel 082-440-504  
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**Forest Department Sarawak**

Wisma Sumber Alam  
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Petra Jaya, 93660 Kuching  
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Fax 082-441-210  
Email [lth@sarawaknet.gov.my](mailto:lth@sarawaknet.gov.my)  
[www.forestry.sarawak.gov.my/forweb/homepage.htm](http://www.forestry.sarawak.gov.my/forweb/homepage.htm)

**Sarawak Biodiversity Centre**

KM 20, Jalan Borneo Heights  
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93990 Kuching  
Tel 082-610-610  
Fax 082-611-535  
Email [biosar@sbc.org.my](mailto:biosar@sbc.org.my)  
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**Sarawak Forestry Corporation (SFC)**

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[www.sarawakforestry.com](http://www.sarawakforestry.com)

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**Sarawak Native Customs Council**

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Fax 082-234-730  
Email [ambrosld@sarawaknet.gov.my](mailto:ambrosld@sarawaknet.gov.my)  
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**Sarawak Rivers Board**

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Email [muhamayk@sarawaknet.gov.my](mailto:muhamayk@sarawaknet.gov.my)  
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www.ukm.my

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**Appendix 12. List of participants in expert review 27-28 May 2008.**

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14.	Ms Patricia Regis	Independent consultant
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16.	Ms Sheema Abdul Aziz (Rapporteur)	WWF-Malaysia

**Appendix 13. List of participants in stakeholder consultations.**

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12.	Mrs Rosila Anthony	Sabah Forestry Department
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16.	Pn Rahimah Ahmad	Environment Protection Department
17.	Mr Jasper	Sabah Museum
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22.	Ms Jayashree Kanniah	WWF-Malaysia
23.	Mr Raymond Alfred	WWF-Malaysia
24.	Ms Rashidah Maqbool	WWF-Malaysia
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27.	Ms Sheema Abdul Aziz (Facilitator)	WWF-Malaysia

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Final Workshop, Kuala Lumpur, 29 June 2009

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4.	Mr Joanes Unggang	Grand Perfect
5.	Mr Dickson John Timban	Grand Perfect
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22.	Ms Jenny Chen	STA
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40.	Ms Lucy Chong	SFC

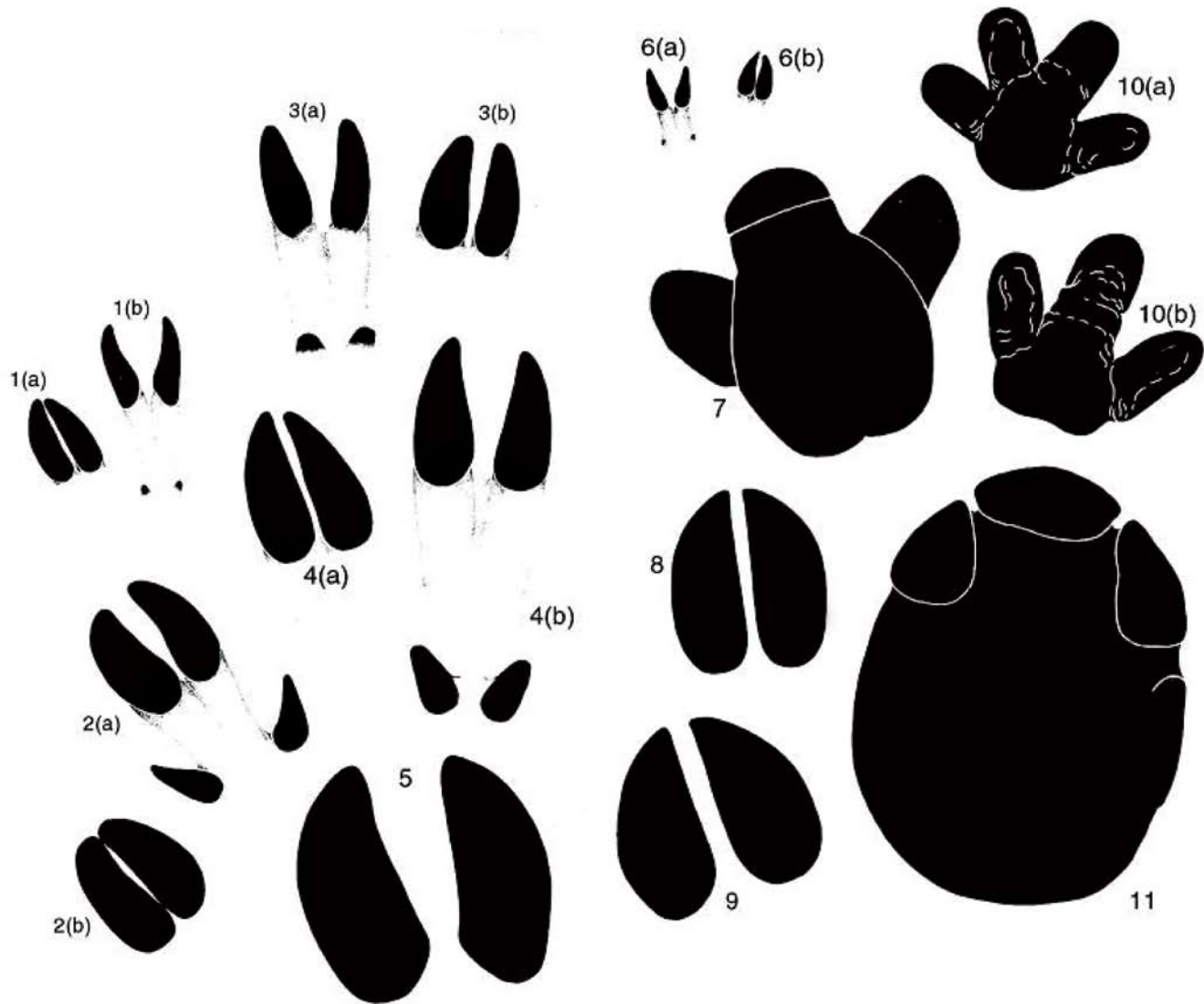
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**Appendix 14. Mammal Tracks of Thailand.**



