FAUNA & FLORA INTERNATIONAL

High Conservation Value Area (HCVA) Assesment and Carbon Accounting

for :

Laman Satong Village Forest
Ketapang District-West Kalimantan

Fauna & Flora International - Indonesia Programme
(FFI-IP)
Komplek Laboratorium Universitas Nasional (UNAS),
Jl. Harsono RM No. 1, Ragunan, Jakarta 12550, Indonesia
Tel: 021-7800981, Fax: 021-7801024, Email: info@ffi.or.id

Jakarta, July 2012

Table of Contents

List of Tables

List of Figures

List of Appendices

List of Acronym and Abbreviations

BOD	: Biological Oxygen Demand
CITES	: Convention on International Trade in Endangered Species of Wild Fauna and Flora
COD	: Chemical Oxygen Demand
CR	: Critically Endangered
DD	: Data Deficient
DO	: Dissolved Oxygen
EN	: Endangered
FFI - IP	: Fauna & Flora International – Indonesia Programme
FSC	: Forest Stewardship Council
GIS	: Geographic Information System
HCV	: High Conservation Value
HCVA	: High Conservation Value Area
IUCN	: International Union for the Conservation of Nature
LC	: Least Concern
MoFor	: Ministry of Forestry
MU	: Management Unit
NE	: Not Evaluated
NT	: Near Threatened
VES	: Visual Encounter Survey
VU	: Vulnerable

1. INTRODUCTION

1.1. Background

Ministry of Forestry issued a regulation, P.49/Menhut-II/2008, onVillage Forest (*HutanDesa*) in 2008. The objective is to give access to local communities to manage forest area within their village boundary in sustainable ways through established Village Institution and management plan, in the hope will improve their livelihoods and wellbeing.

LamanSatong village is one of the villages in Ketapang District, West Kalimantan Province that have received *HutanDesa*designation from Minister of Forestry in 2011 (493/Menhut-II/2011) for 1,070 hectares area. An effective and efficient management is crucial to improve sustainability management in *HutanDesa*. The villagers and the forest management institution in particular, need a comprehensive understanding about forest functions and the method to assess and monitor the functions. High Conservation Value (HCV) assessment is one of the widely accepted methods that can be used to assess forest. HCV assessment is an important component to develop management plan for maintaining and improving the values of forest area. In addition, carbon stocks estimation is also important for the community to link their conservation efforts with carbon market.

HCV assessment and carbon accounting in *HutanDesa*LamanSatongconducted from December 1st-6th, 2011.Seven experts on GIS, ecology, botany, mammals, birds, and herpetofauna were involved in the assessment along with ten field assistants from LamanSatong village,which have had HCV, biodiversity and carbon assessments training.

This report presents the process, findings, management, and monitoring recommendations for HCV 1 -4 and carbon stocks assessment that were conducted by Fauna & Flora International – Indonesia Programme in *HutanDesa*LamanSatong.

1.1.1. HCV Concept

HCV concept was developed in 1999 by the Forest Stewardship Council (FSC) as principle 9 of the FSC standard for certified responsible forestry. The aims of HCV concept is to help forest/land managers improving the social and

environmental sustainability of production using two approaches, first, by identifying areas with exceptionally high social, cultural, environmental or biological value (the HCVs), and second, by developing a management and monitoring plan that ensure the HCVs will be maintained and enhanced (HCV Toolkit, 2008).

The HCV concept gained global notoriety over the past decade as a practical approach for balancing the conflicting goals of sustainable development – people, planet and profit – and is widely used in many natural resource sectors and sustainability standards. A Global HCV Toolkit was developed by ProForest in 2003 to guide the implementation of the HCV assessment process, from which a national interpretation for Indonesia was developed later in the same year, known as the HCV Toolkit for Indonesia Version 1. The Indonesian national interpretation was revised during 2007-2008 through a public, multi-stakeholder process, leading to the revised HCV Toolkit for Indonesia (2008), published in Bahasa Indonesia and English.

The revised HCV Toolkit for Indonesia (2008) was used for this assessment to identify HCVs and develop management recommendations. The list of HCV value is provided in Table 1. In addition, a published good practices document developed by ProForest (Stewart et al. 2008) was used as guidance for this assessment.

1.1.2. Objectives

The HCV assessment process aims to identify HCVs and develop management recommendation for *HutanDesa*management institution through a credible, open, and transparent process that combines technical expertise of qualified assessors and involvement from stakeholder. This can be achieved by:

- collecting and analyzing available primary and secondary data relevant to identifying each HCV in a pre-assessment prior to initiating field work;
- collecting primary data related to HCV identification; and
- reporting provisional HCV findings and management recommendations.

1.1.3. Outputs

The two main outputs from this HCV assessment are a written full assessment report, and a GIS-based spatial database to support HCV management and monitoring.

This report assessment including mapping and description of the landscape context of the assessment area, identification of HCVs within and nearby the area, maps that contain HCVs, or HCVA, carbon stocks estimation and recommendation of HCVs management and monitoring, including (where possible) delineation of the area over which management should be implemented.

The spatial database to support HCV management and long term monitoring includes a variety of GIS data layers, such as land use, land cover (vegetation), geology, soils, landform, ecosystem types, erosion risk maps, digital elevation model (DEM) and satellite and/or aerial photographic imagery, among others.

In this report, each HCV in the assessment area is determined to be either

- Present;
- Potentially present; and
- Not or Unlikely Present

In cases where further research is necessary to define an HCV as present, it may be labeled likely or potentially present. For HCVs determined to be present, potentially present, or likely present at *HutanDesa*LamanSatong, management action must be taken to ensure the value is maintained or enhanced along the *HutanDesa*management. Recommendations for such management are provided in Recommendation and Monitoring Chapters.

1.1.4. Assessment Team

The assessment team for biodiversity and HCV comprised sevenexpertsfrom Fauna & Flora International – Indonesia Programme (FFI – IP). Below is the list of person that involved in this assessment:

1. Andjar Rafiastanto (Team Leader, Forest ecology and management, Conservation planning, Zoologist).

2. Angga Rachmansah (Herpetologist)
3. Joseph Adiguna Hutabarat (Carbon Accounting Specialist)
4. Darkono Tjawikrama (GIS expert)
5. EdyNurdiyansyah (Botanist)
6. EntolMochammadAafAfnan (Mammalogist)
7. Hanjoyo (Botanist)
8. Jihad (Ornithologist)

1.2. HCV Assessment Methods

1.2.1. HCV Definition

HCV is the comprehensive tools to describe the specific value of particular forest area. As mentioned previously, the toolkit is based from the generic principals that consist of six values developed by FSC. Value numbers 1 to 3 are focused on the important biodiversity information. Value number 4 is focused on the ecological aspects and the importance of the ecosystem as ecosystem services. Value numbers 5 and 6 are related to the socio-culture aspects, both for livelihood and culture aspects. The HCV assessment described here refers to HCV definitions, criteria, and methods outlined in the revised HCV Toolkit for Indonesia (version 2008). The six HCVs comprising 13 sub-values are shown in Table 1.

1.2.2. HCV Assessment Process

The HCV assessment process comprised form several steps:

1. Compilation of secondary and available primary data, including preliminary stakeholder consultation;
2. Team formation and briefing on project scope;
3. HCV Pre-assessment based on available data;
4. Planning for fieldwork and agreement on field methods for primary data collection;
5. Fieldwork and primary data collection, including in-depth stakeholder consultation;
6. Data analysis and interpretation
7. Preparation of Report Draft including maps and management and monitoring recommendations; and

8. Adoption by the *HutanDesa* management institution of a formal HCV management and monitoring plan.

This document is a final report for HCV identification, carbon stock estimation, management and monitoring recommendations on*HutanDesa*LamanSatong. It is the major output of steps 4-7 in the HCV process outlined above.

1.2.3. Secondary Data Collection

Secondary data were collected and analyzed as the preparation for primary data collection on the field. Those secondary data including forest cover, ecosystem map, and species data.

a. Forest Cover

Landsat 5 and 7 imageries from 2009 were used to identify forest cover in village forest area and nearby area. The present status of this forest cover will be verified by field assessment team.

b. Ecosystem Mapping

For identification of HCV 3 (rare or endangered ecosystem), the revised and improved version Regional Physical Planning Programme for Transmigration (RePPProT) were used. RePPProTwere conducted by GoI during the 1980s and early 90s. The RePPProT program described and mapped 414 land systems throughout Indonesia at a scale of 1:250,000. These land systems are classifications of landform based on associations among lithology, climate, hydrology, topography, soils, geographic location and organisms. These same environmental factors affect the distribution of natural ecosystems, and with some modification (explained below) enable use of RePPProT maps as proxies for ecosystem typing across Indonesia.

c. Species Data

For assessment of HCVs 1 and 2, secondary data on species potentially present in the assessment area were extracted from Digital Appendices provided with the revised Toolkit. In addition, the secondary data were extracted from scientific journals and any biodiversity and carbon reports which the research were conducted nearby the assessment area.

Table 1. The High Conservation Values for Indonesia as defined in the revised HCV Toolkit for Indonesia (2008).

HCV 1 Areas with Important Levels of Biodiversity	1.1	Areas that Contain or Provide Biodiversity Support Function to Protection or Conservation Areas
	1.2	Critically Endangered Species
	1.3	Areas that Contain Habitat for Viable Populations of Endangered, Restricted Range or Protected Species
	1.4	Areas that Contain Habitat of Temporary Use by Species or Congregations of Species
HCV 2 Natural Landscapes & Dynamics	2.1	Large Natural Landscapes with Capacity to Maintain Natural Ecological Processes and Dynamics
	2.2	Areas that Contain Two or More Contiguous Ecosystems
	2.3	Areas that Contain Representative Populations of Most Naturally Occurring Species
HCV 3 Rare or Endangered Ecosystems	3	Rare or Endangered Ecosystems
HCV 4 Environmental Services	4.1	Areas or Ecosystems Important for the Provision of Water and Prevention of Floods for Downstream Communities
	4.2	Areas Important for the Prevention of Erosion and Sedimentation
	4.3	Areas that Function as Natural Barriers to the Spread of Forest or Ground Fire
HCV 5 Basic Needs	5	Natural Areas Critical for Meeting the Basic Needs of Local People
HCV 6 Cultural Identity	6	Areas Critical for Maintaining the Cultural Identity of Local Communities

1.2.4. Primary Data Collection

Vegetation and carbon stock

The vegetation parameters collected were number of trees in each DBH class, tree species, Diameter Breast Height (DBH), tree height, and geographic coordinates.Leaf, twig, fruit, and flower (where is available) were collected for herbarium specimen. Each herbarium specimens were also photographed for further identification. An exploration around each sample plots and along each line transects to identify the tree species was also conducted to gain comprehensivehabitat descriptions.

At every 2km line transect, five 20m x 125m plot were made on 0, 500, 1000, 1500, and 2000m with four nested subplots on each plot to measure the DBHs of different tree-classes(Table 2).Biomass calculations to estimate carbon stocks in the area within the plots followed allometric equations by Kenzo(2001) as below:

$$AGB = 0.1525*DBH^{2.34}$$

Table 2. Plot and sub-plot sizes and vegetation categories.

Plot Size	DBH	Categories	Class
10 m x 10 m	5 - 15 cm	Pole Trees	C
20 m x 20 m	15 - 30 cm	Small Trees	B
20 m x 125 m	> 30 cm	Large Trees	A

Mammals

The collection of mammals data were conducted using three complementary methods:

- Line transect

  Mammals observation was conducted in exploration way on 2 km transect. Observation was conducted in two times, day (05.-30 – 11.00) and night (18.00 – 22.00) times. This method was used to collect species data aroundtransects. The data parameters thatwere collected are species, abundance, activity, call, footprint, and nest. Observation was conducted for 3-4 days depending on the weather condition.

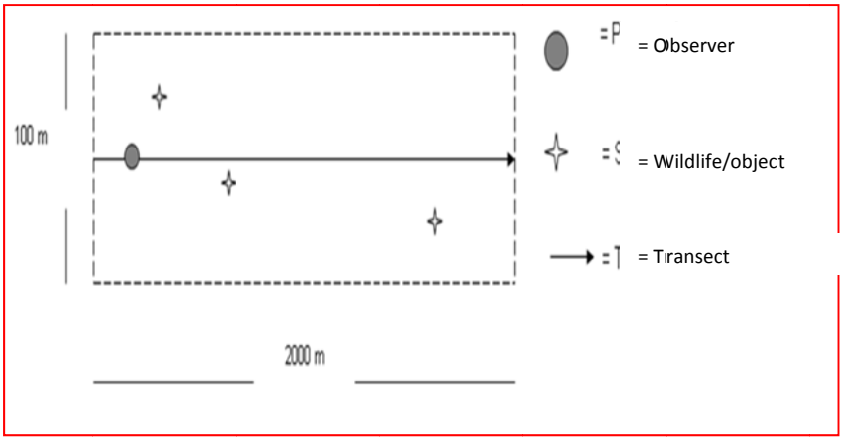

Figure 1.Line transect method design.

- *Recce Walk*

  Mammals observation was conducted in an exploration way on path outside the line transect, such as local community path to harvest firewood or logging path. The aim of this method is to collectmammal's data outside transects. The data parameters that were collected are similar with the line transect method.

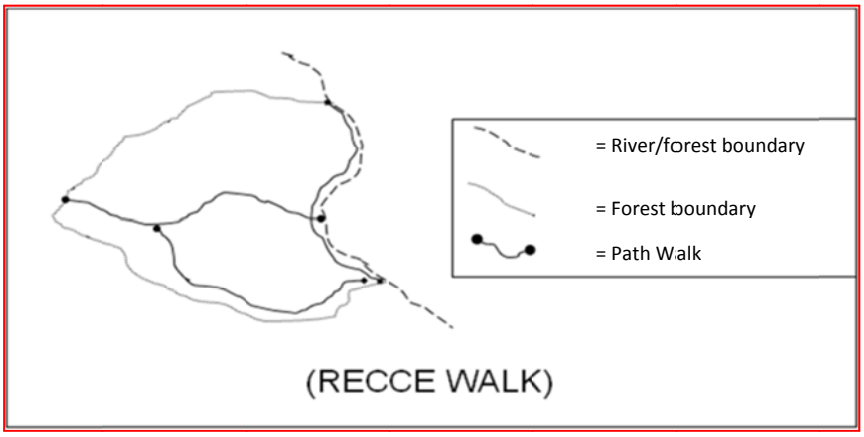

Figure 2.*Recce walk* method design

<u>Birds</u>

Data collection for bird'ssurveys was conducted using three complementary methods: transect and point count, Visual Encounter Survey (VES), and *road count*. Data collection using point count method was conducted on 1km line transect. There were 6 point-counts for each transect with distance between points was 200m. All bird species that was sighted including birdcall or song, that was heard within 30 minutes in each point count, were

recorded (Bibby et al., 2000).Data collection using point count method was conducted in two periods, morning (5.15 – 10.00) and afternoon (15.00 – 18.30). During daytime, data collection was conducted nearby transect using VES or road count methods.Recording method that was used during VES or road count was 20 MacKinnon species list (MacKinnon et al., 1999).

All bird species was identified in the field using'A Field Guide to the Birds of Borneo, Sumatra, Java and Bali' bookby MacKinnon et al. (1999). Bird's call or songs identification was carried out using 'Birds of Tropical Asia' software by Scharinga(2001). The nomenclature, scientific name, Indonesian name, and English name following Sukmantoro et al. (2007). Birds species conservation and protection status following IUCN Redlist of Threatened Species (2011), CITES (2011), and Government of Indonesia regulations (UU NO. 5 year 1990, PP No. 8 year 1990, and PP No.7 year 1999).

Herpetofauna

The methods used to obtain herpetofauna data were Visual Encounter Survey (VES) and transect. Visual Encounter Survey (VES) is a method in which observers walked through a designated area for a prescribed time-period to search the target animals systematically (Heyer et al., 1994). VES was carried out during day and nighttime in four settled transects. Each transect is 2km long and was assessed for two constitutive days when possible. In addition, the ecological data for each transects (forest type, temperature) and animals encountered (substrate, vertical height and distance from water, etc) were recorded.

In the field, frogs were identified using the book 'A Field Guide to The Frogs of Borneo' by Inger and Stuebing (2005),reptiles were identified using thebook 'A Field Guide to The Snakes of Borneo'by Stuebing and Inger(1999), 'A Pocket Guide Lizard of Borneo' (Das, 2004), and 'A Photographic Guide to Snakes & Other Reptiles of Borneo' (Das, 2006). Furthermore, to confirm the identity of the specimens, some specimens were re-identified by Prof. Djoko T. Iskandar, School of Life Sciences and Technology (SITH), Bandung Institute of Technology (ITB).

2. Site Description

2.1. Management Unit

2.1.1. Name and Contact Information

The *Hutan Desa* Manjau management institution:

Budi

Head of village forest management institution

LamanSatong Village, Ketapang District, West Kalimantan

2.1.2. History of the Management Unit

Ministry of Forestry issued a regulation,P.49/Menhut-II/2008, about *Hutan Desa* in 2008. The objective is to give access to local communities to manage forest area within their village boundary in sustainable ways through village institution and management plan, in the hope to improve their livelihoods and well-being.LamanSatong villagers were enthusiasticfor this opportunityand proposed for the *HutanDesa*permit on November 2010 to the Ministry of Forestry (MoFor).

