

**Wildlife Conservation Society – Lao PDR Program  
and  
The National University of Laos**

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***Wildlife Hunting and Use Near the  
Nam Kading National Protected Area,  
Bolikhamxay Province***

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**2005-06 Student Research Project  
Technical Report**



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Cover Illustrations: Far Left: Students train at Muang Mai Forestry School, Middle: Students and trainers, Far right: Land use map Photos: Chris Hallam (WCS Lao)

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## 2 Executive Summary

ເນື້ອໃນຂອງບົດລາຍງານສະບັບນີ້ແມ່ນຜົນໄດ້ຮັບຂອງການສຳຫຼວດໂດຍນັກສຶກສາຂອງມະຫາໂລແຫ່ງຊາດ, ພະນັກງານຂອງໂຄງການຮັກສາລະບົບນິເວດ ແລະ ຄູມຄອງສັດປ່າຂອງປ່າສະຫງວນນ້ຳກະດິງ ແລະ ອົງການອະນຸລັກສັດປ່າປະຈຳລາວໃນ 8 ໝູ່ບ້ານທີ່ເປັນບູລິມະສິດທີ່ອາໄສຢູ່ອ້ອມຂ້າງປ່າສະຫງວນແຫ່ງຊາດນ້ຳກະດິງ ຂອງແຂວງບໍລິຄຳໄຊ ສປປ ລາວ ແຕ່ເດືອນ ມັງກອນ ຫາ ເມສາ ປີ 2006.

ການຄົ້ນຄວ້າໃນແນວໃສ່ການເກັບກຳຂໍ້ມູນກຽບກັບການບໍລິໂພກ ແລະ ວິທີການຫຼ່າສັດປ່າ ແລະ ເຂົ້າໃຈຂອງປະຊາຊົນທ້ອງຖິ່ນກ່ຽວກັບ 32 ຊະນິດພັນສັດປ່າທີ່ຢູ່ໃນ 8 ບ້ານເປົ້າໝາຍ ແລະ ຍັງໄດ້ໃຫ້ຄຳແນະນຳຕໍ່ການຄຸມຄອງປ່າສະຫງວນແຫ່ງຊາດນ້ຳກະດິງ.

ນອກຈາກນີ້ພວກເຮົາຍັງເອົາຊັ້ນຊີລາຍຊື່ ແລະ ໂຊຮູບຂອງສັດປ່າແຕ່ລະຊະນິດເພື່ອໃຫ້ຊາວບ້ານຜູ້ທີ່ບໍ່ເຂົ້າໃຈກ່ຽວກັບຊະນິດພັນທີ່ນອນຢູ່ໃນກຸ່ມດຽວກັນ. ຕົວຢ່າງ: ນົກເຂົາ (Pale-capped pigeon) ແລະ ຊະນິດອື່ນຂອງນົກເຂົາ, ໝູ່ປ່າ (palm civet) ແລະ ໝູ່ປ່າຊະນິດອື່ນ. ດັ່ງນັ້ນ ຢູ່ໃນການອະທິບາຍນີ້, ພວກເຮົາຕ້ອງໄດ້ເຂົ້າໃຈຢ່າງຈະແຈ້ງຕໍ່ບັນຫາດັ່ງກ່າວ.

ບັນດາຊະນິດພັນສັດປ່າທີ່ນຳສະເໜີແມ່ນຍົກໃຫ້ເຫັນຕົວຢ່າງຂອງກຸ່ມຫຼື ຕະກູນຂອງສັດປ່າຈຳພວກໜຶ່ງ. ແມ່ນອນວ່າ, ການນຳສະເໜີນີ້ບໍ່ແມ່ນນຳສັດປ່າຊະນິດໃດໜຶ່ງເຊັ່ນ: ການອະທິບາຍກ່ຽວກັບຊ້າງອາດຈະເປັນການງາຍ.

ການສຶກສາຄົ້ນຄວ້ານີ້ແມ່ນໄດ້ພົບຫຼາຍໆຊະນິດພັນສັດປ່າແມ່ນຖືກຫຼ່າໂດຍຊາວບ້ານເພື່ອເປັນອາຫານ ແລະ ໃຊ້ເປັນຢາ ທີ່ຢູ່ໃນເຂດປ່າສະຫງວນທີ່ຫວງທຳມະຊາດ. ຫຼາຍວິທີການຫຼ່າແມ່ນ

ໄດ້ລະບຸ ແລະ ບົ່ງບອກເຖິງການອະນຸລັກປ່າໄມ້ຂອງຊາວບ້ານ ຫຼື ປ່າສະຫງວນແຫ່ງຊາດນ້ຳກະດິງ,

ຈຸດສຳຄັນແມ່ນລະບຸເຖິງແຫຼ່ງທີ່ຢູ່ອາໄສຂອງສັດໃນປ່າໄມ້ ແລະ ທັງເປັນແຫຼ່ງທີ່ສຳຄັນຂອງອາຫານ

ອີກດ້ວຍ. ຕາມການລາຍງານຂອງຊາວບ້ານໄດ້ໃຫ້ຮູ້ວ່າ ມີນັກຫຼ່າຈາກບ້ານອື່ນລັກລອບເຂົ້າມາບຸກ

ລຸກຢູ່ຂົງເຂດບ້ານຂອງເຂົາເຈົ້າ ສະນັ້ນ ດ້ວຍສາຍເຫດດັ່ງກ່າວ ຈຶ່ງເປັນບັນຫາໃຫ້ຊາວບ້ານນັ້ນຍາກ

ຕໍ່ການຄຸມຄອງແຫຼ່ງທຳມະຊາດໃຫ້ຍືນຍົງໄດ້. ເຊັ່ນວ່າ ເປັນແຫຼ່ງ ທາດໂປຼຕິນ, ເຮັດໃຫ້ນັກຫຼ່າທັງ

ຫຼາຍບົ່ງບອກເຖິງຄວາມນິຍົມພາຍໃນການບໍລິໂພກຊັ້ນສັດປ່າ ແລະ ຊັ້ນປາ. ການຊຸກຍູ້ ການຄຸມ

ຄອງແຫຼ່ງທຳມະຊາດແບບຍືນຍົງຈະຊ່ວຍໃຫ້ລະບົບການດຳລົງຊີວິດຂອງຊາວບ້ານໃຫ້ດີຂຶ້ນໃນອະນາຄົດ.

ມີຊາວບ້ານຈຳນວນໜຶ່ງ ທີ່ໄດ້ຮູ້ການທຳມະຊາດລັກລອບຫຼ່າສັດປ່າເພື່ອເປັນອາຫານ ສຳລັບ 7 ຊະນິດພັນທີ່ສຳຄັນ

ທີ່ບົ່ງບອກເຖິງທຳມະຊາດເສີມການຫຼ່າສັດ ຫຼື ສົມຮູ້ຮ່ວມຄິດກັນເພື່ອວາງ

ແຜນການຫຼ່າສັດ ແລະ ການຄຸມຄອງຈະຕ້ອງໄດ້ພິຈາລະນາເພື່ອເປັນເຄື່ອງມືໃນການຈັດການ.

ໂດຍທົ່ວໄປແລ້ວ, ແມ່ນໄດ້ລາຍງານ ແລະ ບົ່ງບອກເຖິງການພັກດັນໃຫ້ມີການຢຸດຕິການ

ທຳລາຍແຫຼ່ງທຳມະຊາດ ແລະ ທັງເປັນແຫຼ່ງອາຫານທີ່ສຳຄັນ.