**PICTORIAL REFERENCE TO TRACKS OF HOOFED ANIMALS** (Not to scale)

Rujukan Bergambar untuk Tapak Kaki Haiwan Berkuku (Tidak mengikut skala)



<b>No.</b>	<b>Name of animal (Nama haiwan)</b> <b>Inggeris / saintifik / Bahasa Malaysia (English / scientific / Malay)</b>
1(a) & (b)	Common barking deer / Muntiacus muntjak / Kijang
2 (a) & (b)	Common wild pig / Sus scrofa / Babi hutan
3 (a) & (b)	Serow / Capricornis sumatraensis / Kambing gurun
4 (a) & (b)	Sambar deer / Cervus unicolor / Rusa
5	Water buffalo / Bubalus bubalis / Kerbau
6 (a) & (b)	Lesser mouse deer / Tingulus javanicus / Kancil
7 (a) & (b)	Sumatran rhinoceros / Dicerorhinus sumatrensis / Badak sumbu
8	Banteng / Bos javanicus / Banteng
9	Gaur / Bos gaurus / Seladang
10 (a) & (b)	Tapir / Tapirus indicus / Tenuk atau Cipan
11 (a) & (b)	Elephant / Elephas maximus / Gajah



**PICTORIAL REFERENCE TO TRACKS OF PAWED ANIMALS** (Not to scale)

Rujukan Bergambar untuk Tapak Kaki Haiwan Berkuku (Tidak mengikut skala)

No.	Name of animal (Nama haiwan) Inggeris / saintifik / Bahasa Malaysia (English / scientific / Malay)
1 (a) & (b)	Yellow-throated marten / <i>Martes flavigula</i> / Pulasan
2 (a) & (b)	Malayan porcupine / <i>Hystrix brachyura</i> / Landak raya
3	Eurasian otter / <i>Lutra lutra</i> / Memerang
4	Smooth-coated otter / <i>Lutra perspicillata</i> / Memerang
5 (a) & (b)	Burmese ferret badger / <i>Melogale personata</i>
6 (a) & (b)	Hare / <i>Lepus</i> sp. / Arnab
7 (a) & (b)	Malayan pangolin / <i>Manis javanica</i> / Tenggiling
8	Small-clawed otter / <i>Aonyx cinerea</i> / Memerang
9	Long-tailed macaque / <i>Macaca fascicularis</i> / Kera
10 (a) & (b)	Large bamboo rat / <i>Rhizomys sumatrensis</i> / Dekan
11 (a) & (b)	Brush-tailed porcupine / <i>Atherurus macrourus</i> / Landak batu
12 (a) & (b)	Bay bamboo rat / <i>Cannomys badius</i> / Dekan
13	Rat / <i>Rattus</i> sp. / Tikus
14 (a) & (b)	Large Indian civet / <i>Viverra zibetha</i> / Musang Jebat
15	Masked palm civet / <i>Paguma larvata</i> / Musang
16	Hog badger / <i>Arctonyx collaris</i>
17	Javan mongoose / <i>Herpestes javanicus</i> / Tikus mondok
18	Moonrat / <i>Echinosorex gymnurus</i> / Tikus bulan
19	Otter civet / <i>Cynogale benetti</i> / Musang
20	Common palm civet / <i>Paradoxurus hermaphroditus</i> / Musang
21	Small Indian civet / <i>Viverricula indica</i> / Musang
22	Binturong / <i>Arctictis binturong</i> / Binturong
23	Asiatic wild dog / <i>Cuon alpinus</i> / Anjing hutan
24	Three-striped ground squirrel / <i>Lariscus insignis</i> / Tupai
25	Malayan weasel / <i>Mustela nudipes</i> / Jelu
26	Fishing cat / <i>Prionailurus viverrinus</i> / Kucing hutan
27	Tiger / <i>Panthera tigris</i> / Harimau
28	Asiatic black bear / <i>Ursus thibetanus</i> / Beruang

Source: Kanjanavanit (1997).











WWF-Malaysia, the national conservation trust, is committed to safeguarding our country's natural resources and unique wildlife for all Malaysians. Since 1972, WWF-Malaysia has worked on important conservation projects, from saving endangered species such as tigers and turtles, to protecting our highland forests, rivers and seas.

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- Promoting the reduction of pollution and wasteful exploitation consumption

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