There were two main steps passed in this process. The first step was forming the management institution that was successfully established by the community on July 5, 2011. The second step was verification and field visit by the MoFor staffs. The output of this process was a decree for land tenure designation for 1,070 ha forest as *HutanDesa*that is written on Minister of Forestry decree No. 493/Menhut-II/2011.Currently, the forest management institution is waiting for the approval from the Governor of West Kalimantan, for the working-plan proposal in managingthe *HutanDesa*.

2.1.3. Government Land Use Planning

As shown in Figure 3, all LamanSatong Village area is classified as Convertible Production Forest (HPK) based on West Kalimantan land use designation (TGHK, 2000). The Ministry of Forestry released 17,986.9 ha, including LamanSatong village, to be converted into oil palm concession under PT. KAL managementin October 2009.Geographically, the north side of LamanSatong

village is GunungPalung National Park (TN), the southeastside is Production Forest (HP), and the west side is other land use (APL).

2.2. Biophysical Environment

2.2.1. Administration and Transportation

Administratively, *Hutan Desa* Laman Satong is within Matan Hilir Utara sub-district (kecamatan), Ketapang District (kabupaten), and West Kalimantan Province. *HutanDesa*LamanSatong can be reached from the capital city of West Kalimantan, Pontianak,via air, land, and water transportations. Via air, transportation from Pontianak useda small plane and took approximately 30 minutes to reach Ketapang and another 2 hours to reach LamanSatongvillage by car. Via land, transportation from Pontianak used a car and took approximately 9 hours to reach LamanSatong Village. Via water, transportation from Pontianak used a speedboat and took around 7 hours to reach Ketapang. Further transportation to reach LamanSatong Village is similar with transportation that described via air transportation.

2.2.2. Land System, Ecosystem, and Soils

Land System and Ecosystem

LamanSatong Village Forest area is comprised from three land systems, Bukit Pandan (BPD), Honja (HJA), and Kahayan (KHY) (Figure 4). BPD is classified as non-sedimentary mountain ridge systems. HJA is classified as hillocky acid igneous/metamorphic plains. KHY is classified as Coalescent estuarine/riverine plains.Most of village forest area lies within Bukit Pandan land system (991.15 ha).

Natural vegetation in Bukit Pandan (BPD) and Honja (HJA) land systems is lowland dipterocarp forest and in Kahayan (KHY) land system is riparian forest. However, a small part of BPD and HJA land systems in east and south parts of village forest is potentially a peat land (Figure 5).

Soils

RePPProt described soil types based on dominant soil types present in each land system. Most of the village forest area lies within BPD and HJA land systems.

Dominant soil types in these land systems are hapludults and plinthudultsHapludults are the Udults that do not have a fragipan and that have less than 50 percent plinthite in all horizons within 150cm of the mineral soil surface. Plinthudults are the Udults that have plinthite that either forms a continuous phase in, or constitutes more than half the matrix of, one or more horizons within 150cm of the mineral soil surface.Dominant soil types in KHY land system is haplaquents, fluvaquents, and tropohemist.

Puslittan and Agroclimate (2000) soil types' classification system does not match with RePPProt soil type's arrangement. Based on Puslittan and Agroclimate soil types classification, LamanSatong Village Forest is comprised from three soil types. These soil types are haplohemists and sulfihemist with peat plain landform, haplohumults and haplodux with volcanic plain landform, and haplorthods and palehumults with tectonic landform (Figure 5).

2.2.3. Geology, Topography, and Elevation

Geology

*HutanDesa*LamanSatong is comprised from three geology formation, Kerabai Volcanic (*batuangunungapikerabai*), Sukadana Granite (*Granit Sukadana*), and RombakanLereng (Qs) (Figure 6). Kerabai Volcanic is composed from andesit, basalt, and dacit, tuda, agglomerate, and lava. Granite Sukadana is composed from light red biotite granite, alkaline feldspar granite, and monzogranite from upper limestone age. Rombakanlereng is composed from basic materials in steep slope which are sandstone and conglomerate from quarter age. Most of *HutanDesa*LamanSatong lies on Kerabai Volcanic (980.82 ha).

Topography and Elevation

Slope in *HutanDesa*LamanSatong is between 0.56-52.93%(Figure 8). Most of LamanSatong Village Forest area has slope between 0.56-10%, 10.01-20%, and 20.01-30%. The area of these slope are 268.11ha, 296.46ha, and 273.78harespectively. Only 54.27ha of LamanSatong Village Forest area has very steep slope (40-52.93%). Elevation in LamanSatong Village Forest is between 1 – 400mabove sea level (Figure 7).

2.2.4. Rainfall

LamanSatong Village Forest area falls within B1 agro – climatic zone of Oldemen et al. (1980). B1 zone shows a long-term average of at less seven, but less than nine‘wet’ months (greater than 200mm per month) per year.

WorldClim precipitation data indicates that the license area experiences a long term average of ten ‘wet’ months, 2 ‘medium’ months (between 100 and 200mm rainfall per month) and no dry months per year. This data has been checked and verified against RePPProT rainfall data for the three nearest rainfall stations to the license area (Sandai, Ketapang and Sukadana).

Estimated annual rainfall is between 3,000 and 3,500mm per year (WorldClim). Annual rainfall in the surrounding landscape ranges from 2,900 to 3,800mm, peaking on the vicinity of the mountains at nearby Sukadana.

2.2.5. Hydrology

West Kalimantan has five main river regions, Kapuas, Sambas, Mempawah, Pawan, and JelaiKendawangan based on PerMenPekerjaanUmum No.11A year 2006. There are several small streams within village forest area. Some of these streams are flow to Siduk River in the north of village forest, and others are flow to Kuala Satong River in the south of village forest. Siduk and Kuala Satongwatersheds are part of Pawan River Region(Figure 9).

2.2.6. Land Cover

There are four land cover types in LamanSatong Village forest. These land cover types are secondary dry forest, secondary swamp forest, agriculture mixed with shrubs, and bushes (Figure 10). Bushes are the dominant land cover type in LamanSatong Village Forest with area size 793.29ha. This condition was due to forest fire in 1990s. The second dominant land cover type in LamanSatongVilage forest is the secondary dry forest with area size 275.27ha. The area of secondary swamp forest and agriculture mixed with shrubs land cover types respectively are 0.64ha and 1.88ha.

2.2.7. Physiographical Context

LamanSatong Village lies within the boundary of Coastal Swamplands and Southern Plains and Mountains physiographic regions. These physiographic regions extend from north (Coastal swamplands start extends from Pontianak District and Southern Plains and Mountains start extends from southern part of Sanggau District) to south (most of Ketapang District). Coastal Swampland physiographic region has a relatively flat terrain, while Southern Plains and Mountains physiographic region has a gentle topography with occasional steep sided hills.LamanSatong Village Forest is located in Southern Plains and Mountains physiographic region.

2.2.8. Biogeography Context

Biogeography is the study of natural distribution patterns of plants and animals. In Indonesia, biogeography is an interesting topic as the country is made up of thousands of islands, which means that the spread of species is naturally limited by sea surrounding these islands. Islands that are geographically isolated and with unique geological histories tend to have unique flora and fauna, as the sea produces a barrier for species from other islands that can colonize islands over time. Islands closer together, and those with a shared geological history, will tend to share much of their flora and fauna.

LamanSatong Village is located in Kalimantan and is part of the Sunda shelf. Thus the species assemblages found on the island are similar to those throughout South East Asia (Malaysia), Sumatra, and Java. LamanSatong Village area falls within the Borneo biogeographical sub-region (bio-unit) 25b (MacKinnon & MacKinnon 1986). This large bio-unit covers the area of the southern Kapuas River and western Barito River. Hence, extends across half of West Kalimantan province and most of the Central Kalimantan Province.

Noteworthy, the sub-species of mammals found in 25b and found nowhere else in Borneo are (i) the Central Bornean Orangutan (*Pongopygmaeus ssp. wurmbil*), (ii) the Agile Gibbon (*Hylobatesagilisalbibarbis* that now considered as a separate species: *Hylobatesalbibarbis*), (iii) one sub-species of langur (*Presbytisrubicunda ssp. rubida*), and (iv) the two sub-species of Prevost's

squirrel (*Callosciurusprevostii ssp. sanggaus* and *waringensis*) (Payne et al. 1985; Swindler and Erwin 1986; Nijman et al. 2008).

2.2.9. Social Context

Ethnic in LamanSatong Village is predominantly Dayak with 80-100% of residents in each sub-village (*dusun*) of the Kalay ethnic group. Others ethnic in the village are Melayu, Javanese, and Bugis. Both Dayak and Melayu residents (despite adopting Christianity and Islam, respectively) still have practices that tie to animistic belief systems, for example, the practice of giving offerings (*sesajen*) to their ancestors and sprits that live in the forests and rivers. Such practices persist, despite emerging modernization and social changes brought about by trans-migrants (Java) and improved road infrastructure in the area. Most of these rituals are related to agricultural cycles (e.g., nyapataun, turunberais, pelepahsapi, baliktugal and selapitbereh). Such ritual practices are typical of communities whose livelihoods are closely tied to agricultural lands. Rituals to avoid bad luck and poor harvests are also commonplace.

Historically, the socio-cultural context of this village has been influenced by the changing socio-economic landscape of Ketapang and its various emerging industries, first logging (including PT MarselaWanaSekawan which operated locally throughout the 1990s), and more recently by the growth of the mining and oil palm industries. The development of roads and other infrastructure has enhanced community accessibility, and therefore socio-economic activity, as well as engagement in politics. A mixed culture of Melayu and DayakKalay is obvious in a couple of dusun (Manjau and Kepayang), displaying somewhat of an ambiguity between the two identities and cultures.

The Dayak Kalay people of LamanSatong have the clearest historical ties to the area, with their ancestors previously residing in an area near the LamanRandu cemetery, which is no longer inhabited, but preserved as a culturally important site. The ancestral group separated into three settlements, now dusun: Nek Doyan, Kepayang, and Manjau. Subsequently other ethnic groups began to intermix, including Melayu, Javanese and Bugis. In Kepayang this integration seems to be greatest. Their activities in the forest have been reduced due to the

presence of neighboring GunungPalung National Park and related enforcement measures and the growth of mining and plantations in lands surrounding their village.

The majority of communities earn their living by farming in wet rice paddy fields and dry agricultural fields (ladang). Some families also own rubber gardens, with a long history of rubber production in the area. Much more rare, are individuals making a living as merchants, state employees or laborers. However, at the present day many of villagers working as labor in oil palm concession (such as PT.KAL). Villagers claim not to engage in logging anymore out of fear of being caught, but illegal logging activities clearly still exist in the oil palm concession (PT. KAL) and nearby forests, including protected areas. The illegal logging is reportedly taking place by local people outside LamanSatong Village. It is likely that people were disinclined to report any involvement in this activity as a source of income.

Dayak communities still use swidden agriculture methods, rotating and burning new agricultural plots each year. Rice paddy farmers, on the other hand, use the same plots of land each year, tending to have fields of 0.5-1.5 hectares per family of either wet paddy field or ladang. Rice paddy fields are tended using hand labor (by hoe), without fertilizer, making output relatively low. Wet rice paddies reportedly produce from 60-80 ‘big’ cans (1 big can = 8 kilograms) of rice, which is not sold, but used to meet their own food needs. Families that own rubber gardens tend to have 2-3 hectares per family with a daily harvest of 5-10 kilograms. Rubber is sold for IDR 9000-11,000 per kilogram (refer to the price on June 2010).

With regard to education, most residents have completed elementary school, but very few have completed junior or senior high school. Everysub-village (*dusun*) has an elementary school. With regard to medical facilities, this village has a medical center staffed with one medical officer, and each *dusun* has traditional midwifes and healers. More extensive medical services are available in the city of Ketapang (approx. 2 hour by car) or and Sukadana (approx. 30 minutes by car).

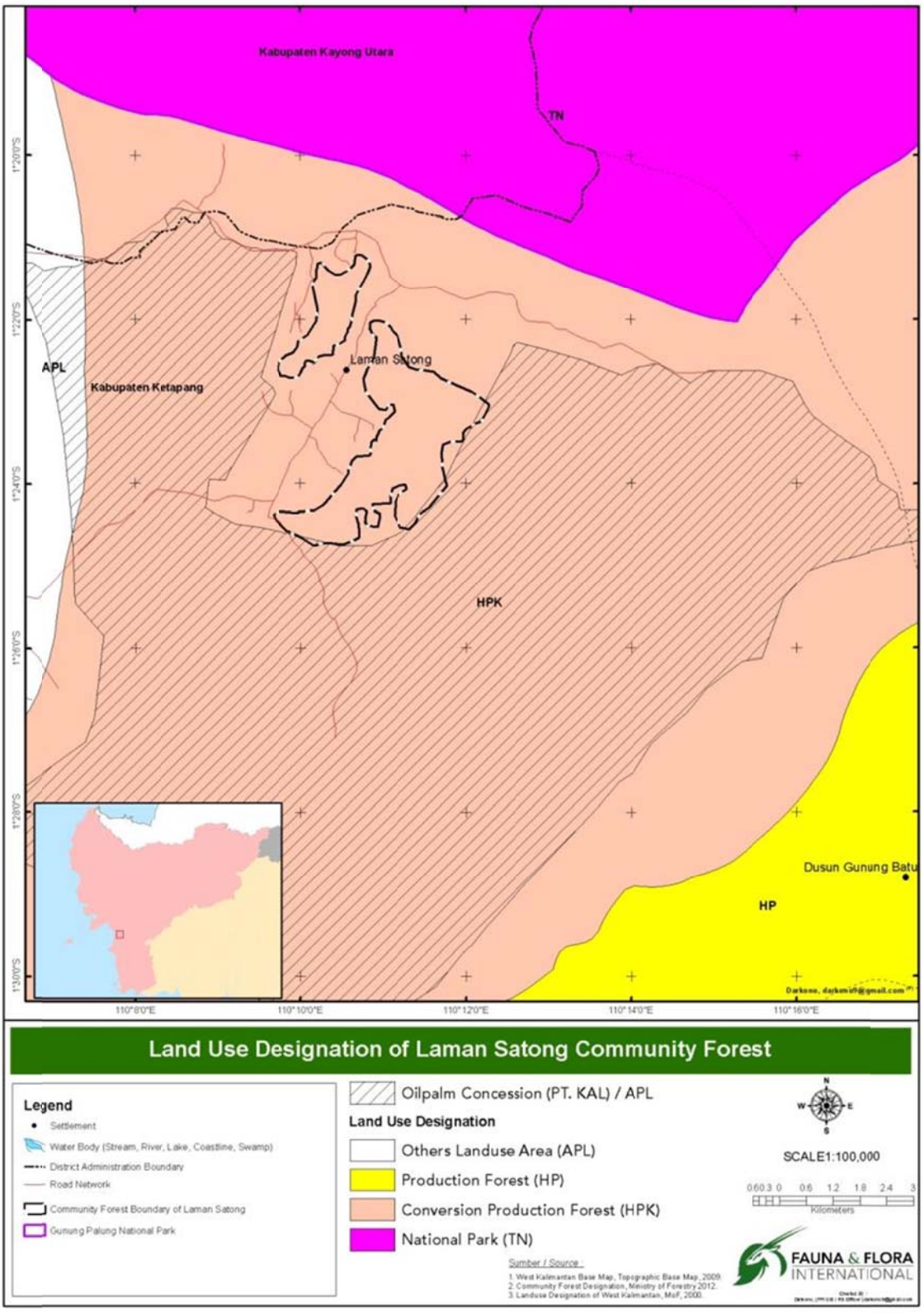

Figure 3. Government land use designation in LamanSatong Village.