ທັງໝົດແມ່ນໄດ້ກ່າວເຖິງ ການຫຼ່າສັດປ່າເປັນປະຈຳ ເພື່ອເປັນອາຫານ ແລະ ຄ້າຂາຍສັດ  
ປ່າທີ່ຫາຍາກໃນລາຄາແພງ. ຕໍ່ບັນຫາດັ່ງກ່າວແມ່ນໄດ້ເລັ່ງໃສ່ການຫຼຸດການຫຼ່າສັດແບບດັບສູນ ແລະ  
ເປັນບັນຫາທີ່ນຳໄປສູ່ການດຳລົງຊີວິດ ແລະ ການອະນຸລັກຊີວະນາໆພັນ ໃນເຂດປ່າສະຫງວນ  
ແຫ່ງຊາດນ້ຳກະດິງ ແລະ ເປັນວຽກທີ່ເປັນບູລິມະສິດທີ່ຈະຕ້ອງໄດ້ປະຕິບັດຂອງໂຄງການIEWMP.  
ການຄັດແຍງລະຫວ່າງຄົນກັນສັດ ແມ່ນໄດ້ນຳສະເໜີໃຫ້ຊາວບ້ານໄດ້ຮັບຮູ້. ຕໍ່ກັບບັນຫາດັ່ງກ່າວນີ້  
ແມ່ນຕ້ອງການຄວາມຊ່ວຍເຫຼືອ ແລະ ເອົາໃຈໃສ່ຕໍ່ວຽກງານດັ່ງກ່າວເພື່ອການຄຸມຄອງປ່າສະ  
ຫງວນແຫ່ງຊາດນ້ຳກະດິງຮ່ວມກັບຊາວບ້ານທີ່ຍັງບໍ່ທັນໄດ້ເຂົ້າໃຈໃນການອະນຸລັກສັດປ່າໃຫ້ເຂົ້າ  
ໃຈຢ່າງເລິກເຊິ່ງ.

## Executive Summary

This report details the results of surveys conducted by students from the National University of Laos, and staff of the Integrated Ecosystem and Wildlife Management Project and the Wildlife Conservation Society Lao Program in eight villages around the Nam Kading National Protected Area (NKNPA) in Bolikhamxay Province Lao PDR from January-April 2006.

The research aimed to collect data on wildlife use, and hunting techniques, and perceptions of local abundance of 32 types of wild animals in the eight target villages and to make recommendations to NKNPA management. Although we give species names and show photos of species, we understand that villagers may not distinguish between species that are similar in the same group. Eg. Pale-capped pigeon and other pigeons, common palm civet and other civets. Thus in the interpretation, we must be careful to make this clear. The species shown are likely representative of a group of animals. Of course, this is not the case for some species such as elephant thus interpretation here will be easier.

The research found that a wide variety of animals are hunted and used for food and medicine by villages in the NPA management zone. Many of the best hunting areas were identified as being within village conservation forest or within the NKNPA, pointing to the value of these habitats as sources of food. All villages reported that outsiders coming into village areas to harvest resources was a problem for villagers in the sustainable management of their resources. As a protein source, respondents indicated a preference for fish over domestic or wild meat. Encouraging the sustainable management of these protein sources will help to ensure diverse and resilient livelihood systems for villagers. A small number of respondents reported taboos on eating or hunting for seven species. The encouragement of taboos, or the incorporation of these beliefs into education material and management should be investigated further as a management tool.

Generally, wildlife species were reported to be in decline including those that are important for food. Those that were reported as hunted more frequently corresponded to high consumption and sale rates and higher-priced species. These declines suggest unsustainable harvesting and thus have important repercussions for livelihoods and conservation of biodiversity in the NKNPA and should be urgently addressed by the IEWMP. Wildlife human conflict was reported in all villages. These issues will need to be addressed by NKNPA management with villages as they are seen as a negative aspect of wildlife.

### **3 Introduction**

#### **3.4 Background to the Student Research Project**

In October 2002 the Wildlife Conservation Society – Lao PDR Program (WCS) and the National University of Laos (NUoL) entered into a two-year memorandum of understanding (MoU). Five different activities are incorporated into the MoU, one of which is a Student Research Project which provides field research training and experience for final year Bachelor of Forestry and Bachelor of Science students.

Each year, WCS technical staff work with up to 10 students and their professors from the Faculties of Science and Forestry to design a field research project, provide training in research methods, and provide training, lodging and materials for the students to conduct the research project. WCS technical staff also provide technical assistance to students to manage and statistically analyse their data for completion of their university thesis requirements for graduation.

The overall objective of the Student Research Project (SRP) is to increase student capacity in field research into biodiversity by:

- ☐ Increasing student knowledge of field survey techniques,
- ☐ Training students in data collection, organisation and data analysis, and
- ☐ Providing equipment and facilities support to students to complete theses.

The Project also provides valuable data to conservation project managers and contributes to technical reports and journal articles on that status and conservation of wildlife in Lao PDR. In 2005-2006, the SRP worked entirely with the IEWMP, which included support for 10 students: four students from each of the Faculties of Science and Faculty of Forestry at NUoL, and two students from the Bolikhamxay Forest Technical School.

#### **3.5 Objectives of the 2005-2006 Student Research Project**

The 2005-2006 SRP focused on wildlife consumption in Bolikhamxay province. The objectives of the Project were to:

- ☐ Determine the extent of, and processes employed in, wildlife use and hunting by villages on the border of the Nam Kading NPA (refer to section 4.2),
- ☐ Conduct baseline land use mapping and forest product use by villages on the border of the Nam Kading NPA.

#### **3.6 Rationale**

Hunting is an important activity of many of the rural inhabitants in Lao PDR and the quarry from these hunts forms an important part of local diets (see (Clendon 2001; Krahn 2003; Krahn 2005). However, as a result of hunting methods becoming more sophisticated, increasing human population pressure and regional markets becoming more accessible through transport and communications improvements it is now generally accepted that wildlife is hunted unsustainably in Lao and in Southeast Asia more generally (Duckworth, Salter et al. 1999; Corlet 2007; Singh, Boonratana et al. 2007).

In November 2005, a strategic planning workshop for the Integrated Ecosystem and Wildlife Management Project indicated that 'overharvest for subsistence and trade' was one of the major

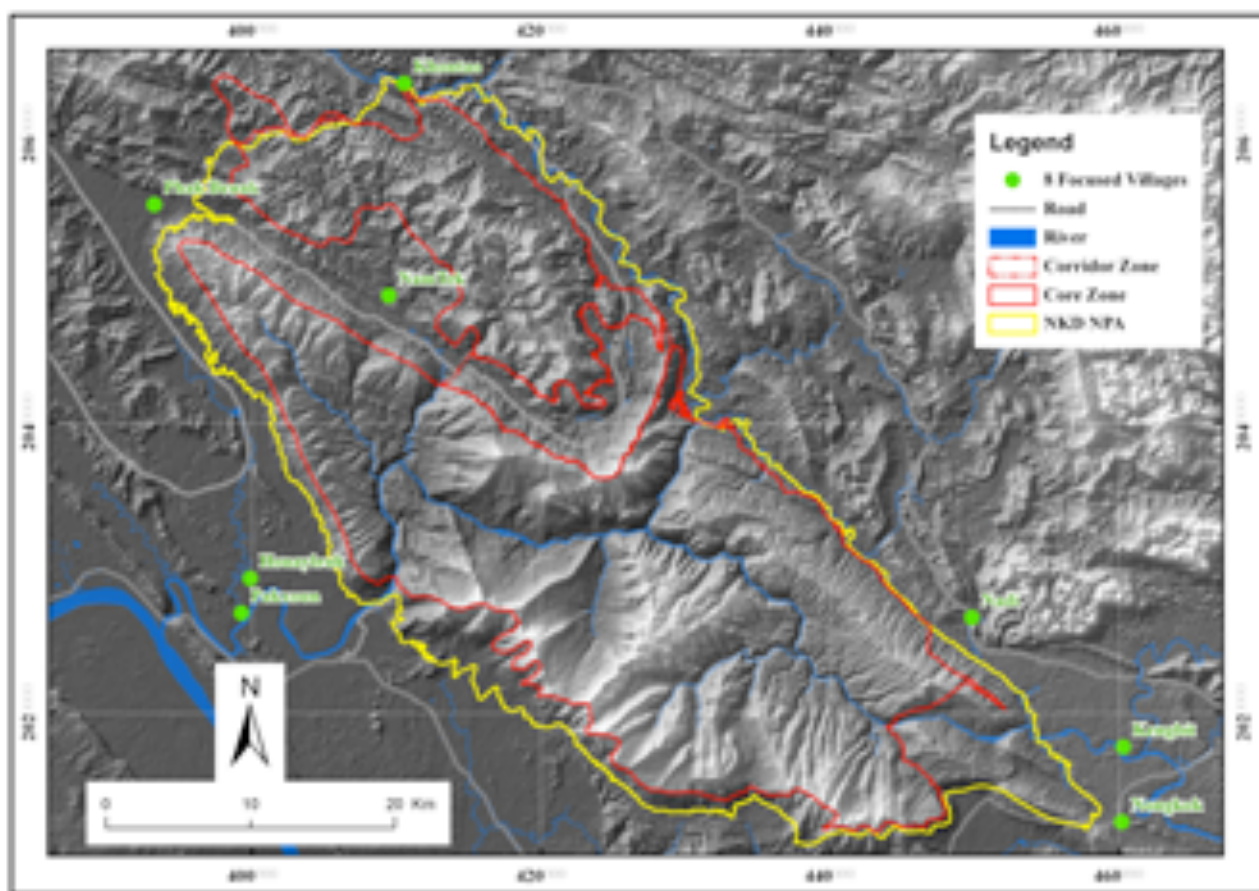


threats to the conservation of biodiversity in the Nam Kading NPA that is contributing to habitat depopulation and eventually to species extirpations (Johnson, Vannalath et al. 2006; Vannalath 2006). The purpose of this study was to gather a baseline of information on wildlife hunting and use on which to base management decisions. In addition, with the completion of the Nam Theun 1 hydro-power project scheduled for 2013, parts of the Nam Kading NPA will be permanently inundated with the formation of a reservoir (Gamada 2007). It is therefore critical to determine as much as possible about the environment in the NPA to inform planning for possible mitigation measures against current and future threats.

This report describes the methodology and results of a study undertaken into wildlife hunting, trade and use in the Nam Kading NPA (NKNPA). These results are then discussed in the context of future implications for management and options for community based management of wildlife resources.

## 4 Study Area

The research was conducted in 8 villages surrounding the NKNPA, in Bolikhamxay Province.(see figure 1) The NKNPA is located entirely in Bolikhamxay Province and covers an area of between 1442 to 1680 km<sup>2</sup> (IEWMP 2006). The Nam Kading forms one of three major watersheds in the province. Within the Nam Kading NPA the Nam Kading River primarily receives water from the Nam Mouan, Nam Xat, Nam Tek and Nam An.



**Figure 1: Nam Kading National Protected Area**

The majority of Bolikhamxay Province is mountainous, with terrain varying from the Mekong flood plain to steep karsts, narrow valleys and rolling hills. Mountain ranges follow a NW to SE orientation. The Nam Kading NPA ranges in elevation from 138m, to Phou Pa Paek (1,514m).

Mean annual rainfall ranges from 2,000mm to 3,300mm. Average monthly temperatures vary between 20 and 30 degrees Centigrade (PSTEO 2006)

Eighty-four percent of Nam Kading NPA is primary forest and 15% shows sign of human alteration either in regrowth, a woody- shrub land or grassland (NGD 2005). The Nam Kading NPA area was first assessed for its conservation value in 1991 by the World Conservation Union (IUCN) and the Department of Forestry who conducted interviews in several villages in the area as part of an assessment of the conservation value of the area (Berkmuller, Southammakhod et al. 1995). The NPA is home to at least 43 species of mammals and 234 species of birds (Duckworth et al., 1999). Reptile and amphibians have not been surveyed systematically.

The population of Bolikhamxay Province is 225,167 or 15 persons per km<sup>2</sup> (NCS b 2005), lower than the national average 24.6 persons/km<sup>2</sup>. Agriculture is the primary employment activity, with much of it at a subsistence level. The number of villages in the province in 2004 is reported at 327 (NSC 2005). Thirty-three ethnic groups are recorded in the province (NSC 1995 in MCTPC 2000). There are eight major groups, with the Lao Loum group (Meuy and Phouthai) accounting for over 80% of the population.

The long history of human occupation in this area has resulted in large areas of forest in the province being removed and replaced by secondary forest, bamboo thickets or savannas. The amount of time since, and the nature of the human impact will determine the kind and magnitude of forest regeneration. Seemingly pristine forests are also impacted by hunting for subsistence and trade. As a result some forests can be “empty” and animals’ behaviour can change as a result of harvest selection pressure on survivors. The long term result of removal of ecosystem components on the forest regeneration and ecosystem function is not known.

## 5. Methodology

### 5.1 Training

From January 18<sup>th</sup> -24<sup>th</sup> 2006, six WCS staff, 10 NUoL students, five professors and three IEWMP staff participated in seven days of training prior to conducting village visits. Appendix 1 summarizes the content of the training modules. The results of the training are reported in a separate report (see: Hallam et al. 2006)

### 5.2 Research

From January 26<sup>th</sup> -March 7<sup>th</sup>, 2006, surveys were conducted in eight villages in and adjacent to the Nam Kading NPA. The methodology employed in the research and analysis of data follows that used by Johnson *et al.* (2003) in a similar study in the Nam Ha NPA in Luang Namtha Province. Data from the research can be found in 2 and 3. The research team comprised eight students, four District Forestry staff and two WCS staff. The research team was supported by two drivers.

**Table 1: Survey Team Members**

Name	Position	Institution
Mr Souvanny Ounmany	Project manager	WCS
Ms Malaykham Dongdala	Technical officer	WCS
Ms Vanida	Forestry student	NUoL
Ms Sysomphan	Forestry student	NUoL
Ms Burevanhpheng	Science student	NUoL
Ms Phouvanh	Forestry student	PAFC
Mr Phouthakone	Forestry student	NUoL

Mr Soukphansa	Science student	NUoL
Mr Painxay	Forestry student	PAFC
Mr Phoutisak	Forestry student	NUoL

### *Village Selection*

The eight target villages for the IEWMP that were identified based on village's location (i.e. at major access points) around the Nam Kading NPA.

District Forestry staff identified these villages as frequently using and trading in wildlife products and as villages that have a history of human-wildlife conflict. The eight villages surveyed represent 35% (n=23) of the villages within 3km of the NKNPA boundary.

At each village, the team met with the village head to explain the purpose of the survey and to ask permission to conduct the survey in the village. The team was divided into four groups, each including two students. Three groups administered the household questionnaire survey while the fourth group worked with informants to compile maps of land use and the reported distribution of a small subset of 15 wildlife species (see Appendix 4) in each village area. Data collection was conducted over three to four days per village.

### *Household Questionnaires*

Households to be interviewed were identified with the assistance of the village head. Households were chosen based on the following criteria:

1. Households representing a range of socio-economic status, ethnicity, gender and age
2. Households active in wildlife use and consumption
3. Households knowledgeable of the area within 10km radius of the village.

At each household, a group of two students met with the head of the household (typically the mother and/or father) to explain the purpose of the survey and to ask permission to conduct the questionnaire.

The questionnaire (Appendix 5) was made up of 15 questions in two parts:

1. General village information
2. Wildlife hunting and use

Part two consisted of a set of eight questions related to hunting, trade and wildlife use, and nine questions asked about a set of 32 species (Appendix 4). The species were chosen based on their predicted occurrence in the Nam Kading NPA and were species thought to be commonly used by local people for food, medicine and/or trade. When asking about species, interviewers used picture cards of each animal. Most likely some pictures represent animals groups rather than the specific species. Eg: Inornate squirrel represents squirrels as a group. For more unmistakable and unique species such as Tigers or elephants responses are species specific. This should be taken into account when reviewing results. All interviews were conducted in Lao language.