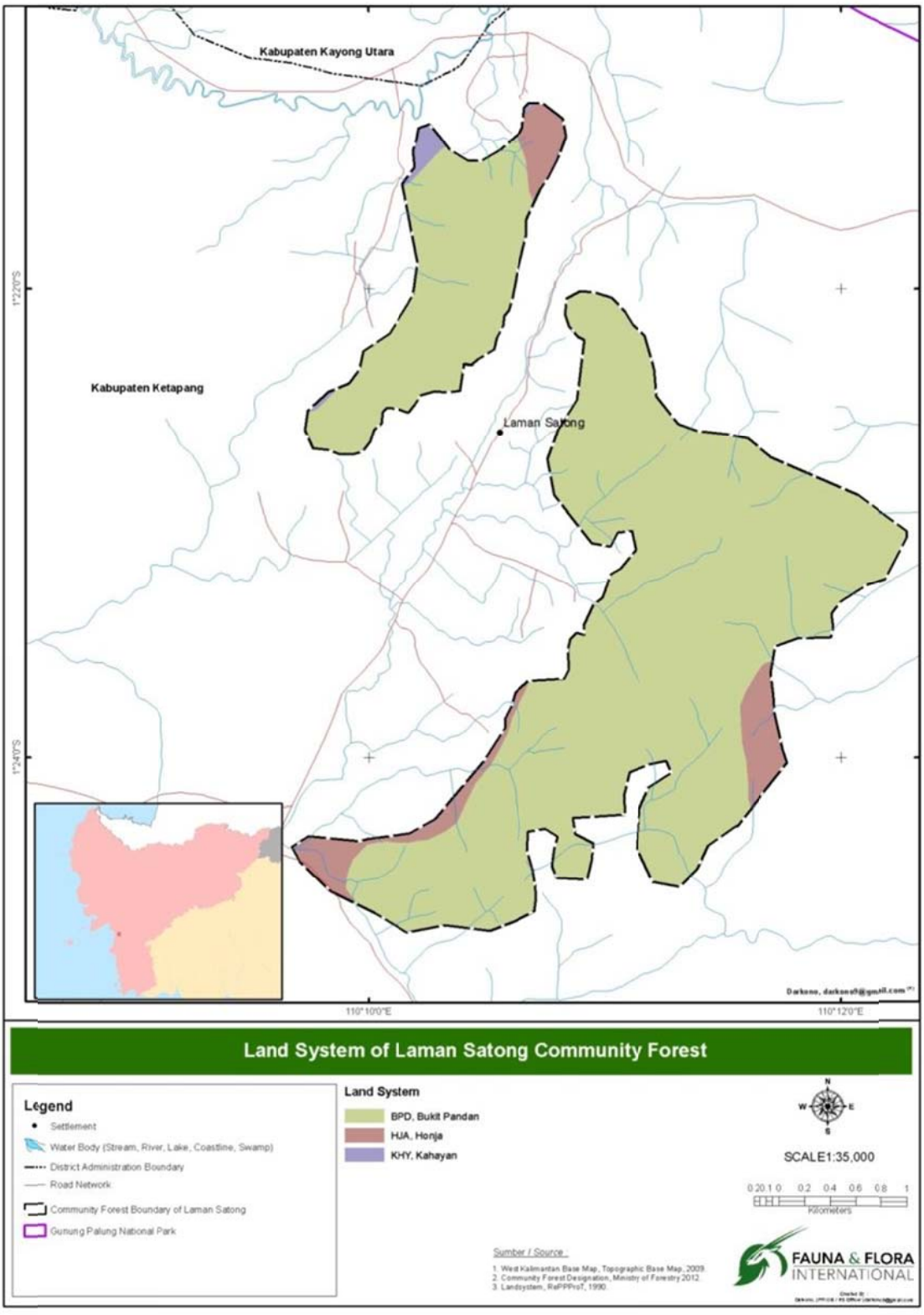

Figure 4. Land systems in*HutanDesa*LamanSatong.

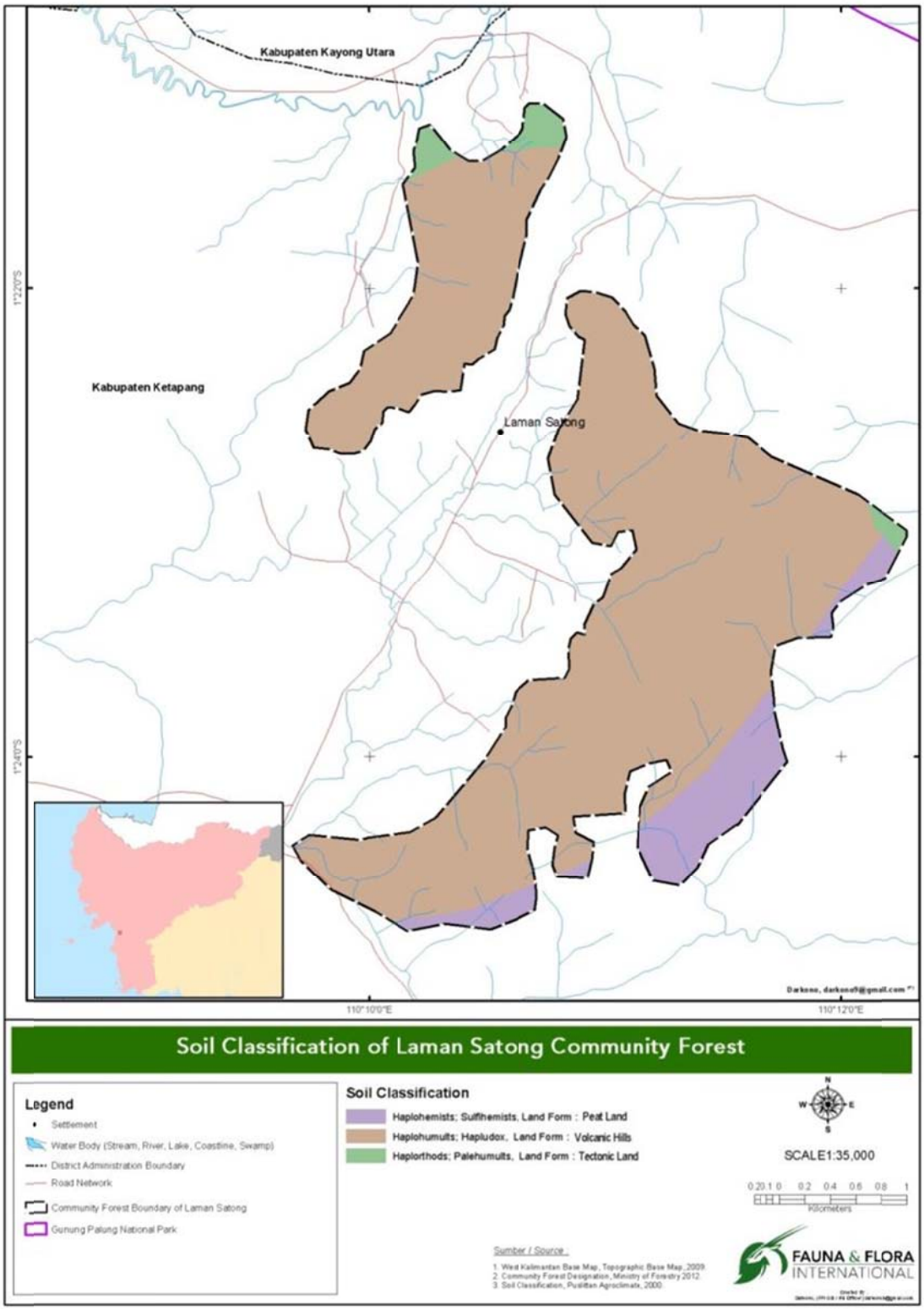

Figure 5.Soils types Classification in *HutanDesa*LamanSatong.

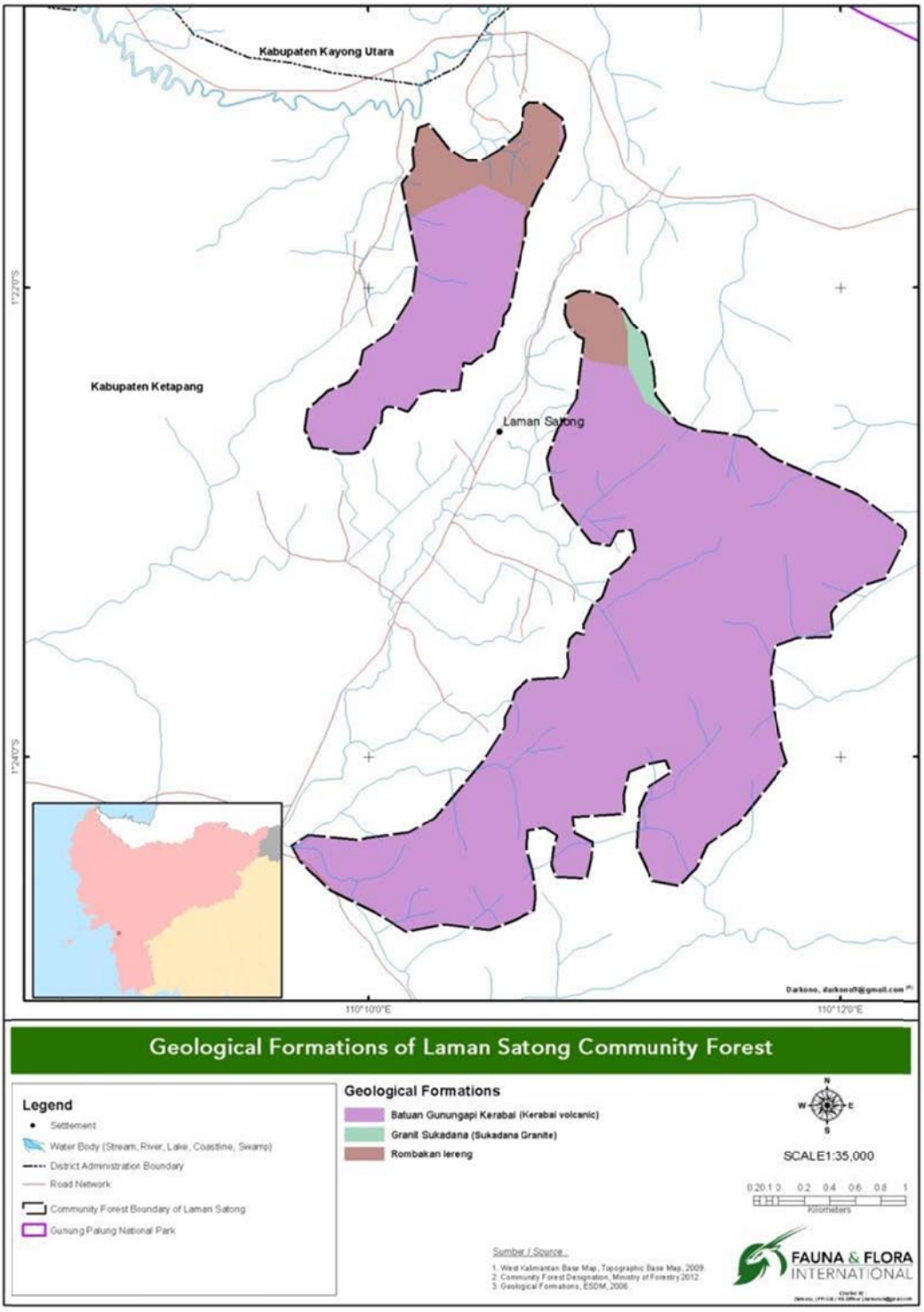

Figure 6.Geological formations in *HutanDesa*LamanSatong.

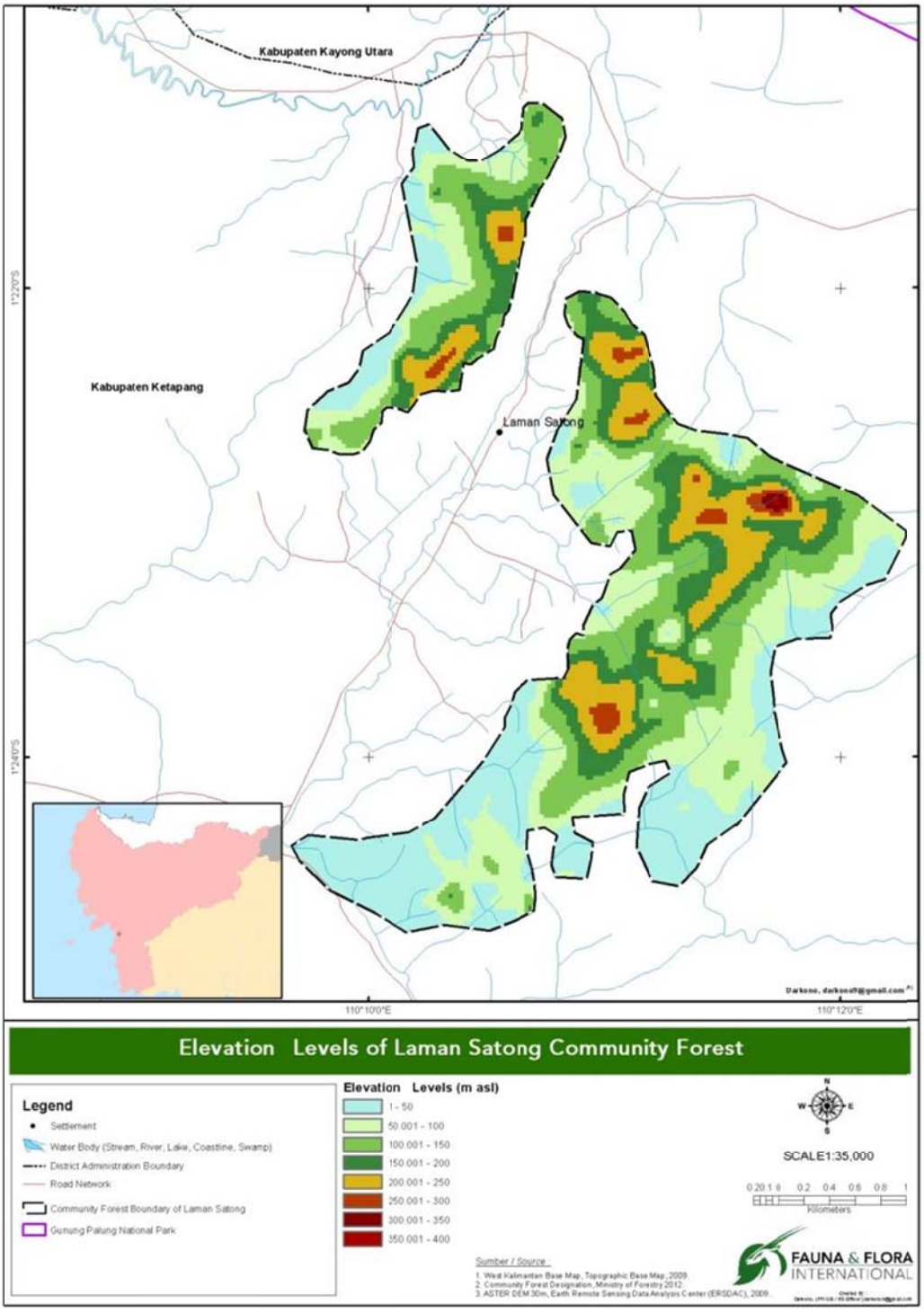

Figure 7. Elevation levels in *HutanDesa*LamanSatong.

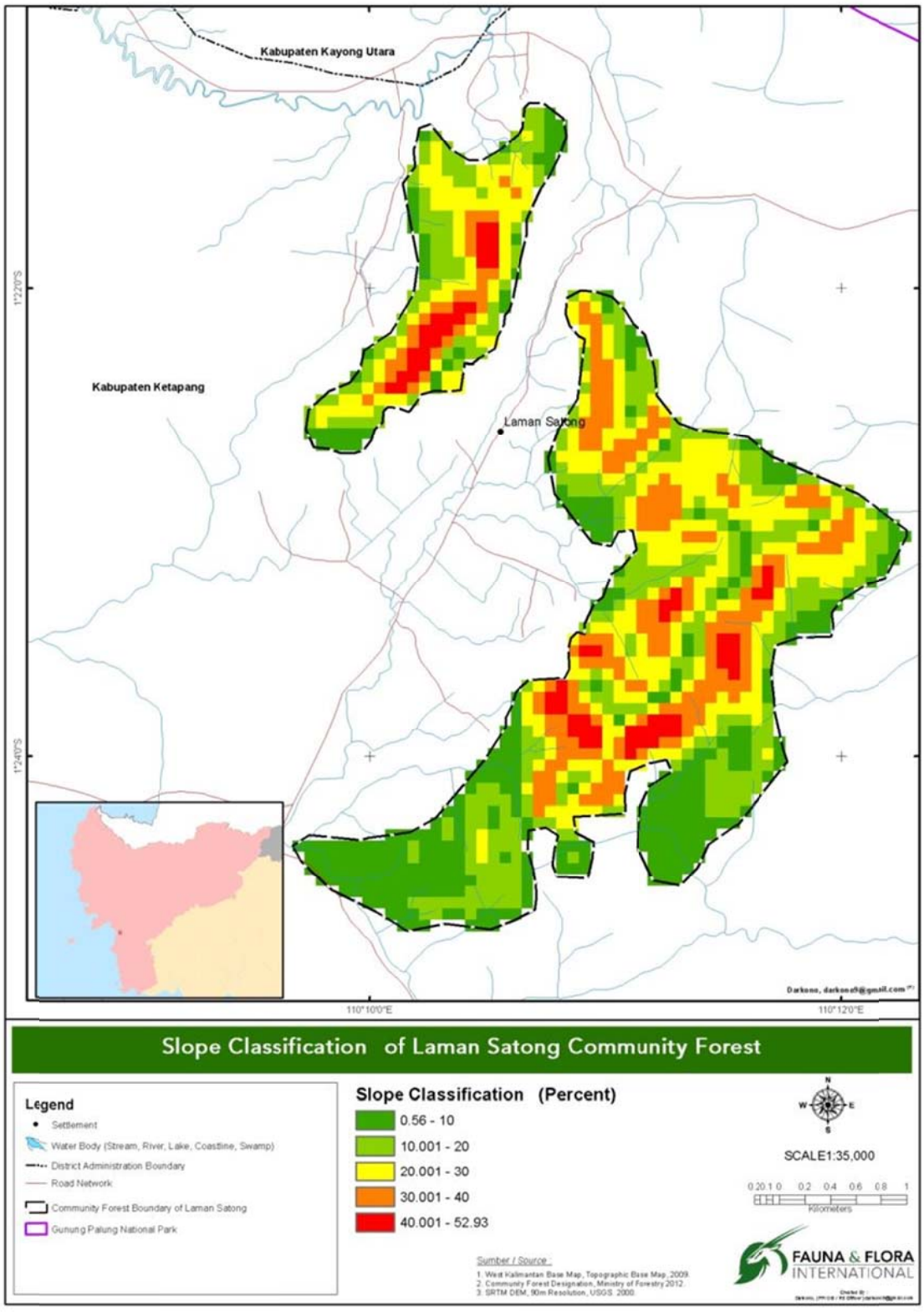

Figure 8. Slope classification in*HutanDesa*LamanSatong.