Following surveys questionnaire data was entered into excel. General village information and information from individual species was summarized and compared between villages and is presented in the sections below.

### *Land Use and Wildlife Distribution Mapping*

This land use mapping survey had three objectives:

1. To collect information on local names for map features and to add detail to the existing topographic maps of eight target villages in the Nam Kading NPA.
2. To gather spatial information on village land use in the eight target villages in the Nam Kading NPA (e.g., Hunting areas, fishing areas, sites of cultural significance)

3. To map the reported distribution of 15 wildlife species (Appendix 3). The 15 species were a subset of the 32 and chosen based on conservation importance.

The village head identified groups of people to participate in the landuse mapping activity based on the same criteria used to identify households for the questionnaire survey. A group for NTFP collection and fisheries was also identified. The villagers provided information relating to natural and anthropogenic features of the landscape, which the research team transferred to A0 maps using a variety of coloured symbols. The villagers were then asked if the draft map was accurate and modifications were made as necessary.

Following the preparation of the base map, the villagers showed the research group the locations of relevant features in and around the village. The features included:

- Village facilities and natural landmarks such as water tanks, rivers, forest areas
- Locations of previous observations and signs (tracks, scats, etc) of the 15 wildlife species

These maps were later digitized using ArcView 3.2.

Each local landmark or feature was given a local name. These were linked to the map and the details stored in a GIS when digitized. Graphical data was digitized using ARCVIEW3.1 to produce land use maps of each village. Information on past and present animal distribution was used to create broad overview maps of the NKNPA showing possible habitats for animals now and in the past.

## 6. Results

### 6.1 Survey Villages and households

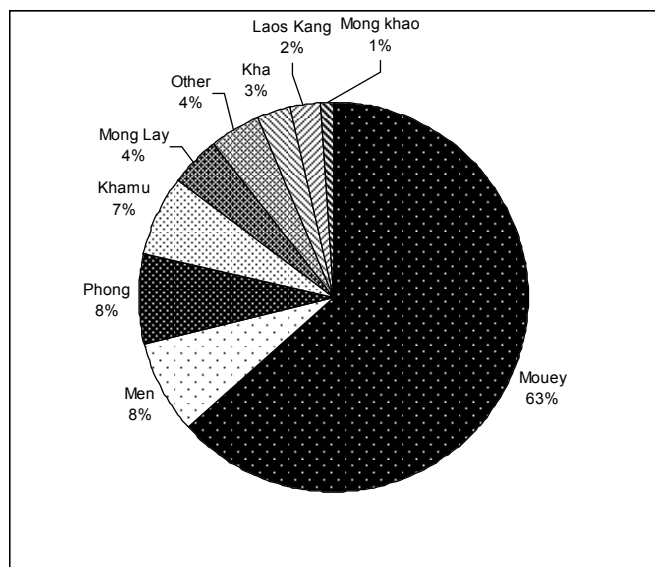
Between 18 and 24 households were interviewed in each village, representing a range of 9% to 31% of households per village (Table 2). Compared to the 2005 census(NSC 2005), the survey found that the number of households in seven of the eight villages had increased with the largest increase in Ban Phak Beuak (122 households). The average increase in the number of households across the eight villages was 31% most of this is accounted for by relocation of families into Ban Pak Buek as part of Government relocation program and voluntary migration from northern provinces. (pers com. M. Phakhounthong)

**Table 2: Number and percentage of households in each village and the number of households interviewed**

Village Name	District	# HH (this survey)	# HH (2005 census)	# HH interviewed	% HH interviewed
Kengbit	KK	102	105	21	20.59
Nongkok	KK	166	130	21	12.65
Paksoun	PKD	100	89	21	21.00
Houeyluek	PKD	103	84	21	20.39
Namtek	BLK	120	93	21	17.50
Pakbuek	BLK	265	143	24	9.06
Kontao	VT	59	46	18	30.51
Nadi	VT	93	82	21	22.58
		1008	772	168	16.67

Note: KK= Khamkert District, PKD= Pakkading District, BLK= Bolikhan District, VT=Vienthong District

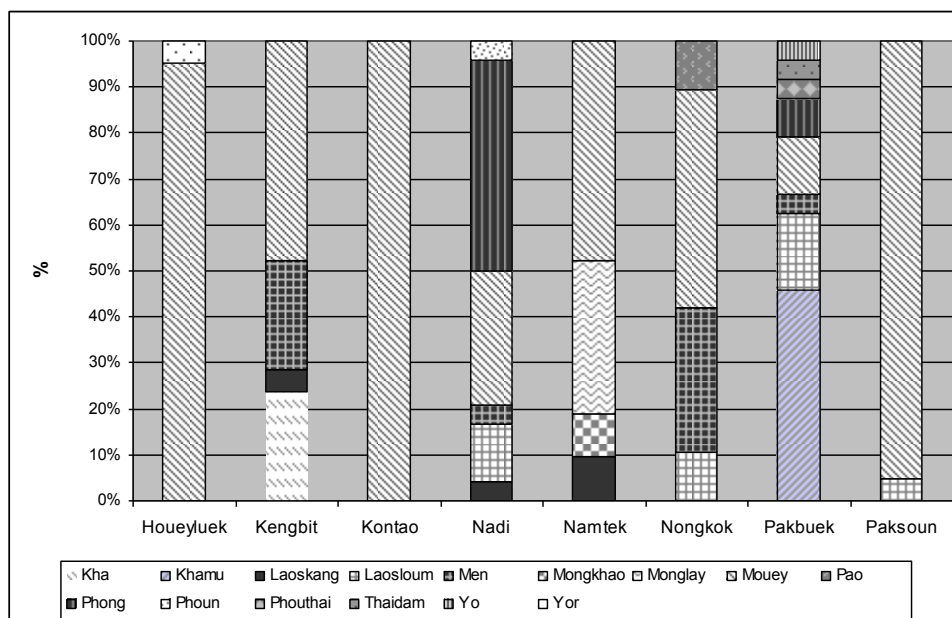
The average household size in villages surveyed was 6.35 people (n=168), which is above the national average of 5.9 (NSC 2005). Across all villages the majority of households were from the Mouey (63%) ethnic group (Figure 2).



**Figure 2: % of ethnic groups surveyed in 8 target villages (n=168)**

A total of 15 different ethnic groups were recorded during the survey with an average of 1.8 (n=15) per village.

The variety of ethnic groups present in villages varied greatly. Pak Beuak was the most heterogeneous (8 groups) while Khontao contained only one group (Figure 3).



**Figure 3: Variation in ethnic groups within villages**

The average age of villages reported from respondents was 24.5 years (5-61 years). Nam Tek is the most recently settled (5 years ago) village while Paksoun was the oldest, established 61 years ago. The period that respondents reported being settled in their current villages ranged from 1-51 years, with an average of 14 years (n=168). The wide variety of ethnic groups, some usually found in the northern regions of the country (e.g.: Khamu) and the recent arrival of some households and village establishment is likely due to recent government resettlement programs aimed at bringing remote communities closer to services (GoL 2004). A summary of general village statistics can be found in Appendix 6.

## 6.2 Wildlife Hunting

### Seasonal Hunting Effort

In response to the question about when people hunt for each type of animal (Appendix 5, question 4), respondents indicated that many wild animals are harvested in the mid to late wet season, from July-October. This is concerning as this period is also a time where hunting is restricted (see Wildlife and Aquatic Law 0360).

Where animals were not hunted the question was rephrased to state “when do you see this animal the most” thus information is obtained for Indochinese tiger and Asian elephants which are not reportedly hunted in the villages surveyed. This does not however represent hunting effort for this species and should be more viewed as the result of more time being spent in the forest in these periods. ie: people are in the forest more in these months and therefore see tigers more in this time.

Overall hunting effort increases in the wet season and early dry from June to November. From December to April there is a gradual decrease with the least effort being expended in April (Figure 4).

Hunting effort for rodents generally were reportedly harvested throughout the year with a slight increase in the wet season (June to October) (Figure 4) Single species tended to follow this pattern (Figure 5)

There is a marked increase in hunting effort for ungulates from June to September (Figure 4), corresponding to the majority of the wet season.

Wild pigs are hunted more at the end of the wet season around November when the weather starts to dry up. Wild pigs reportedly come out of the NKNPA during the dry season to find water near villages (pers comm.. M. Phakhunthong 2006). Sambar deer are reportedly not hunted at all during the months of March, April and May (Figure 6)

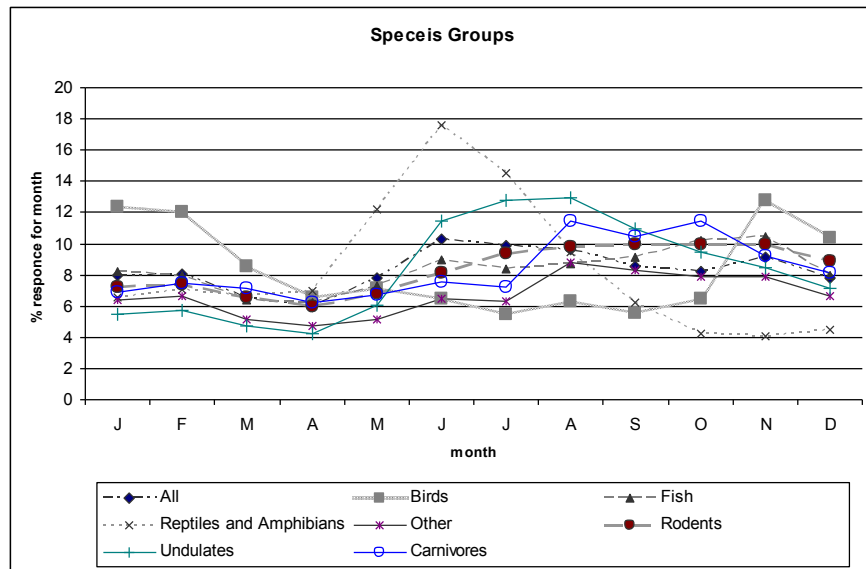
Villages reported that elephants were not hunted but tended to be seen more frequently from August to October (Figure 7).

Hunting effort for birds (Figure 8) peaked in the mid dry season whereas for amphibians and reptiles (Figure 9) peak harvest effort is in June corresponding with peak rainfall season. It should be noted that the majority of the species on the list are either aquatic reptiles or amphibians thus biasing the results.

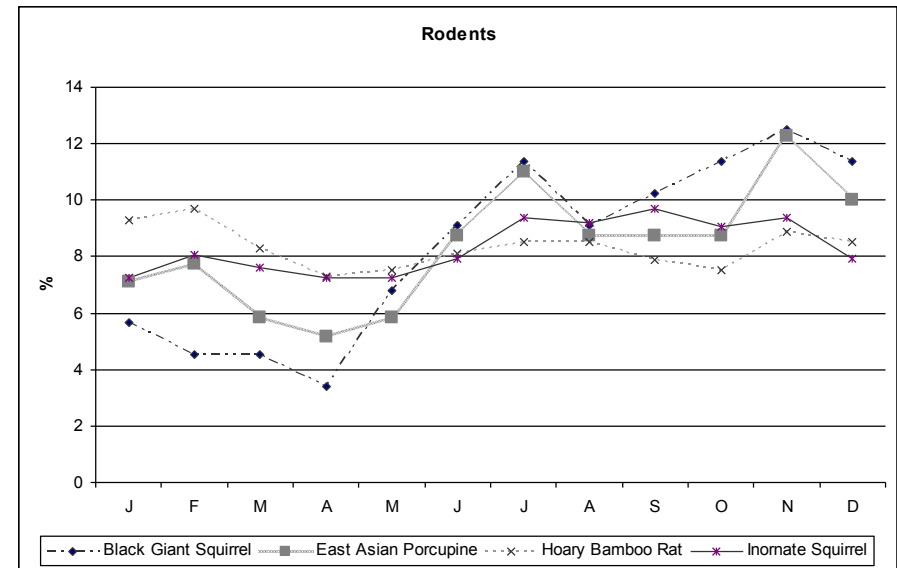
Fish peak harvest season was reported to be in the late wet to early dry season, around November with a low in the late dry season (March and April). For *Bargarius bargarius* and *Hemibargarius wyckoides* peak harvest was in November and December respectively. (Figure 10)

For carnivores: Tigers were not reported to be hunted but were more seen in the wet season (June-October) (Figure 11) More hunting effort is invested in civets during this same period.

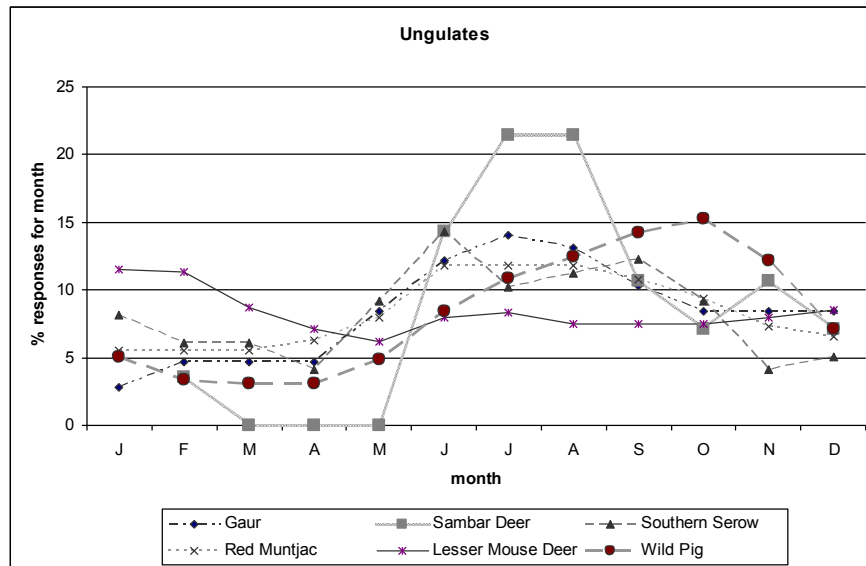




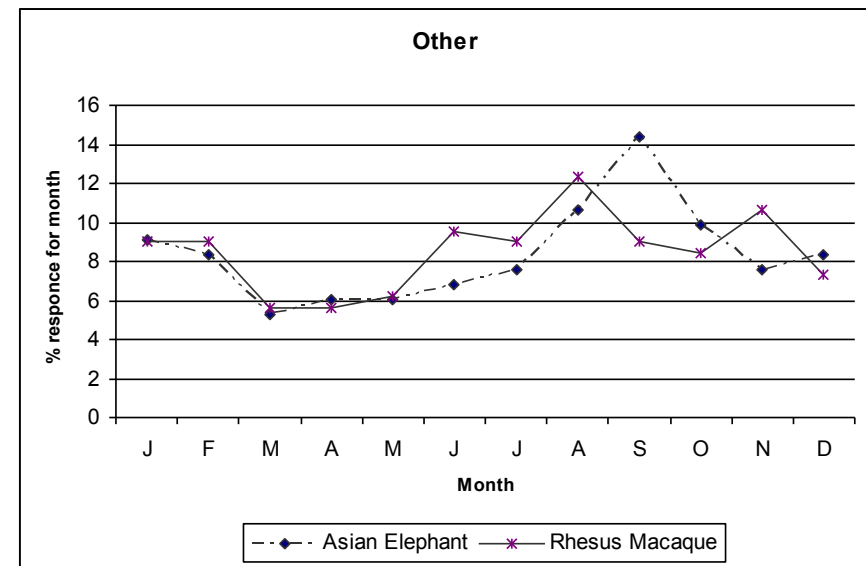
**Figure 4: Seasonal level of hunting (all species groups)**