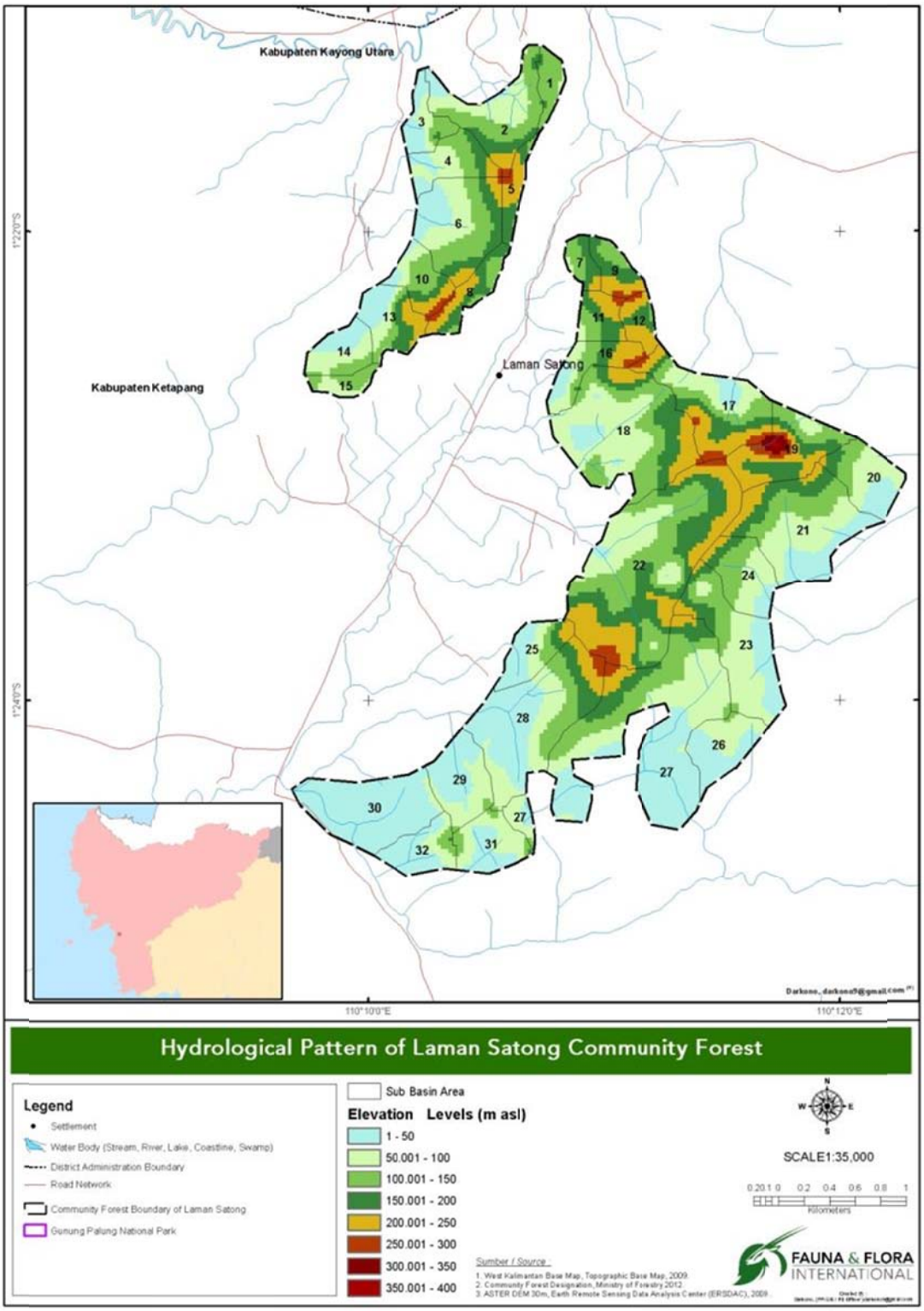

Figure 9.Hydrological patterns in *HutanDesa*LamanSatong.

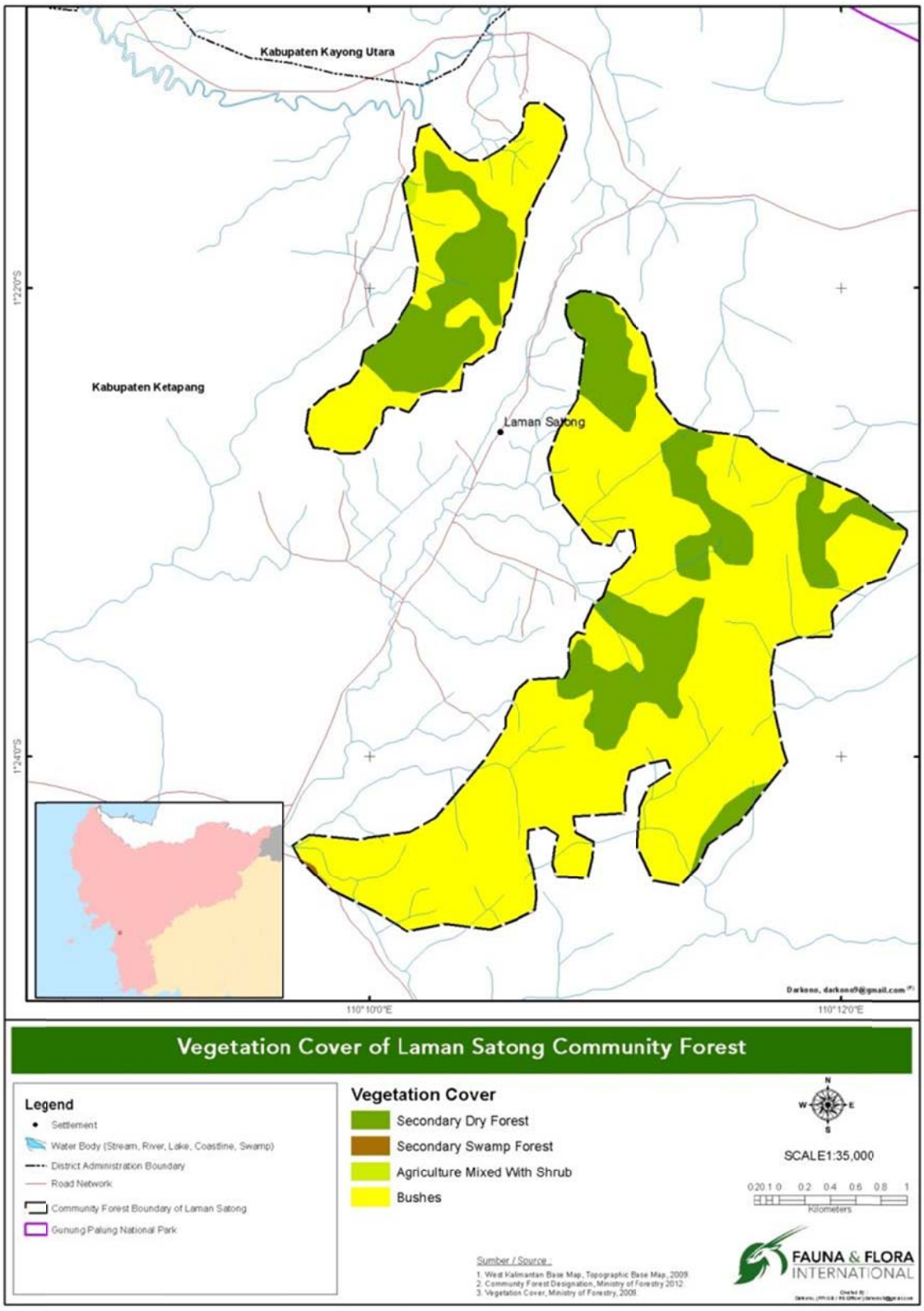

Figure 10.Vegetation covers in *HutanDesa*LamanSatong.

3. HCV Assessment Findings and Recommendations for Management and Monitoring

3.1. HCV 1 Areas that Contain Important Levels of Biodiversity

3.1.1. HCV 1.1 - Areas that Contain or Provide Biodiversity Support Function to Protection or Conservation Areas.

HCV 1.1 aims to identify areas that contain or provide biodiversity support function for protection or conservation areas in or near the management unit (area under *hutandesa* permit) and to ensure that management actions are taken to maintain or enhance such areas. If management unit (i) have protection or conservation area (ii) potentially provide biodiversity support function to protection or conservation area (iii) activities of management unit will give impact on biodiversity conservation function in protection or conservation area nearby it, these circumstances will be considered as HCV 1.1.

HCV	Key Question	Status
1.1	Does the *hutandesa* area contain a Protected or Conservation Area, or does it provide a biodiversity support function to such area(s) in the surrounding landscape?	Present

Findings

River buffers and surface springs

Riparian zones along rivers and buffer zones around surface springs are designated Local Protection Areas under Indonesian regulation (KeputusanPresiden No. 32/1990). This regulation requires the maintenance of buffer zones of at least 100m on both sides of large rivers, and 50m on small rivers, as well as a buffer of 200m radius around surface springs. No minimum size of a river or spring requiring a buffer is stipulated in the law. The main goal of these buffers is to protect water quality and related environmental services, but well protected buffers also support biodiversity conservation by providing corridors between forested areas and helping to maintain habitat quality for species reliant on aquatic environments, including fish, amphibians, reptiles and some mammals.

Figure 9 shows streams position (hydrological patterns) in *HutanDesa*LamanSatong. The streams in this area are very important on

provisioning clean water for LamanSatongvillage, especially Manjau sub-village (*Dusun*). Since the *HutanDesa* is protected under its permit, the river buffers are covered under this permit too.

Village protection area

The LamanSatong village declared a village protection area within their village boundary. The area called MariaCave or *Gua* Maria. Since this sacred place for Catholic congregation is a local protection area, it is still categorized as HCV 1.1 despite the motive was based from religious reason that supposed to be HCV 6.

Provide support function to protection area

There are two protection areas nearby LamanSatong village:GunungPalung National Park and GunungTarak Protection Forest. This *HutanDesa*provides support function to those areas because of its geographic position. This *HutanDesa*actsas a corridor for animal movement (i.e. birds and large mammals),between those protected areas or with others forested landscape nearby the area.

Management Recommendations

1. Zero-logging in *HutanDesa*Protection area that covers area along the streams and surface springs as its Buffer Zone. Ideally, a 1000m buffer zone should be applied to minimize the negative impact to *HutanDesa* area. The size of buffer zone area is complying with forestry regulation. Boundaries of the buffer zone should be aligned with natural boundaries such as rivers and ridgelines where appropriate to augment sub-watershed integrity. This may involve increasing the 500m-width zone. Whilst logging may not impact the protection area directly, the no-logging buffer zones adjacent to the protected area will help reduced access to these areas by third parties, and help to mitigate illegal or unsustainable activities. However, for the case of *HutanDesa*, it is not possible to create such buffer zone wide due to its neighboring village that may not have a similar scheme with LamanSatong village. But, existing protected area i.e. GunungPalung NP and GunungTarak Protection Forest may become a buffer for *hutandesa* and vice versa.

2. *HutanDesa* management institution should conducting education and awareness programs to the villagers to improve their knowledge and understanding about protection areas. In addition, they should initiate discussion regarding hunting, poaching, natural resources utilization regulation, and encourage customary law to protect and manage the biodiversity of the protection areas in sustainable ways.

Monitoring Recommendations

1. Monitoring of HCVA 1.1 can be conducted through regular field survey or forest patrol every 3 months. Field survey or forest patrol is conducted to monitor the intactness of HCVA 1.1 condition through monitoring key species such as big mammals and birds that are inhabit protection areas and sensitive to disturbance. Furthermore, this survey or patrol is conducted to monitor forest crime such as poaching or illegal logging.
2. *HutanDesa*management institution can do a collaborative monitoring with district forest department and environment NGO to monitor HCVA 1.1 using satellite imageries. This method can give information about land cover change periodically. Unfortunately, this method is relatively costly and may not be feasible for the *HutanDesa* management institution. Collaboration with NGOs and district forest department may enable them to use this monitoring method.
3. Monitoring customary law thatin line and related with protection of HCVA 1.1.

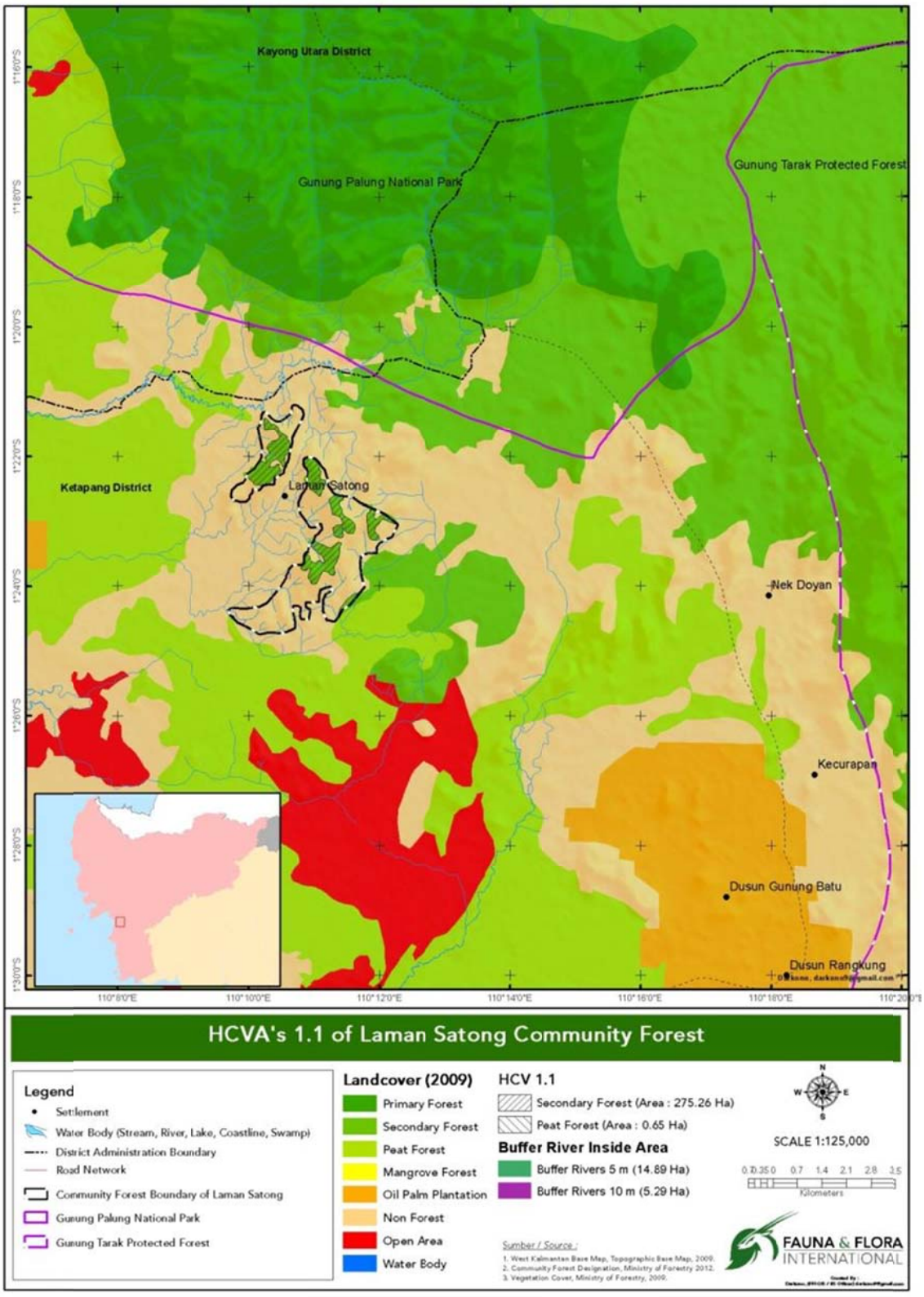

Figure 11.HCV 1.1 in *HutanDesa*LamanSatong.

3.1.2. HCV 1.2 - Critically Endangered Species

HCV 1.2 aims to identify where Critically Endangered (CR) species are known or likely to occur, and to ensure that management action is taken to promote the survival of all individuals.

Only species that are listed as CR species on the Red list of Threatened Species IUCN is considered on identifying HCV 1.2. Every individual of HCV 1.2 is very important for their own survival. Thus, all the community has the responsibility to protect and conserve this species. Unlike for HCV 1.3, under the revised Toolkit, population viability is not a criterion for identifying HCV 1.2 – the presence of one individual of a CR species merits HCV 1.2 status, and must be managed to promote its survival.

HCV	Key Question	Status
1.2	Is the *hutandesa* area or the adjoining landscape known or likely to contain individuals of one or more critically endangered species?	Present

Findings

One Dipterocarpaceae tree species was identified in village forest area, rusty brown meranti*Hopeaferruginea*.This species was recorded in sample plot 1,500m in transect 1 (LS_1_D). Many species of family Dipterocarpaceae are associated with primary or old secondary natural forest. Only small fragments of secondary natural forest are left in LamanSatong.