**Figure 5: Seasonal level of hunting: Rodents**

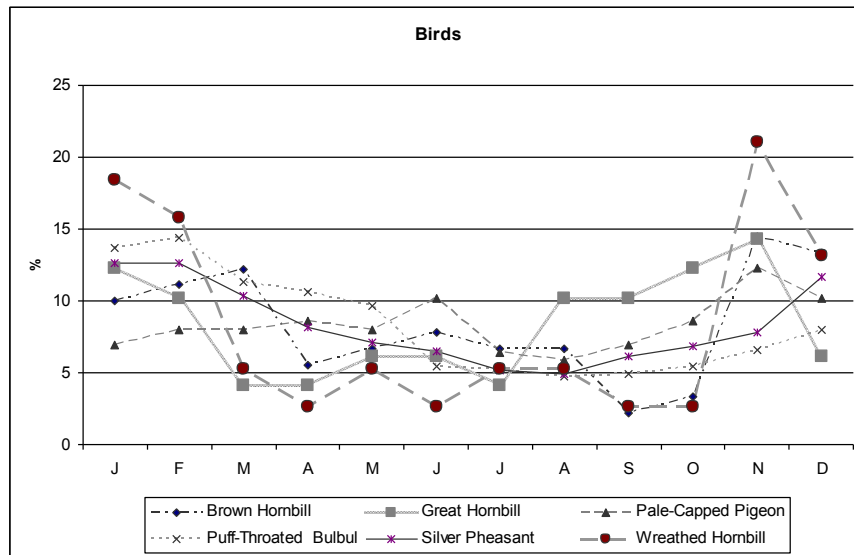


**Figure 6: Seasonal level of hunting: Ungulates**

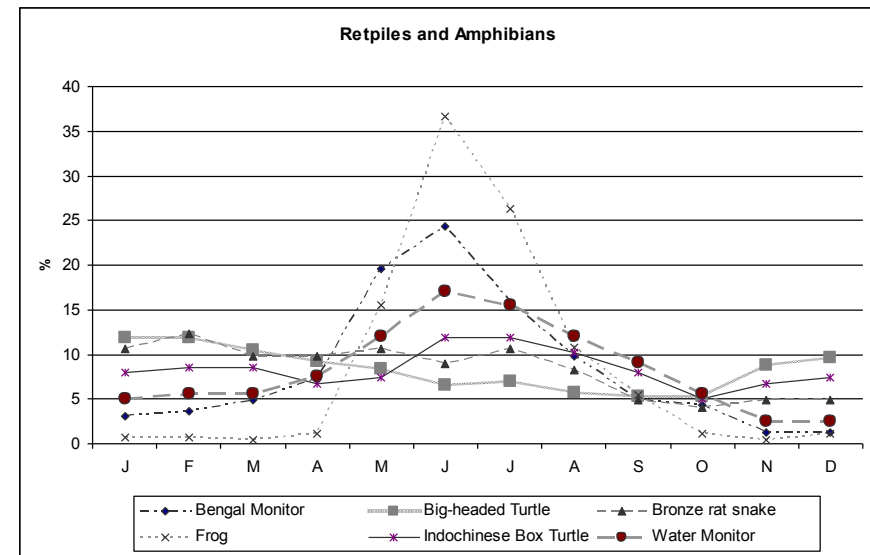


**Figure 7: Seasonal level of hunting: Other**

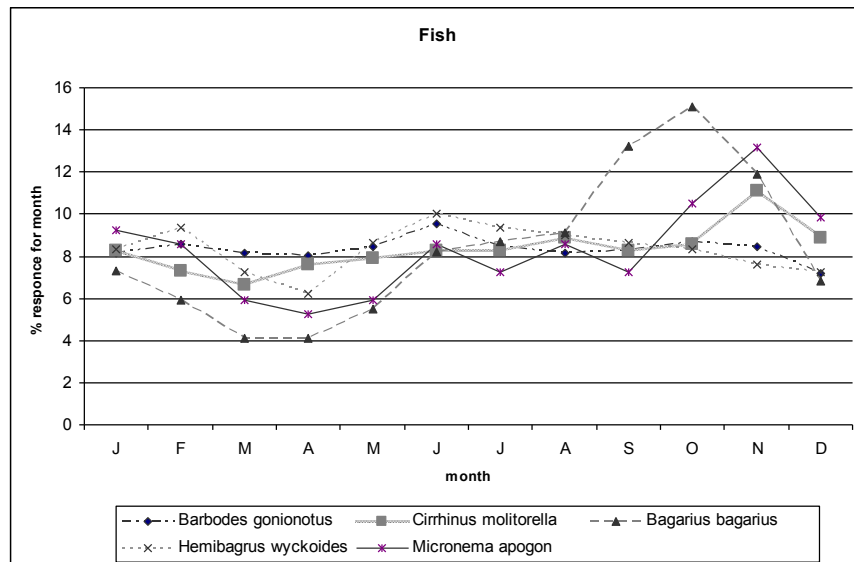




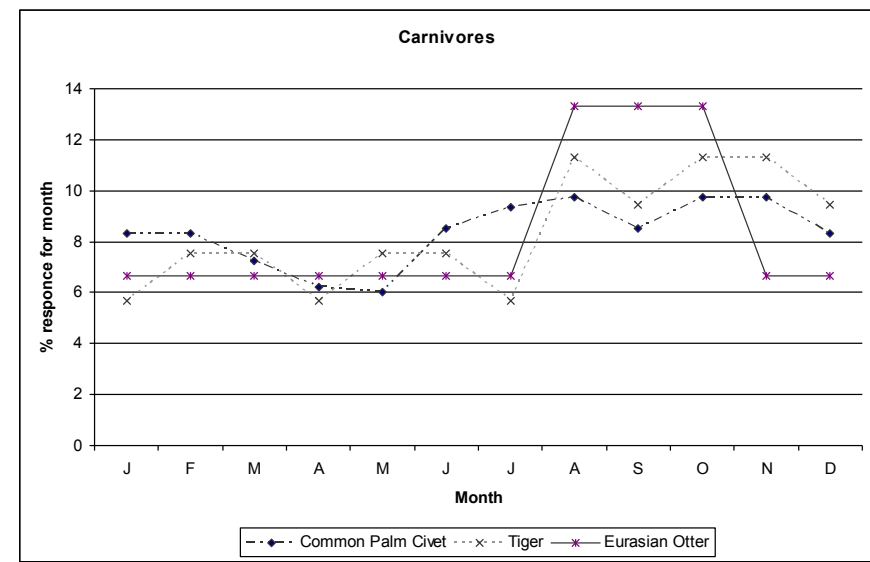
**Figure 8: Seasonal level of hunting: Birds**