Management Recommendations

1. Species conservation

   Tree species that is listed on HCV 1.2 need a special consideration. Propagation and replanting of this species will help to reduce the critical level of population on this species.

2. Species identification training

   All communities around the village forest need to know and aware about HCV 1.2 species, thus they can actively involveon effort to conserve this

species. In order to achieve this, species identification training should be conducted.

Monitoring Recommendations

1. Species sustainability can be monitored through the population number in the forest after replanting as well as the number of individual that survive.In addition, presence of surviving seedling can be a good indicator to check if there is any tree regeneration.
2. Effectiveness of species identification training can be monitored from the ability of villagers when they are involved in species inventory survey.

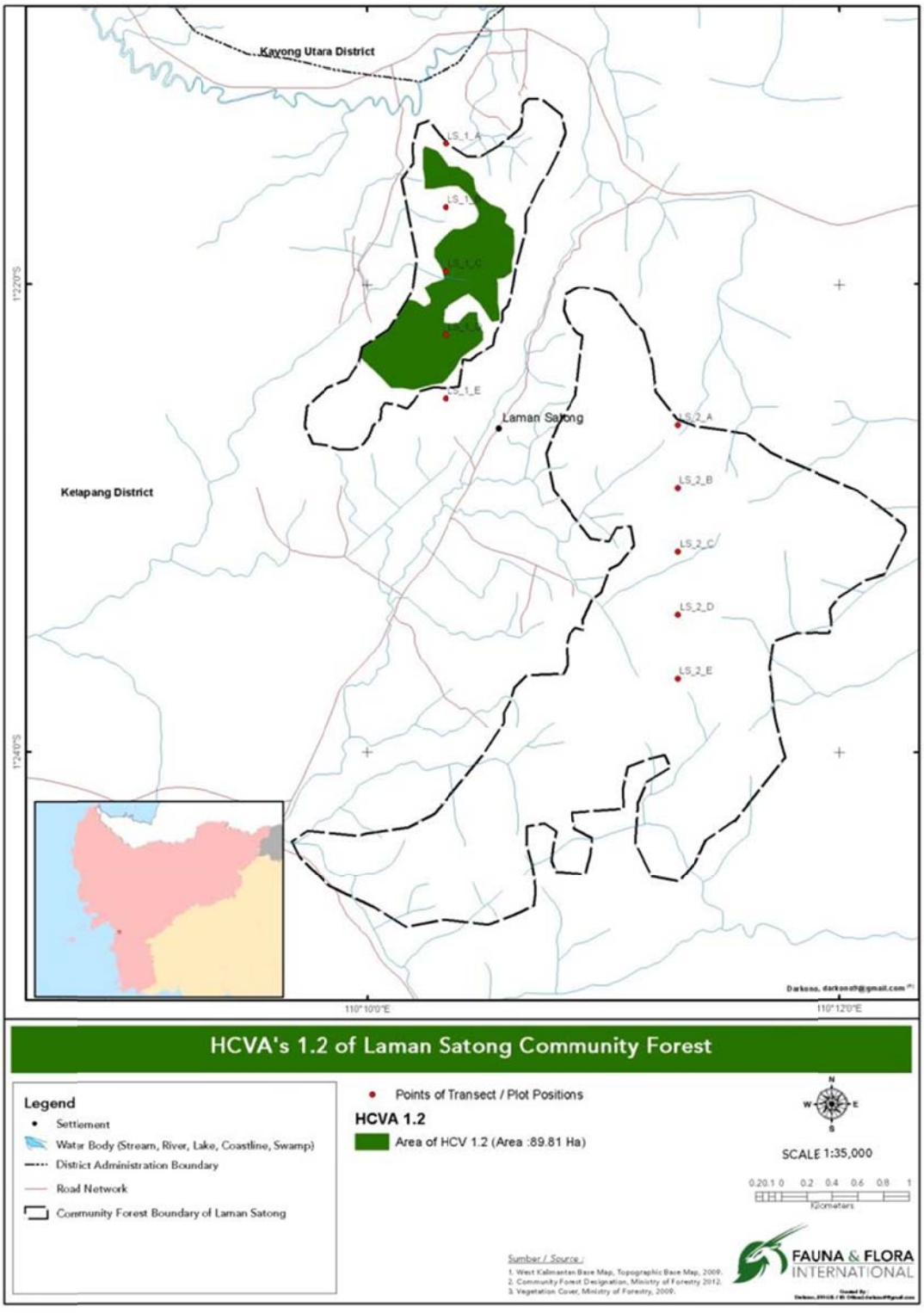

Figure 12. Distribution of HCV 1.2 in*HutanDesa*LamanSatong.

3.1.3. HCV 1.3 - Areas that Contain Habitat for Viable Populations of Endangered, Restricted Range, or Protected Species

HCV 1.3 aims to identify areas where viable populations of endangered, restricted range or protected species are known or likely to occur, and to ensure that management action is taken to conserve sufficient habitat for continued viability of the population(s). In the assessment of this HCV, populations of species confirmed or likely present are assumed viable until demonstrated otherwise through modeling, analysis of habitat extent and condition, or exhaustive field surveys. Viable populations of critically endangered HCV 1.2 species are also considered under HCV 1.3.

HCV	Key Question	Status
1.3	Is the *hutandesa* area or nearby landscape known or likely to contain viable populations of one, more endangered, restricted range, or protected species?	Present

Findings

Plants

OneDipterocarpaceae and Lauraceae tree species,*Hopeaferruginea*and *Eusideroxylonzwageri*respectivelywere recorded from this assessment. As mentioned previously, populations of species confirmed or likely present are assumed viable until demonstrated otherwise. Thus, these species are listed as HCV 1.3.

Mammals

A total of 14 mammal's species was recorded in LamanSatong Village Forest from this assessment. Among those species, 8 species were identified as HCV 1.3. These HCV 1.3 species were including one species listed as endangered (EN), *Hylobatesalbibabris*, two species listed as vulnerable (VU), one species listed on appendix I, four species listed on appendix II, four species protected by Government of Indonesia law, and three species are known as Bornean endemic (Table 3).

Figure 13. Pig- tail macaque (*Macacanemestrina*), one of HCV 1.3 species that was recorded (Photographed by Andhy PS/FFI – IP)

Birds

A total of 158 bird's species was recorded in LamanSatong Village Forest from this assessment. Of these, 68 species were identified as HCV 1.3. These including four species, *Spizaetusnannus*, *Alcedo euryzona*, *Centropus rectunguis*, and *Pitta baudii* are listed as vulnerable (VU), one species is listed on appendix I, twenty one species are listed on appendix II, thirty four species are protected by Government of Indonesia law, four species are known as Bornean endemic, and two migrant species (Table 4).

Figure 14.*Spizaetusnannus*(Photographed by Andhy PS/FFI – IP)

Herpetofauna

A total of 24 herpetofauna species was recorded in LamanSatong Village Forest from this assessment. Ten species were identified as HCV 1.3 including two reptile, *Cuoraamboinensiskamaroma*, and *Amydacartilaginea* listed as vulnerable (VU), one reptile, *Gonocephalusdoriae*protected by Government of Indonesia law, three reptile and two amphibians species are known as Bornean endemic, four reptile species are listed on appendix II, and one reptile species is listed on appendix III. In addition, one reptile species, *Cyrtodactylus*sp is considered as new species for sciences (Iskandar pers. comm.) (Table 5).

Figure 15.*Amydacartilaginea*(Photographed by Angga R/FFI – IP).

Management Recommendations

1. Protection and management species

   Protection and management species in *HutanDesa*LamanSatong is very important to be conducted, especially for species that were identified as HCV 1.2 and HCV 1.3. Ecological function in village forest area is effected by abiotic and biotic components especially animals and plant species, thus the existence and sustainability of these species are very important.

   In order avoiding illegal encroachment and hunting, intensive forest patrol needs to be conducted regularly by villagers and *HutanDesa*management institution.

2. Sustainable forest management

   Overexploitation in harvesting forest product will disturb ecosystem balance including the HCV 1.2 and 1.3 species survival. Thus, sustainable forest management needs to be conducted to ensure HCV 1.2 and 1.3 will be maintained and enhanced.

3. Forest training and education

   Villagers are the heart of village forest management. As mentioned previously, training and education regarding forest, its function and sustainable management should be conducted. Thus, villagers will have enough knowledge and skills to do sustainable forest management.

4. Habitat quality enhancement

   Replanting native plant species that are important for animals such as food and nest trees should be conducted to enhance the habitat quality. In addition, build canopy bridges (Figure 16) to connect the forest fragments (west and east fragments) will help animals movement especially primate.

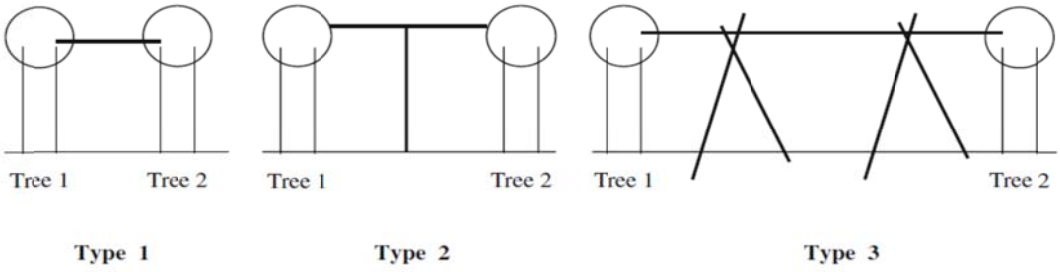

Figure 16. Example canopy bridges design (Das, et al., 2009).

Monitoring Recommendations

1. Regular biodiversity inventory needs to be conducted regularly, thus trend on species number and individuals can be well monitored.
2. The quantity of forest product that harvested by villagers should be monitored to ensure villagers using sustainable forest management on their harvesting practices.

3. Villagers' knowledge and skills improvement on sustainable forest management can be monitored through forest management activities that have been done by them.

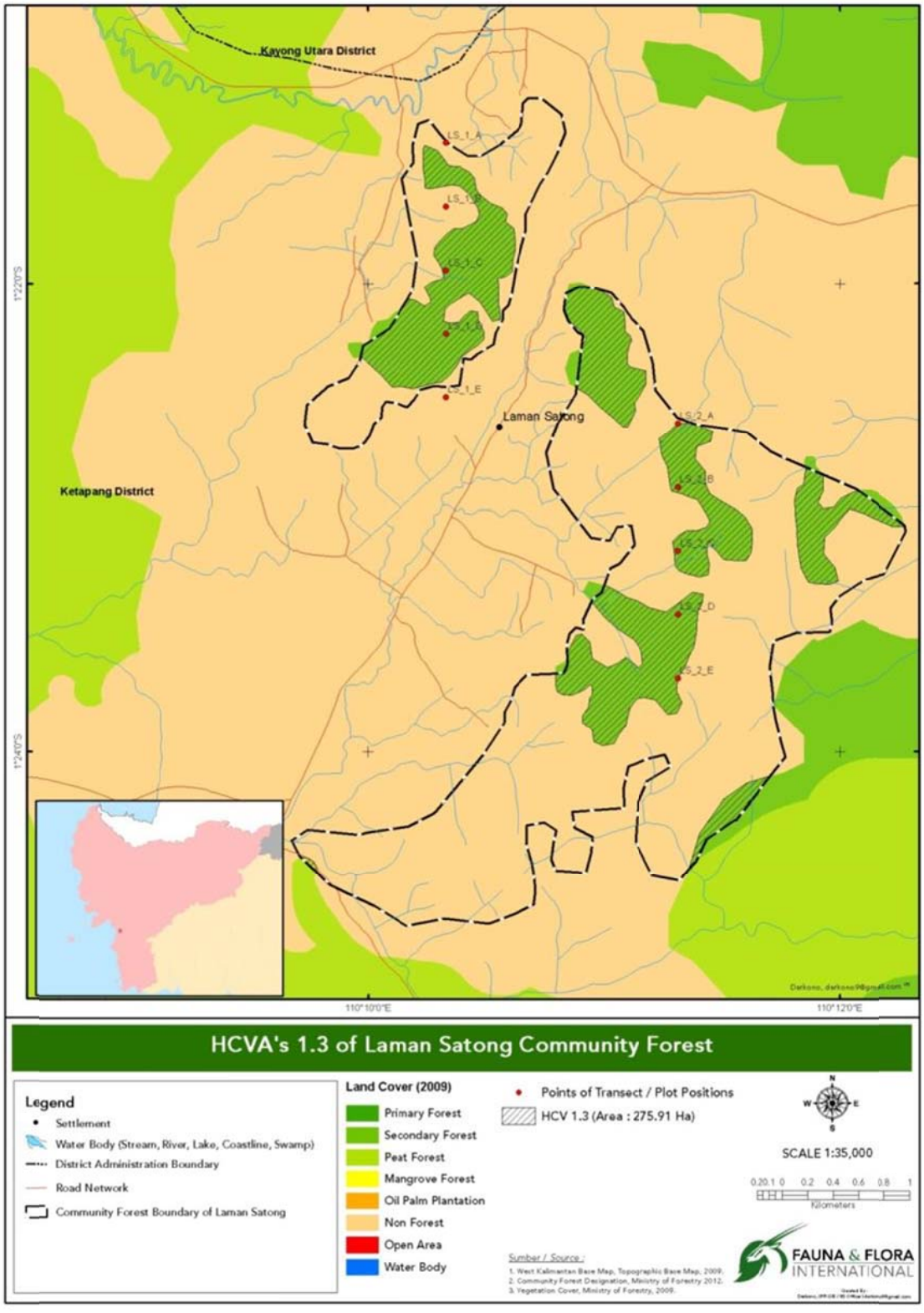

Figure 17.HCV 1.3 in *HutanDesa*LamanSatong.

Table 3. List of mammals species that were identified as HCV 1.3.

No.	Species	Transects		Conservation Status			Endemik
		LS 1	LS 2	IUCN	CITES	Peraturan RI	
1	*Tupaia minor*	1	0	LC	II		
2	*Presbytis rubicunda*	0	1	LC	II	ya	Ya
3	*Macaca nemestrina*	1	1	Vu a2cd	II		
4	*Hylobates (agilis) albibarbis*	1	1	En a4cd	I	ya	Ya
5	*Ratufa affinis*	1	0	NT	II		
6	*Lariscus insignis*	0	1	LC		ya	
7	*Exilisciurus exilis*	1	1	LC			Ya
8	*Muntiacus muntjak*	1	0	LC		ya	
9	*Rusa unicolor*	0	1	Vu a2cd+3cd+4cd		ya	
	Total	6	6				

Table 4. List of birds species that were identified as HCV 1.3.

No	Family	Scientific Name	CITES							Transect		VES
			VU	NT	I	II	RI	End	Mig	LS 1	LS 2	L.Satong
1	Accipitridae	*Spilornis cheela*				1	1			1	1	
2	Accipitridae	*Haliastur indus*				1	1				1	1
3	Accipitridae	*Spizaetus nanus*	1			1	1			1		
4	Accipitridae	*Spizaetus cirrhatus*				1	1			1		1
5	Accipitridae	*Hieraaetus kienerii*				1	1			1		
6	Accipitridae	*Pernis ptilorynchus*					1		1		1	
7	Alcedinidae	*Alcedo meninting*					1				1	1
8	Alcedinidae	*Ceyx rufidorsa*					1			1	1	1
9	Alcedinidae	*Pelargopsis capensis*					1				1	
10	Alcedinidae	*Alcedo euryzona*	1				1			1		
11	Bucerotidae	*Anorrhinus galeritus*				1	1			1		
12	Bucerotidae	*Anthracoceros malayanus*		1		1	1				1	
13	Bucerotidae	*Aceros corrugatus*		1		1	1				1	
14	Bucerotidae	*Anthracoceros albirostris*				1	1				1	
15	Bucerotidae	*Buceros rhinoceros*		1		1	1			1	1	1
16	Bucerotidae	*Rhinoplax vigil*		1	1		1			1	1	1
17	Cuculidae	*Centropus rectunguis*	1							1		
18	Dicaeidae	*Prionochilus xanthopygius*						1		1	1	1
19	Falconidae	*Microhierax fringillarius*				1	1				1	
20	Meropidae	*Merops philippinus*							1			1
21	Muscicapidae	*Cyornis superbus*						1		1		
22	Nectariniidae	*Arachnothera longirostra*					1			1	1	1
23	Nectariniidae	*Arahnothera crassirostris*					1			1		
24	Nectariniidae	*Arachnothera flavigaster*					1				1	1
25	Nectariniidae	*Anthreptes singalensis*					1			1	1	
26	Nectariniidae	*Anthreptes rhodolaema*		1			1			1		
27	Nectariniidae	*Anthreptes makacensis*					1			1	1	1
28	Nectariniidae	*Aethopyga siparaja*					1			1	1	
29	Nectariniidae	*Anthreptes simplex*					1				1	
30	Nectariniidae	*Hypogramma hypogrammicum*					1			1	1	1
31	Nectariniidae	*Leptocoma sperata*					1			1	1	1
32	Phasianidae	*Argusianus argus*		1			1				1	
33	Pittidae	*Pitta granatina*		1			1				1	
34	Pittidae	*Pitta baudii*	1				1	1		1		
35	Ploceidae	*Lonchura fuscans*						1		1	1	1
36	Psittacidae	*Loriculus galgulus*				1				1	1	1
37	Psittacidae	*Psittacula longicauda*		1		1				1		
38	Psittacidae	*Psittinus cyanurus*		1		1				1	1	
39	Rhipiduridae	*Rhipidura javanica*					1				1	1
40	Strigidae	*Ketupa ketupu*				1						1
41	Strigidae	*Ninox scutulata*				1				1	1	
42	Strigidae	*Strix leptogrammica*				1					1	
43	Strigidae	*Otus lempiji*				1				1	1	
44	Strigidae	*Otus rufescens*		1		1				1	1	
45	Sturnidae	*Gracula religiosa*				1	1			1	1	1
46	Trogonidae	*Harpactes duvaucelii*		1			1			1	1	1
47	Trogonidae	*Harpactes orrophaeus*		1			1			1		1
48	Tytonidae	*Phodilus badius*				1					1	1

Table 5. List of herpetofauna species that were identified as HCV 1.3.