**Figure 9: Seasonal level of hunting: Reptiles and Amphibians**



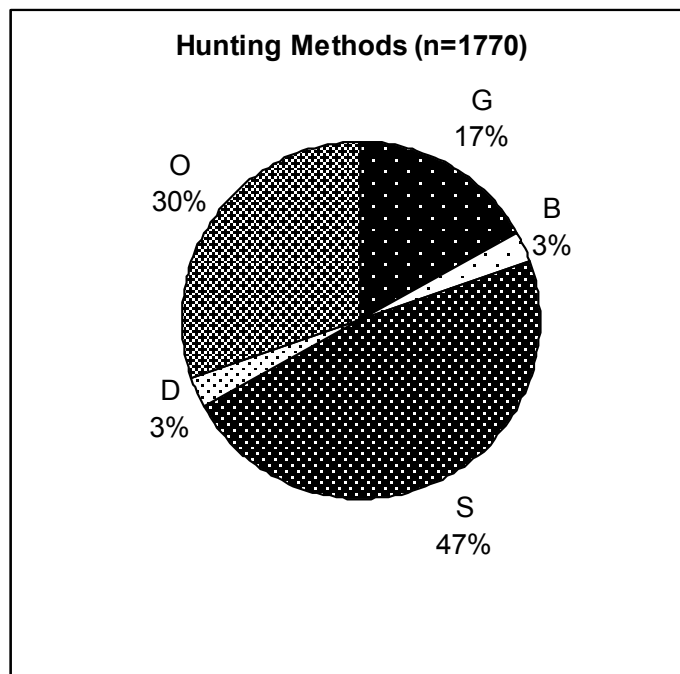
**Figure 10: Seasonal hunting level: Fish**



**Figure 11: Seasonal Hunting level: Carnivores**

### 6.2.2 Hunting Methods

For terrestrial wildlife and amphibians, snares are the most commonly used hunting technique (47%, n=1770) followed by other methods (30%, n=1770). Other methods included using torches, baiting, searching using dogs, and various other techniques discussed below. Fish are caught using various methods. These are also discussed below.



S=Snare, G= Gun, B= Crossbow, O=Other, D=Did not answer  
**Figure 12: Most frequently reported hunting methods**

Snares are the most frequently mentioned hunting technique for birds (44.7%, n=303; Figure 13) and reportedly most often for harvesting pheasants and pigeons. Notably for the two larger hornbills, guns are the more common technique (66.7%, n= 21). Smaller birds (eg: Puff throated bulbul) are reportedly hunted most frequently using other methods: using glue placed on branches with bait, and with slingshots.

Rodents (Figure 14) are hunted with a variety of methods that depended on the habitat of the animal.) Eg: Bamboo rats were mostly dug from their burrows while arboreal species such as the black giant squirrel were shot with guns. The most commonly reported techniques reported overall for rodents is snares (49% n=392). Small squirrels (represented by Inornate squirrel) were caught more with snares than other species surveyed.

For reptiles and amphibians (Figure 15) the most commonly reported hunting method was "other" (57.9%, n=409) "Other" included many different methods. Turtles are reported as hunted with dogs or caught using baited hooks. Frogs are simply collected using torches from suitable habitat. Monitor lizards are collected using looped rope or by cutting down trees. Rat-snakes are caught using nets or hit with a stick. The variety of techniques used most likely represents the varied habitats and lifecycles of the species.

Fish were all hunted using other methods including assorted nets, baited hook and traps. No figure is shown.

All ungulates except for Gaur are reported as hunted (Figure 16). The smaller ungulates are more readily reported as caught in snares (see mouse deer) where as the larger (wild pigs and sambar deer) are more reported as shot shot. There is an inverse correlation between body size and reported use of snares for hunting ( $r^2=-0.91$ )

Figure 17 shows that elephants are not hunted at all and that Rhesus Macaques are shot or caught with snares.

Figure 18 shows civets are caught mostly with snares and that otters with other methods. The other methods included the use of nets and bait. They are reportedly caught often as bi-catch as they get entangled in the fishing nets. Tigers were not reportedly hunted.

Legend for Figure 13-16: G= Guns, B=Bow, S=Snare, D= Did not answer, O= Other

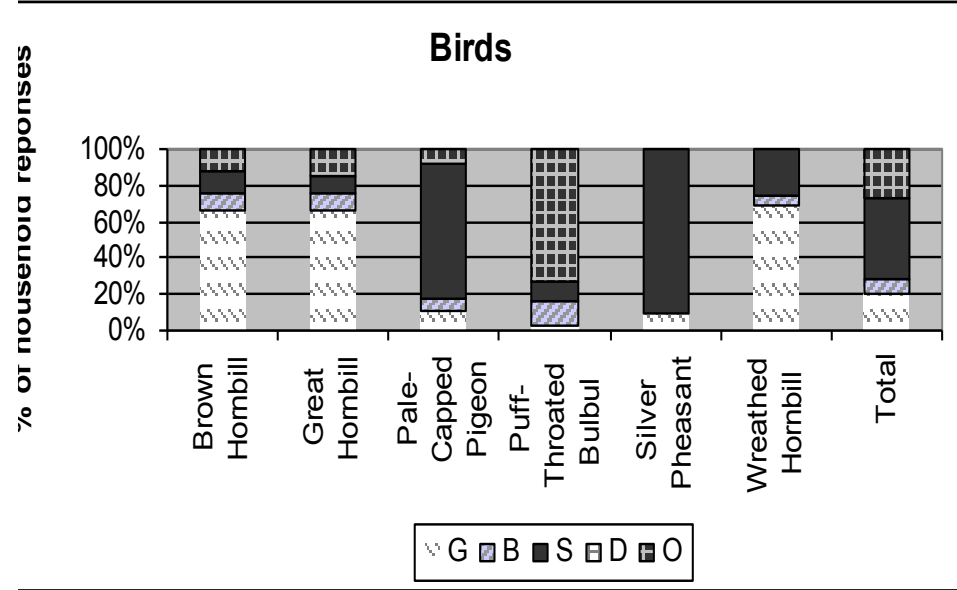


Figure 13: Hunting Methods for Birds

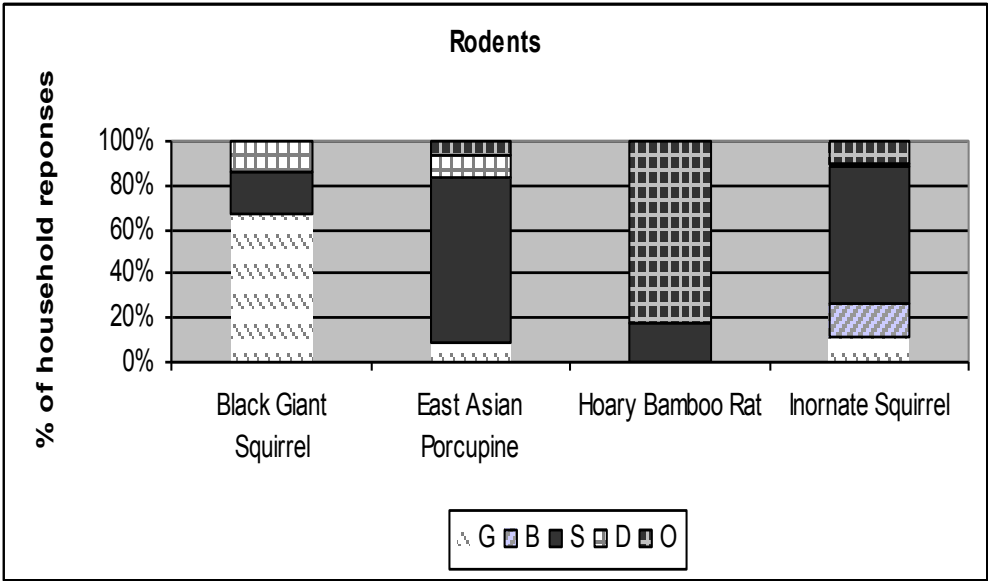
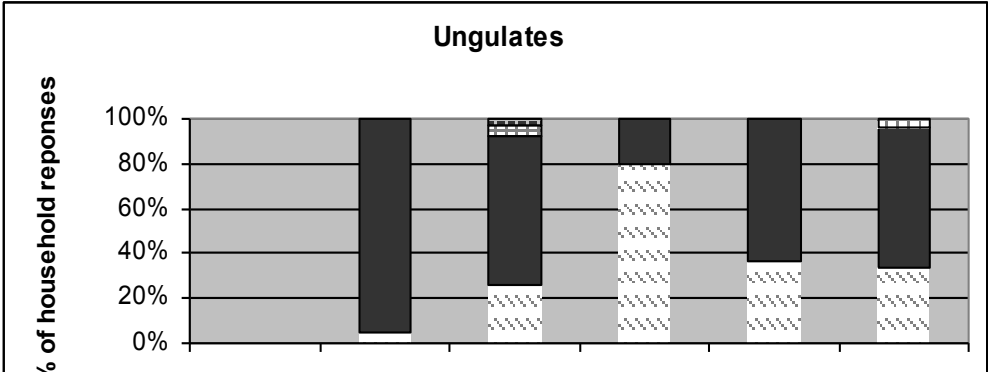
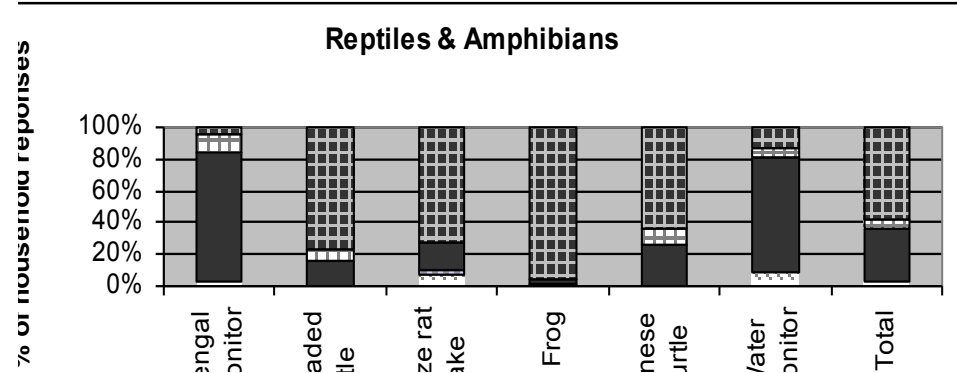