No.	Species Name	Conservation Status			Endemic	Transects		Outside transects
		IUCN	CITES	RI		LS 1	LS 2	
Amphibians								
Megophryidae								
1	*Leptolalax cf dringi*	NT			1	1		
Ranidae								
2	*Rana raniceps*	LC			1			
Reptiles								
Agamidae								
3	*Gonocephalus doriae*	NE			1			
Bataguridae								
4	*Cuora amboinensis kamaroma*	VU	II					1
Elapidae								
5	*Naja sumatrana**	NE	II			1		
Gekkonidae								
6	*Cyrtodactylus malayanus*	NE			1	1	1	
7	*Cyrtodactylus sp*	NE			1	1		
Pythonidae								
8	*Python breitensteini**	NE	II		1			1
9	*Python reticulatus **	NE	II					1
Trionychidae								
10	*Amyda cartilaginea*	VU	II					1
Varanidae								
11	*Varanus salvator**	LC	III					1
	* = likely present							

3.1.4. HCV 1.4 Areas that Contain Habitat of Temporary Use by Species or Congregations of Species

The purpose of HCV 1.4 is to identify and maintain habitat features of exceptional importance within a landscape, where temporary congregations of wildlife occur during key stages of the life cycle, such as for periodic feeding, reproduction, shelter or to seek refuge from disturbance. The management goal of HCV 1.4 is to maintain the function and accessibility of such areas to resident wildlife.

The Indonesian Toolkit lists the following examples of key habitats under HCV 1.4:

- caves for bats or swiftlets;
- lakes or other open water bodies for resident or migrant water birds;

• breeding habitat, such as grassy banks along slow moving rivers for crocodiles;
• salt licks;
• areas with known high concentrations of fruit availability, especially figs, for frugivorous vertebrates;
• natural areas with high concentrations of dead standing trees used for nesting by birds and other vertebrates; and
• ecotones or ecoclines across which animals move, sometimes in large numbers, to forage in different habitats where food is available at different times.

HCV	Key Question	Status
1.4	Does the *hutandesa* area or adjacent landscape contain or is it likely to contain keystone habitat(s) of temporary use by species or congregations of species?	Potentially present

Findings

Two migrant birds' species were recorded in LamanSatong Village Forest from this assessment, *Pernisptylorhyncus,* and *Meropsphilippinus*. Further research needs to be conducted to identify temporary area of these species within LamanSatong Village Forest.

Management Recommendations

1. Conduct further research to identify migrant species, their habitat, possible nesting site and distribution within LamanSatong Village Forest.
2. Protection and monitoring of HCV 1.4 should be conducted regularly, for example every migrant season in September - January
3. Established buffer zones around HCV 1.4 to reduce impact from human disturbance.

Monitoring Recommendations

Similar with recommendations for sub-HCVs 1, forest patrol should be conducted to monitor HCV 1.4 status.

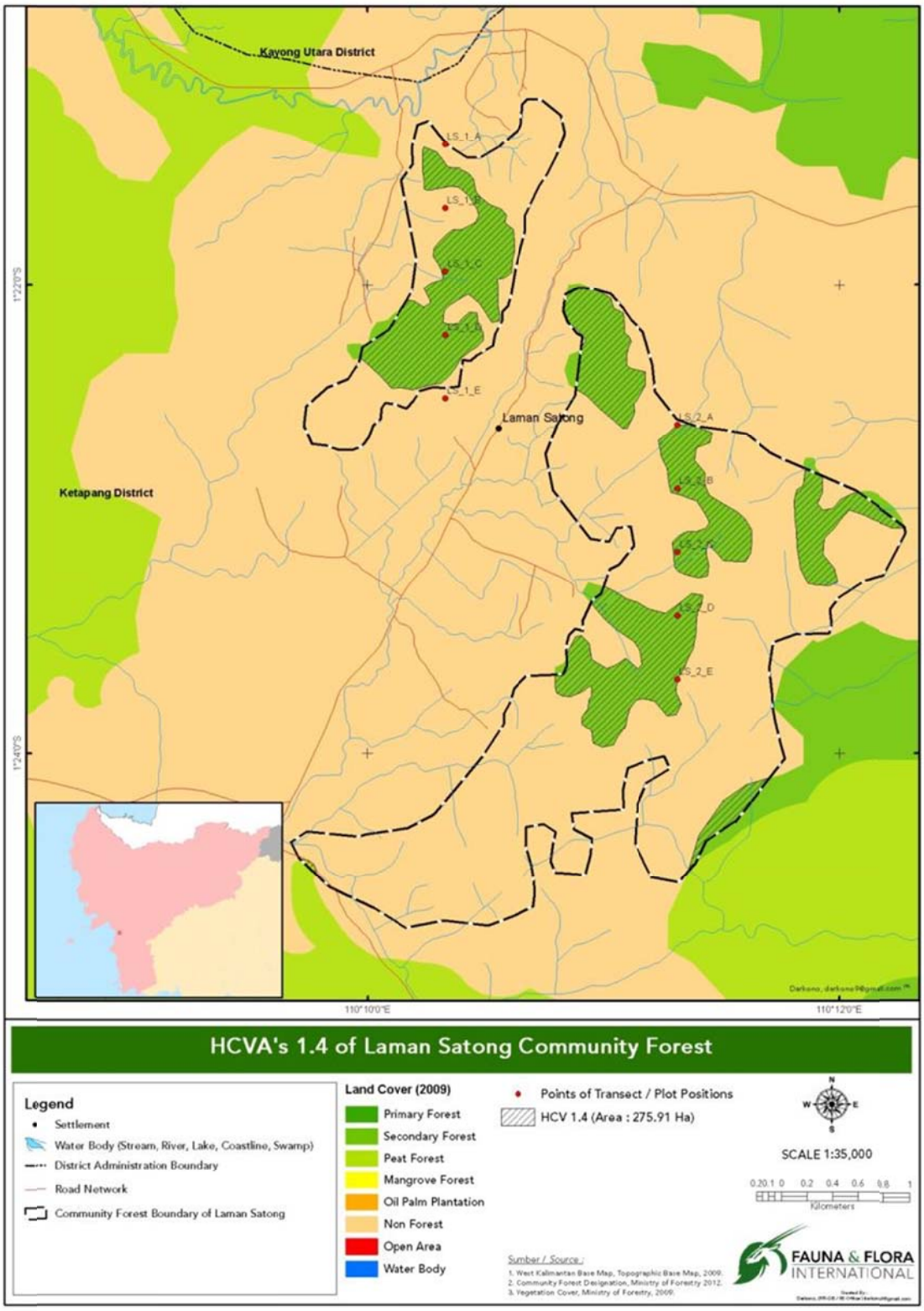

Figure 18. Potential area of HCV 1.4 in *HutanDesa*LamanSatong.

3.2. HCV 2 Large Landscapes and Natural Ecological Dynamics

3.2.1 HCV 2.1 Large Natural Landscapes with the Capacity to Maintain Natural Ecological Processes and Dynamics

HCV 2.1 aims to identify large, relatively intact natural landscapes with a capacity to maintain natural ecological processes and dynamics, and to ensure that management action is taken to protect core areas and associated buffer zones of such landscapes.

HCV	Key Question	Status
2.1	Does any part of the *HutanDesa* area exist within a large natural landscape, defined as a natural forest (or other vegetation mosaic) with a core area of >20,000ha surrounded by a buffer zone of 3 km from the forest edge?	Not Present

Findings

*HutanDesa*LamanSatong lies between GunungPalung National Park and Sungai Putri Peat Swamp forest block; however, it is now isolated by an oil palm concession and fragmenting these landscape. Thus, HCV 2.1 was considered not present in this village forest.

3.2.2 HCV 2.2 Natural Areas that Contain Two or More Contiguous Ecosystems

HCV 2.2 aims to identify and maintain ecotones and ecoclines that connect different ecotypes, especially where they occur as part of large natural landscapes (HCV 2.1). Such transitional environments are important not only for maintaining movement of species and flux of materials and energy, but also as centres of biodiversity in their own right.

HCV	Key Question	Status
2.2	Does the *hutandesa* area contain ecotones/ecoclines critical for maintaining connectivity between two or more major ecosystem types?	Not Present

Findings

Most of land cover in *HutanDesa*LamanSatong is classified as bushes and secondary dry forest. Secondary swamp forest and agriculture mixed with shrubs land cover were also identified in this village forest. However, the natural

ecosystems between secondary dry forest and secondary swamp forest do not continuous. Thus, HCV 2.2 was considered not present in this village forest.

3.2.3 HCV 2.3 Areas that Contain Representative Populations of Most Naturally Occurring Species

HCV 2.3 aims to identify landscapes with a capacity to support populations of most naturally occurring species within the region of the assessment area.

HCV	Key Question	Status
2.3	Does the *HutanDesa* area form part of a landscape with capacity to support populations of most naturally occurring species within the Western Plains and Mountains physiographic region?	Not Present

Findings

Based on this HCV assessment, six raptor species were recorded in LamanSatong Village Forest. However, others top predator such as clouded leopard and animals that need wide range variety habitat such as orangutan were not recorded. Thus, HCV 2.3 was considered not present in this village forest.

3.3 HCV 3 - Rare or Endangered Ecosystems

HCV 3 aims to identify rare or endangered ecosystems and ensure that management action is taken to maintain them

HCV	Key Question	Status
3	Does the *HutanDesa* area contain ecosystems that meet the criteria of rare or endangered?	Not Present

Findings

Natural vegetation in LamanSatong Village Forest was lowland Dipterocarpaceae forest. At present, vegetation in Lamansatong is classified as young secondary forest with few dipterocarp tree species. Thus, HCV 3 was considered not present in LamanSatong Village Forest.

3.4 HCV 4 - Environmental Services

3.4.1 HCV 4.1 Areas or Ecosystems Important for the Provision of Water and Prevention of Flood for Downstream Communities

HCV 4.1 aims to identify areas or ecosystems that are important for the provision of clean water and prevention of flood for downstream communities. If HCV 4.1 is present, management action must be taken to maintain provision of these services.

The revised Toolkit defines areas important for the provision of clean water as watersheds and riparian zones that feed into rivers on which communities depend for water and related services, such as protein from fishing. The revised Toolkit defines ecosystems important for the provision of water and prevention of floods as:

- Cloud forest;
- Ridge line forest;
- Riparian or flood plain forest;
- Karst forest;
- Peat swamp forest or peat land;
- Freshwater swamp forest;
- Mangrove forest;
- Marsh or other wetland vegetation; and
- Lakes or other open water bodies.

HCV	Key Question	Status
4.1	Does the *HutanDesa* area contain areas or ecosystems important for the provision of clean water and the prevention of flood?	Present

Findings

Figure 9showing the watersheds in *HutanDesa*LamanSatong area. Based on interviews with communities, the dependency of communities around village forest on river for providing their basic need of clean water is very high. Based on analysis using vegetation cover and slope data,

*HutanDesa*LamanSatong has several important areas for floods prevention (Figure 19). Thus, HCV 4.1 was considered present in this village forest.

Management Recommendations

Recommendations for managing HCV 4.1 are similar with HCV 1.1:avoid logging and development in riparian zones, water catchment areas, and important areas for floods prevention, especially in area high and medium priority areas. If there any of these areas are in fair or poor conditions, restoration should be conducted, thus water quality and hydrological function will be maintained. In addition, buffer zones along river should be maintained. Below are recommended riparian buffers widths:

Table 6.Recommended riparian buffers on each river's side.

River Width	Buffer on each side
>30 m	**100 m**
20-30 m	**50 m**
8-20 m	**20 m**
5-8 m	**10 m**
<5 m	**5 m**

Monitoring Recommendations

Field survey should be conducted regularly to monitor conditions of river buffers, water catchment areas, and important areas of floods prevention. In addition, water quality should be monitored regularly. This can be done through measuring water quality parameters such as BOD, COD, DO, turbidity. *HutanDesa* management institution can do collaboration with district government or others stakeholders to monitor water quality.

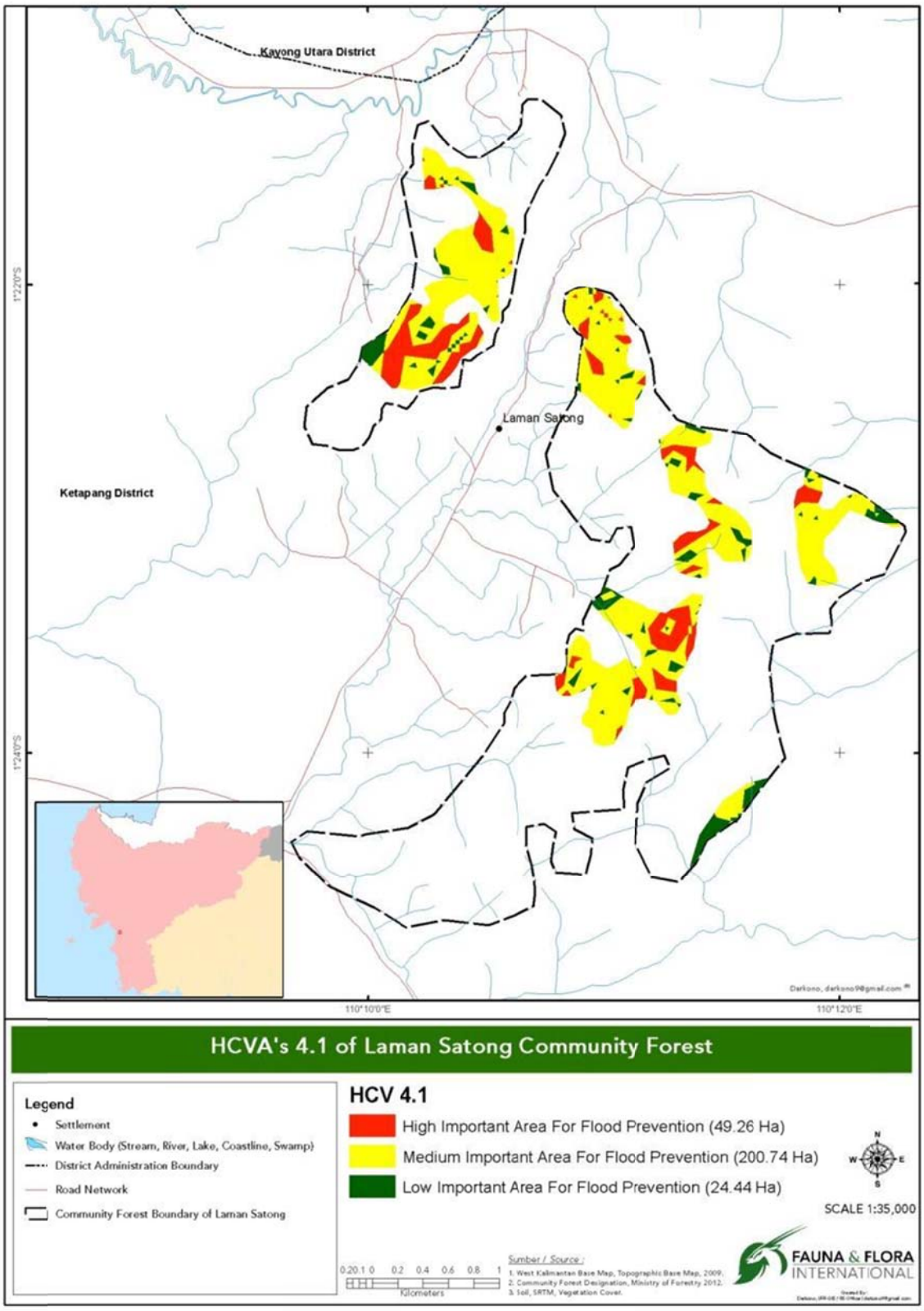

Figure 19.HCV 4.1 in *HutanDesa*LamanSatong.

3.4.2 HCV 4.2 Areas Important for the Prevention of Erosion and Sedimentation

HCV 4.2 aims to identify areas with High Erosion Risk that must be managed carefully to prevent soil erosion or sedimentation of rivers.

HCV	Key Question	Status
4.2	Do areas important for the prevention of soil erosion and sedimentation occur within the *HutanDesa* area, for example, erosion prone soil types on steep slopes?	Present

Findings

Slope in most of village forest area is 0.56 – 30% (Figure 8). A total of 54.27ha of *HutanDesa*LamanSatong Forest has a very steep slope (40 - 52.93%).As shown in Table 7 and Figure 20, there are three potential erosion types in LamanSatong Village Forest based on analysis using USLE method, heavy, medium, and light erosions. Thus, HCV 4.2 was considered present in *HutanDesa*LamanSatong.

Table 7. Potential erosion in *HutanDesa*LamanSatong based on USLE method

Solum	**Potential erosion**		
	0 - 15 ton	15 – 60 ton	60 – 180 ton
150 cm	1.63 ha	5.15 ha	0.29 ha
100 cm	218.23 ha	717.29 ha	119.54 ha

Notes: Heavy
Medium
Light

Management Recommendations

Avoid logging and development in areas that have heavy and medium potential erosions. If development will be carried out in low potential erosion, the development should be planned very carefully.

Monitoring Recommendations

Monitoring recommendations for HCV 4.2 is similar with other HCVs, field survey or forest patrol should be conducted to identify erosions. Water turbidity can be used as one of parameters to monitor erosions.

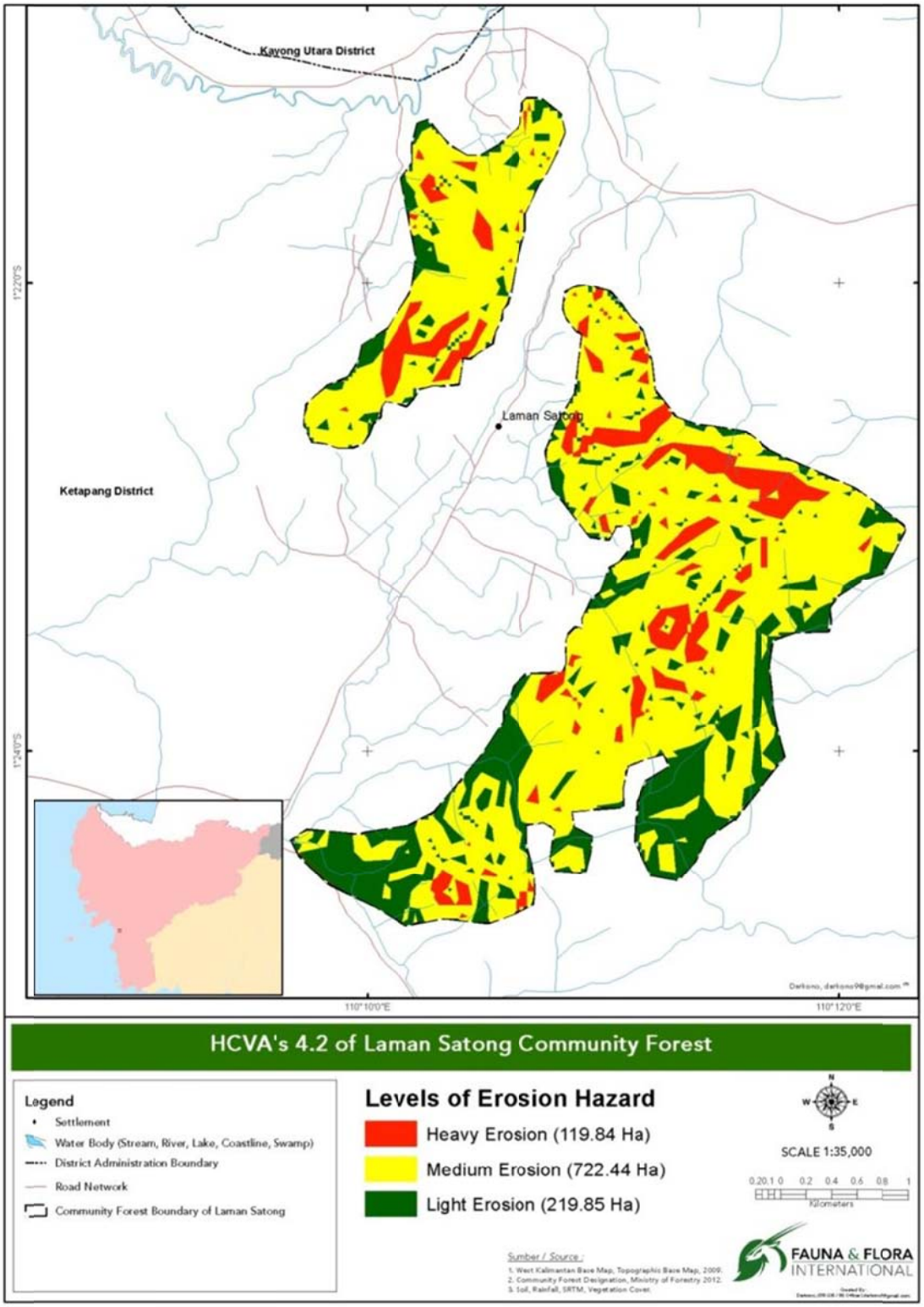

Figure 20.HCV 4.2 in *HutanDesa*LamanSatong.

3.4.3 HCV 4.3 - Areas that Function as a Natural Break to the Spread of Forest or Ground Fire

HCV 4.3 aims to maintain areas that act as natural firebreaks between source areas of fire and those vulnerable to fire damage.

HCV	Key Question	Status
4.3	Does the *HutanDesa* contain areas that function as a natural barrier to the spread of forest or ground fire?	Not Present

Findings

On this HCV assessment, areas that function as a natural barrier to the spread of forest or ground fire were not recorded.

4. Carbon Stock

Following Kenzo (2001) allometric equation, the average carbon stock in LamanSatong is 58.62±15.52 tonC/ha, with 66.85±15.8 tonC/ha on secondary dry forest and 39.48±8.67 tonC/ha on bushes. With the area size of 1,070 ha, total carbon stock (CO_2^{e-}) in *HutanDesa*LamanSatong is 230.43±0.06kiloton. This carbon stock is potential to be used in carbon financing scheme such as Payment on Ecosystem Services (PES) or Reducing Emissions from Deforestation and forest Degradations (REDD+). Considering the potency and opportunity, this carbon stock should be maintained by limiting and managing community land use for agriculture.Although CO_2^{e-} is in gas form, but the monitoring for carbon stock is relative easy because it is essentially stored as a tree. Thus, by using tree's present or absent, the carbon stock in *HutanDesa* can be monitored.

Table 8. Above Ground Biomass Based on Land Classification (Figure 10).

Transects	Class A		Class B		Class C		Land Classification
	Mean	SD	Mean	SD	Mean	SD	
LS 1 C	3.67	1.49	3.05	0.51	3.05	2.12	Secondary Dry Forest
LS 1 B	6.57	1.77	7.12	1.18	2.04	1.44	Secondary Dry Forest
LS 1 D	4.82	2.92	3.98	2.03	2.61	1.70	Secondary Dry Forest
LS 2 E	11.94	14.69	4.71	2.67	3.00	2.41	Secondary Dry Forest
LS 2 D	6.07	4.45	5.03	2.39	2.41	1.16	Secondary Dry Forest
LS 2 C	3.84	2.00	5.52	2.84	3.86	1.79	Secondary Dry Forest
LS 2 B	5.17	4.02	4.76	2.37	3.04	1.78	Secondary Dry Forest
LS 1 E	8.15	0.00	3.46	1.28	3.31	2.28	Bushes
LS 1 A	3.38	2.82	4.99	2.25	1.58	0.81	Bushes
LS 2 A	1.82	0.00	0.00	0.00	0.00	0.00	Bushes

References

Anonim, 1990 *UndangundangRepublik Indonesia, Nomor 5 Tahun 1990, TentangKonservasiSumberDayaAlamHayatidanEkosistemnya*. Jakarta.

Anonim, 1990.*Peraturan PemerintahRepublik Indonesia, Nomor 8 Tahun 1990, TentangPengawetanJenisTumbuhandanSatwa*. Jakarta

Anonim, 1999.*Peraturan PemerintahRepublik Indonesia, Nomor 7 Tahun 1999, TentangPengawetanJenisTumbuhandanSatwa*. Jakarta

Bibby, C., M. Jones, S. Marsden. 2000; *Teknik – Teknik Ekspedisi Lapangan Survei Burung*. BirdLife International-Indonesia Programme, Bogor.

CITES. 2011. *Appendices I, II, and III*. CITES and UNEP.

Das, I. 2004. *Lizards of Borneo*. Natural History Publications. Kota Kinabalu, Sabah.

Das, I. 2006. *A photographic guide snakes andother reptiles of Borneo*. New Holland Publishers (UK) Ltd.

Das, J., Biswas, J., Bhattacherjee, P. C. &Rao, S. S., 2009.Canopy Bridges: An Effetive Conservation Tactic for Supporting Gibbon Populations in Forest Fragments. In: The Gibbons, Developments in Primatology: Progress and Prospects. s.l.:Springer Science, pp. 467 - 475.

DepartemenKehutananRepublik Indonesia.1995.*PetunjukTeknisTebangPilihTanam Indonesia*.DepartemenKehutananRepublik Indonesia, Jakarta.

Eddy, H. R. 2012. *InventarisasidanPenyelidikan Mineral Non Logam di Kabupaten Melawi*. Downloaded from http://psdg.bgl.esdm.go.id on 1 July 2012

Fredriksson, G.M., dan V. Nijman. 2004. Habitat use and conservation status of two elusive ground birds (*Carpococcyxradiatus* and *Polyplectronschleiermacheri*) in the Sungai Wain Protection Forest, East Kalimantan, Indonesian Borneo. *Oryx* 38: 297-303.

HCV Toolkit.2008.*PanduanIdentifikasiKawasanBernilaiKonservasiTinggi di Indonesia.*

Heyer, W. R., M. A. Donnelly, R. W. McDiarmid, L. C. Hayek, dan M. S. Foster. 1994. *Measuring and monitoring biological diversity: standard methods for amphibians*.Smithsonian Institution Press, Washington, DC.

Inger, R. F., dan R. B. Stuebing. 2005. *A field guide to the frogs of Borneo*. Natural History Publiations (Borneo), Kota Kinabalu, Sabah.

IUCN.2011. *The IUCN red list of threatened species.*Accessed fromhttp://www.iucnredlist.org/onNovember, 2011.

Kenzo, T., Furutani, R., Hattori, D., Kendawang, J.J., Tanaka, S., Sakurai, K., Ninomiya, I. 2009.*Allometric equations for accurate estimation of above-ground biomass in logged-over tropical rainforests in Sarawak, Malaysia.* Journal of Forest Research (14): 365-372.

Lambert, F.R., dan N.J. Collar. 2002. The Future for Sundaic Lowland Forest Birds: Long-term effects of commercial logging and fragmentation. *Forktail* (18): 127 – 146.

Mackinnon, J dan K. Phillips. 1993. *Field Guide to the Birds of Sumatera, Borneo, Java and Bali (The greaterSunda Islands*). Oxford University Press, Oxford.

MacKinnon, J. (Ed.).1997. *Protected Areas Systems Review of the Indo-Malayan Realm*. Asian Bureau for Conservation Ltd., Hong Kong, China and World Conservation Monitoring Centre, Cambridge, United Kingdom. 198 pp.

MacKinnon, J., dan K. MacKinnon. 1986. *Review of the Protected Areas System in the Indo-Malayan Realm*. IUCN,Glanddan Cambridge.

Mackinnon, J., K. Phillips, dan Bas van Balen. 1999. *Burung-burung di Sumatera, Jawa, Bali dan Kalimantan (termasuk Sabah dan Sarawak)*. Birdlife International Indonesia Programme. Bogor.

MacKinnon, K., G. Hatta, H. Halim, dan A. Mangalik. 1996. *The ecology of Kalimantan*.Periplus Editions, Singapore.

Maryanto, I., S.S., Anang, dan P.K, Agus. 2008. *MamaliaDilindungiPerundang-UndanganIndonesia*.LIPI Press, Cibinong-Bogor.

Nijman, V., Richardson, M. &Geissmann, T. 2008.Hylobates albibarbis. In: IUCN 2010. IUCN Red List of Threatened Species.Version 2010.4.<www.iucnredlist.org>. Downloaded on 09 November 2010.

Payne J, C.M. Francis, K. Phillipps. 1985.*A field guide to the mammals of Borneo.* The Sabah Society, Kota Kinabalu.

Payne, J., C.M. Francis,dan K. Philips. 2000. *A Field Guide o The Mammals of Borneo.* Sabah Society/ World Wildlife Fund, Malasyia, Kuala Lumpur

RePPProT. 1990. *Review of Phase I Results, West Kalimantan. Regional Physical Planning Programme for Transmigration, Second Edition*.DirektoratBina Program, DirektoratJendralPenyiapanPemukiman, DepartemenTransmigrasi, Jakarta Indonesia.

Sist, P., R. Fimbel, D. Sheil, R. Nasidan A-H Chevallier. 2003. Towards sustainable management of mixed dipterocarp forests of Southeast Asia: moving beyond minimum diameter cutting limits. *Environmental Conservation b30b* (4): 364-374

Stattersfield, A.J., M.J. Crosby, A.J. Long, D.C. Wege. 1998. *Endemic Bird Areas of the World: Priorities for Biodiversity Conservation*.BirdLife International, Cambridge, United Kingdom.

Stewart, C., P. George, T. Rayden, dan R. Nussabaum. 2008. *Good practice guidelines for High Conservation Value assessments A practical guide for practitionersand auditors*. Proforest, Oxford, United Kingdom.

Stuebing, R. B.,dan R. F. Inger. 1999. *A Field Guide to The Snakes of Borneo*. Natural History Publications, Kota Kinabalu, Sabah.

Sukmantoro W., M. Irham, W. Novarino, F. Hasudungan, N. Kemp, dan M. Muchtar. 2007. *Daftar Burung Indonesia no. 2*. Indonesian Ornithologists' Union, Bogor.

Whitmore, T.C. 1984. *Tropical Rain Forests of the Far East* (2nd Ed).Oxford University Press. Oxford.

Yusuf, A.F., I. Aswan, dan S. Halim. 2006. Inventarisasidanpenyelidikanbahangalian non logamKabupatenKatingan, Provinsi Kalimantan Tengah. *Proceeding pemaparanhasil - hasilkegiatanlapangandan non lapangantahun 2006*, PusatSumberDayaGeologi.

Appendix 1. List of mammals species that were recorded in *HutanDesa*LamanSatong

No.	Species	Transects		Conservation Status			Endemik
		LS 1	LS 2	IUCN	CITES	Peraturan RI	
1	*Tupaia minor*	1	0	LC	II		
2	*Presbytis rubicunda*	0	1	LC	II	ya	ya
3	*Macaca nemestrina*	1	1	Vu a2cd	II		
4	*Hylobates (agilis) albibarbis*	1	1	En a4cd	I	ya	ya
5	*Ratufa affinis*	1	0	NT	II		
6	*Callosciurus prevostii*	1	0	LC			
7	*Callosciurus notatus*	1	1	LC			
8	*Lariscus insignis*	0	1	LC		ya	
9	*Exilisciurus exilis*	1	1	LC			ya
10	*Nannosciurus melanotis*	1	1	LC			
11	*Maxomys spp*	0	1				
12	*Trichys fasciculata*	0	1	LC			
13	*Muntiacus muntjak*	1	0	LC		ya	
14	*Rusa unicolor*	0	1	Vu a2cd+3cd+4cd		ya	
	Total	9	10				

Appendix 2. List of birds species that were recorded in*HutanDesa*LamanSatong

No	Family	Scientific Name	IUCN				CITES					Transect		VES
			EN	VU	NT	LC	I	II	RI	End	Mig	LS 1	LS 2	L.Satong
1	Accipitridae	*Spilornis cheela*				1		1	1			1	1	
2	Accipitridae	*Haliastur indus*				1		1	1				1	1
3	Accipitridae	*Spizaetus nanus*		1				1	1			1		
4	Accipitridae	*Accipiter trivirgatus*				1		1	1					
5	Accipitridae	*Spizaetus cirrhatus*				1		1	1			1		1
6	Accipitridae	*Hieraaetus kienerii*				1		1	1			1		
7	Accipitridae	*Pernis ptilorynchus*							1		1		1	
8	Accipitridae	*Elanus caeruleus*							1					1
9	Aegithinidae	*Aegithina viridissima*			1							1	1	1
10	Alcedinidae	*Alcedo meninting*				1			1				1	1
11	Alcedinidae	*Ceyx rufidorsa*				1			1			1	1	1
12	Alcedinidae	*Pelargopsis capensis*				1			1				1	
13	Alcedinidae	*Alcedo euryzona*		1					1			1		
14	Apodidae	*Collocalia esculenta*				1						1		1
15	Apodidae	*Collocalia fuciphaga*				1							1	1
16	Bucerotidae	*Anorrhinus galeritus*				1		1	1			1		
17	Bucerotidae	*Anthracoceros malayanus*			1			1	1				1	
18	Bucerotidae	*Aceros corrugatus*			1			1	1				1	
19	Bucerotidae	*Anthracoceros albirostris*				1		1	1				1	
20	Bucerotidae	*Buceros rhinoceros*			1			1	1			1	1	1
21	Bucerotidae	*Rhinoplax vigil*			1		1		1			1	1	1
22	Campephagidae	*Hemipus hirundinaceus*				1						1	1	
23	Campephagidae	*Pericrocotus igneus*			1							1	1	
24	Campephagidae	*Coracina striata*				1						1		
25	Capitonidae	*Megalaima australis*				1						1	1	1
26	Capitonidae	*Megalaima chrysopogon*				1						1	1	1
27	Capitonidae	*Megalaima mystacophanos*			1							1	1	1
28	Capitonidae	*Megalaima henricii*			1							1	1	1
29	Capitonidae	*Calorhampus fuliginosus*				1						1	1	
30	Caprimulgidae	*Eurostopodus temminckii*				1						1	1	
31	Chloropseidae	*Chloropsis sonnerati*				1						1	1	
32	Chloropseidae	*Chloropsis cyanopogon*			1							1		
33	Chloropseidae	*Chloropsis cochinchinensis*			1							1		
34	Columbidae	*Chalcophaps indica*				1						1	1	
35	Columbidae	*Treron curvirostra*				1						1	1	1
36	Columbidae	*Treron olax*				1							1	1
37	Columbidae	*Ducula aenea*				1						1	1	
38	Corvidae	*Corvus enca*				1						1	1	1
39	Corvidae	*Platylophus galericulatus*			1							1	1	
40	Cuculidae	*Cacomantis merulinus*				1						1	1	

No	Family	Scientific Name	IUCN				CITES					Transect		VES
			EN	VU	NT	LC	I	II	RI	End	Mig	LS 1	LS 2	L.Satong
41	Cuculidae	*Cacomantis sonneratti*				**1**						**1**		
42	Cuculidae	*Centropus rectunguis*		**1**								**1**		
43	Cuculidae	*Centropus sinensis*				**1**						**1**	**1**	**1**
44	Cuculidae	*Chrysococcyx xanthorhynchus*				**1**						**1**		
45	Cuculidae	*Eudynamys scolopaceus*				**1**							**1**	
46	Cuculidae	*Rhinortha chlorophaeus*				**1**						**1**	**1**	**1**
47	Cuculidae	*Rhopodytes diardi*			**1**								**1**	
48	Cuculidae	*Rhopodytes sumatranus*			**1**								**1**	
49	Cuculidae	*Surniculus lugubris*				**1**						**1**	**1**	**1**
50	Dicaeidae	*Dicaeum cruentatum*				**1**							**1**	
51	Dicaeidae	*Dicaeum chrysorrheum*											**1**	
52	Dicaeidae	*Prionochilus xanthopygius*				**1**				**1**		**1**	**1**	**1**
53	Dicruridae	*Dicrurus paradiseus*				**1**						**1**	**1**	**1**
54	Dicruridae	*Dicrurus annectans*				**1**						**1**		
55	Dicruridae	*Dicrurus hottentotus*				**1**						**1**		
56	Eurylaimidae	*Corydon sumatranus*				**1**						**1**		
57	Eurylaimidae	*Cymbirynchus macrorhynchus*				**1**							**1**	
58	Eurylaimidae	*Eurylaimus javanicus*				**1**						**1**	**1**	**1**
59	Eurylaimidae	*Eurylaimus ochromalus*			**1**							**1**	**1**	**1**
60	Eurylaimidae	*Calyptomena viridis*			**1**							**1**		
61	Falconidae	*Microhierax fringillarius*				**1**		**1**	**1**				**1**	
62	Hemiprocnidae	*Hemiprocne comate*				**1**						**1**	**1**	**1**
63	Hemiprocnidae	*Hemiprocne longipennis*				**1**						**1**	**1**	
64	Hirundinidae	*Hirundo tahitica*				**1**							**1**	
65	Hirundinidae	*Hirundo rustica*												**1**
66	Irenidae	*Irena puella*				**1**						**1**	**1**	**1**
67	Laniidae	*Pityriasis gymnocephala*			**1**					**1**				
68	Meropidae	*Merops viridis*				**1**							**1**	
69	Meropidae	*Merops philippinus*									**1**			**1**
70	Meropidae	*Nyctyornis amictus*				**1**						**1**	**1**	**1**
71	Monarchidae	*Hypothymis azurea*				**1**						**1**	**1**	**1**
72	Monarchidae	*Terpsiphone paradisi*				**1**						**1**	**1**	
73	Muscicapidae	*Rhinomyias umbratilis*			**1**							**1**		
74	Muscicapidae	*Cyornis superbus*				**1**				**1**		**1**		
75	Muscicapidae	*Culicicapa ceylonensis*				**1**						**1**		
76	Nectariniidae	*Arachnothera longirostra*				**1**			**1**			**1**	**1**	**1**
77	Nectariniidae	*Arahnothera crassirostris*				**1**			**1**			**1**		
78	Nectariniidae	*Arachnothera flavigaster*				**1**			**1**				**1**	**1**
79	Nectariniidae	*Anthreptes singalensis*				**1**			**1**			**1**	**1**	
80	Nectariniidae	*Anthreptes rhodolaema*			**1**				**1**			**1**		

No	Family	Scientific Name	IUCN				CITES					Transect		VES
			EN	VU	NT	LC	I	II	RI	End	Mig	LS 1	LS 2	L.Satong
81	Nectariniidae	*Anthreptes makacensis*				**1**			**1**			**1**	**1**	**1**
82	Nectariniidae	*Aethopyga siparaja*				**1**			**1**			**1**	**1**	
83	Nectariniidae	*Anthreptes simplex*				**1**			**1**				**1**	
84	Nectariniidae	*Hypogramma hypogrammicum*				**1**			**1**			**1**	**1**	**1**
85	Nectariniidae	*Leptocoma sperata*				**1**			**1**			**1**	**1**	**1**
86	Oriolidae	*Oriolus xanthonotus*			**1**							**1**	**1**	**1**
87	Phasianidae	*Argusianus argus*			**1**				**1**				**1**	
88	Phasianidae	*Lophura ignita*			**1**									**1**
89	Phasianidae	*Rollulus rouloul*			**1**							**1**	**1**	
90	Picidae	*Dendrocopos canicapillus*											**1**	
91	Picidae	*Dryocopus javensis*				**1**						**1**	**1**	
92	Picidae	*Hemicircus concretus*				**1**						**1**	**1**	**1**
93	Picidae	*Meiglyptes tukki*			**1**							**1**	**1**	
94	Picidae	*Meiglyptes tristis*				**1**						**1**		
95	Picidae	*Picus miniaceus*				**1**						**1**	**1**	
96	Picidae	*Reinwardtipicus validus*				**1**						**1**		**1**
97	Picidae	*Micropternus brachyurus*				**1**						**1**	**1**	
98	Picidae	*Sasia abnormis*				**1**						**1**	**1**	
99	Picidae	*Picus mentalis*				**1**						**1**		
100	Picidae	*Blythipicus rubiginosus*				**1**							**1**	
101	Pittidae	*Pitta granatina*			**1**				**1**				**1**	
102	Pittidae	*Pitta baudii*		**1**					**1**	**1**		**1**		
103	Platyseridae	*Philentoma velatum*			**1**								**1**	
104	Platyseridae	*Philentoma pyrhopterum*				**1**						**1**	**1**	
105	Ploceidae	*Lonchura fuscans*				**1**				**1**		**1**	**1**	**1**
106	Podargidae	*Batrachostomus cornutus*				**1**						**1**		
107	Podargidae	*Batrachostomus stellatus*			**1**								**1**	
108	Psittacidae	*Loriculus galgulus*				**1**		**1**				**1**	**1**	**1**
109	Psittacidae	*Psittacula longicauda*			**1**			**1**				**1**		
110	Psittacidae	*Psittinus cyanurus*			**1**			**1**				**1**	**1**	
111	Pycnonotidae	*Criniger phaeocephalus*				**1**						**1**	**1**	
112	Pycnonotidae	*Criniger ochraceus*										**1**	**1**	
113	Pycnonotidae	*Criniger bres*				**1**							**1**	
114	Pycnonotidae	*Iole olivacea*			**1**							**1**		
115	Pycnonotidae	*Ixos malaccensis*			**1**							**1**		
116	Pycnonotidae	*Pycnonotus brunneus*				**1**						**1**	**1**	
117	Pycnonotidae	*Pycnonotus erythropthalmos*				**1**						**1**	**1**	
118	Pycnonotidae	*Pycnonotus melanoleucos*			**1**								**1**	
119	Pycnonotidae	*Pycnonotus simplex*				**1**						**1**	**1**	
120	Pycnonotidae	*Pycnonotus cyaniventris*			**1**							**1**		

No	Family	Scientific Name	IUCN				CITES					Transect		VES
			EN	VU	NT	LC	I	II	RI	End	Mig	LS 1	LS 2	L.Satong
121	Pycnonotidae	*Pycnonotus squamatus*			**1**							**1**		
122	Pycnonotidae	*Pycnonotus goiavier*				**1**							**1**	**1**
123	Pycnonotidae	*Tricholestes criniger*				**1**						**1**		
124	Pycnonotidae	*Pycnonotus atriceps*				**1**						**1**	**1**	
125	Rallidae	*Amaurornis phoenicurus*				**1**								**1**
126	Rhipiduridae	*Rhipidura javanica*				**1**			**1**				**1**	**1**
127	Rhipiduridae	*Rhipidura perlata*				**1**						**1**	**1**	
128	Scolopacidae	*Actitis hypoleucos*				**1**								**1**
129	Sittidae	*Sitta frontalis*				**1**						**1**		
130	Strigidae	*Ketupa ketupu*				**1**		**1**						**1**
131	Strigidae	*Ninox scutulata*				**1**		**1**				**1**	**1**	
132	Strigidae	*Strix leptogrammica*				**1**		**1**					**1**	
133	Strigidae	*Otus lempiji*				**1**		**1**				**1**	**1**	
134	Strigidae	*Otus rufescens*			**1**			**1**				**1**	**1**	
135	Sturnidae	*Gracula religiosa*				**1**		**1**	**1**			**1**	**1**	**1**
136	Sylviidae	*Orthotomus ruficeps*				**1**						**1**	**1**	**1**
137	Sylviidae	*Orthotomus sericeus*				**1**						**1**	**1**	**1**
138	Sylviidae	*Orthotomus atrogularis*				**1**						**1**	**1**	**1**
139	Sylviidae	*Prinia flaviventris*				**1**						**1**	**1**	**1**
140	Timaliidae	*Alcippe brunneicauda*			**1**							**1**	**1**	
141	Timaliidae	*Macronous gularis*				**1**						**1**	**1**	
142	Timaliidae	*Macronous ptilosus*			**1**							**1**	**1**	
143	Timaliidae	*Malacopteron affine*			**1**							**1**	**1**	
144	Timaliidae	*Malacocincla malaccense*			**1**	**1**						**1**	**1**	**1**
145	Timaliidae	*Trichastoma rostratum*			**1**							**1**	**1**	
146	Timaliidae	*Malacopteron magnirostre*				**1**						**1**		**1**
147	Timaliidae	*Malacopteron magnum*			**1**							**1**		
148	Timaliidae	*Pellorneum capistratum*				**1**						**1**	**1**	**1**
149	Timaliidae	*Stachyris leucotis*			**1**							**1**		**1**
150	Timaliidae	*Stachyris poliocephala*				**1**						**1**	**1**	**1**
151	Timaliidae	*Stachyris erythroptera*				**1**						**1**	**1**	**1**
152	Timaliidae	*Stachyris maculata*			**1**							**1**	**1**	**1**
153	Timaliidae	*Stachyris nigricollis*			**1**							**1**	**1**	
154	Trogonidae	*Harpactes duvaucelii*			**1**				**1**			**1**	**1**	**1**
155	Trogonidae	*Harpactes orrophaeus*			**1**				**1**			**1**		**1**
156	Turdidae	*Copsychus malabaricus*				**1**						**1**	**1**	**1**
157	Turdidae	*Copsychus saularis*				**1**						**1**	**1**	**1**
158	Tytonidae	*Phodilus badius*				**1**		**1**					**1**	**1**

Appendix 3.List of herpetofauna species that were recorded in *HutanDesa*LamanSatong.

No.	Species Name	Conservation Status			Endemic	Transects		Outside transects
		IUCN	CITES	RI		LS 1	LS 2	
Amphibians								
Bufonidae								
1	Bufo divergens	LC				2	1	
Dicroglossidae								
2	Fejervarya limnocharis	LC					1	
3	Limnonectes kuhlii	LC				1	1	
Megophryidae								
4	Leptobrachium nigrops	LC					1	
5	Leptolalax cf dringi	NT			1	1		
6	Megophrys nasuta	LC				1		
Microhylidae								
7	Metaphrynella sundana	LC				1		
Ranidae								
8	Rana raniceps	LC			1			
Rhacophoridae								
9	Polypedates macrotis	LC				1	1	
Reptiles								
Agamidae								
10	Draco melanopogon	NE				1		
11	Draco sumatranus	NE				1		
12	Gonocephalus doriae	NE			1			
Bataguridae								
13	Cuora amboinensis kamaroma	VU	II					1
Colubridae								
14	Psammodynastes pulverulentus	NE				1		
Elapidae								
15	Naja sumatrana*	NE	II			1		
Gekkonidae								
16	Cyrtodactylus malayanus	NE			1	1	1	
17	Cyrtodactylus sp	NE			1	1		
Pythonidae								
18	Python breitensteini*	NE	II		1			1
19	Python reticulatus *	NE	II					1
Scincidae								
20	Eutropis multifasciata	NE				1		
21	Eutropis rudis	NE				1		
Trionychidae								
22	Amyda cartilaginea	VU	II					1
Varanidae								
23	Varanus salvator*	LC	III					1
Viperidae								
24	Tropidolaemus subannulatus	NE				1	1	
	* = likely present							

Appendix 4. List of vegetation species that were recorded in *HutanDesa*LamanSatong

No	Family	*Species*	Refference/web/Herbarium
1	Asteraceae	*Vernonia arborea* Buch.-Ham	
2	Euphorbiaceae	*Endospermum diadenum* (Miq.) Airy Shaw	
3	Euphorbiaceae	*Macaranga gigantea* (Reichb.f. & Zoll.) Mull.Arg.	
4	Euphorbiaceae	*Macaranga winkleri* Pax & K.Hoffm.	
5	Myrtaceae	*Syzygium aff.leptostemon* (Korth.)Merr.&Perr.	S21762 (Sarawak)
6	Rhamnaceae	*Zyzyphus sp*	
7	Verbenaceae	*Vitex pinnata* L.	
8	Asteraceae	*Vernonia arborea* Buch.-Ham	
9	Dipterocarpaceae	*Shorea laevis* Ridl.	WAN0002452 (Wanariset)
10	Euphorbiaceae	*Hevea brasilliensis*	
11	Euphorbiaceae	*Macaranga gigantea* (Reichb.f. & Zoll.) Mull.Arg.	
12	Euphorbiaceae	*Macaranga winkleri* Pax & K.Hoffm.	
13	Euphorbiaceae	*Mallotus tiliifolius* (Blume) Müll.Arg.	
14	Fabaceae	*Archidendron jiringa* (Jack) Nielsen	
15	Sterculiaceae	*Scaphium macropodum* (Miq.) Beumee ex Heine	S68116 (Sarawak)
16	Tilliaceae	*Grewia sp*	
17	Tilliaceae	*Microcos sp*	
18	Dipterocarpaceae	*Shorea parvistipulata* Heim	
19	Ebenaceae	*Dyospyros sp1*	
20	Elaeocarpaceae	*Elaeocarpus sp1*	
21	Euphorbiaceae	*Macaranga gigantea* (Reichb.f. & Zoll.) Mull.Arg.	
22	Fabaceae	*Parkia speciosa* Hassk.	S76(Sarawak)
23	Flacourtiaceae	*Hydnocarpus aff.gracilis* (Sloot.)Sleum.	S36978(Sarawak)
24	Moraceae	*Artocarpus sp*	
25	Myrtaceae	*Syzygium sp1*	
26	Olacaceae	*Strombosia aff.ceylanica* Gardn	
27	Rubiaceae	*Nauclea aff.subdita* (Korth.) Steud.	
28	Sonneratiaceae	*Duabanga moluccana* Blume	
29	Tilliaceae	*Microcos triflora* (Blanco) R.C.K.Chung	
30	Verbenaceae	*Clerodendrum inerme* (L.) Gaertn.	
31	Verbenaceae	*Clerodendrum inerme* (L.) Gaertn.	
32	Annonaceae	*Annonaceae 1*	
33	Burseraceae	*Dacryodes sp1*	
34	Ebenaceae	*Dyospyros sp2*	
35	Euphorbiaceae	*Baccaurea sp1*	
36	Euphorbiaceae	*Endospermum diadenum* (Miq.) Airy Shaw	
37	Euphorbiaceae	*Euphorbiaceae 1*	
38	Euphorbiaceae	*Mallotus sp1*	
39	Moraceae	*Artocarpus elasticus* Reinw. ex Blume	
40	Sapindaceae	*Nephelium lappaceum* L.	S43972(Sarawak)
41	Asteraceae	*Vernonia arborea* Buch.-Ham	
42	Bombacaceae	*Durio zibethinus* Murray, Syst. Nat.	
43	Euphorbiaceae	*Euphorbiaceae 1*	
44	Euphorbiaceae	*Macaranga gigantea* (Reichb.f. & Zoll.) Mull.Arg.	
45	Euphorbiaceae	*Macaranga winkleri* Pax & K.Hoffm.	
46	Meliaceae	*Aglaia sp1*	
47	Moraceae	*Artocarpus elasticus* Reinw. ex Blume	
48	Fabaceae	*Archidendron jiringa* (Jack) Nielsen	