Figure 14: Hunting Methods for Rodents



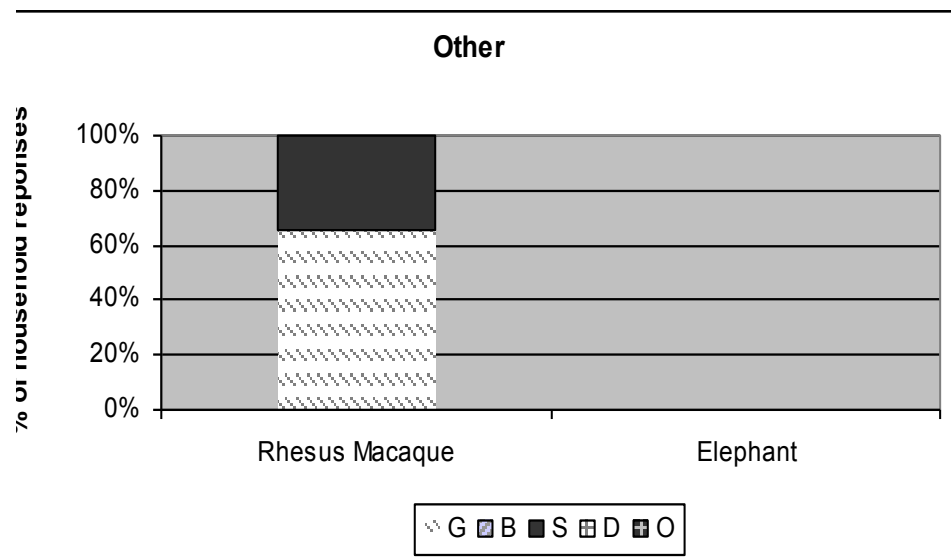


Figure 17: : Hunting Methods for other

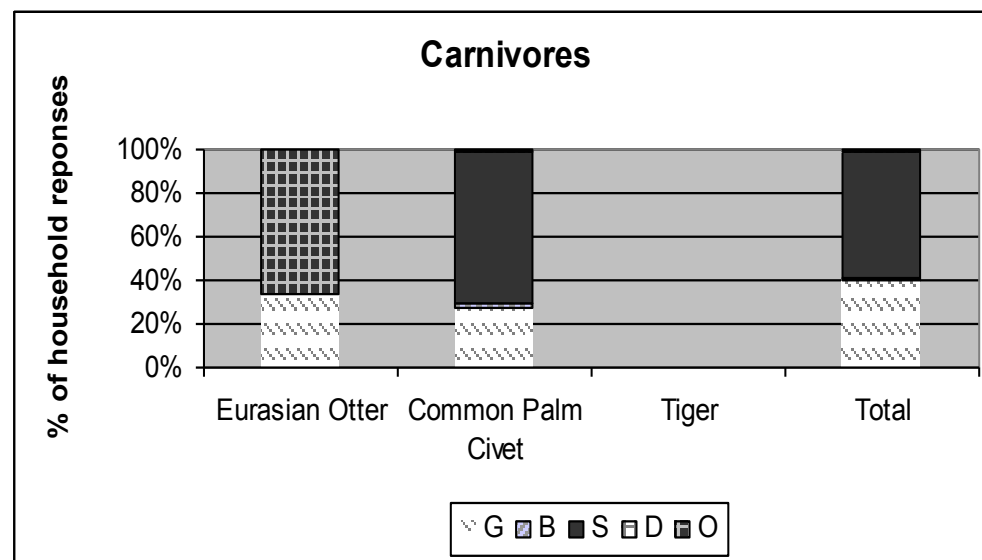


Figure 18: Hunting methods for carnivores

### 6.2.3 Hunters from outside the village

Sixty-seven percent of villagers reported hunting by outsiders (n=168) in their village areas. There was no significant correlation between the distance of the village from the nearest main road and the number of hunters reported to come from outside of the village as found in a similar study of 24 villages in Luang Namtha (Johnson, Singh et al. 2003), however this study a smaller sample size (8 villages) as compared to the 2003 study.

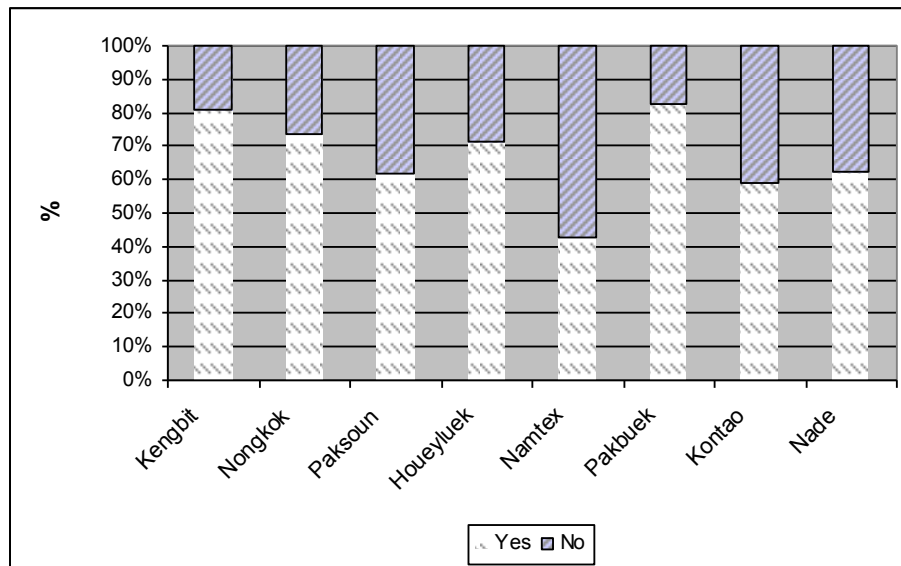


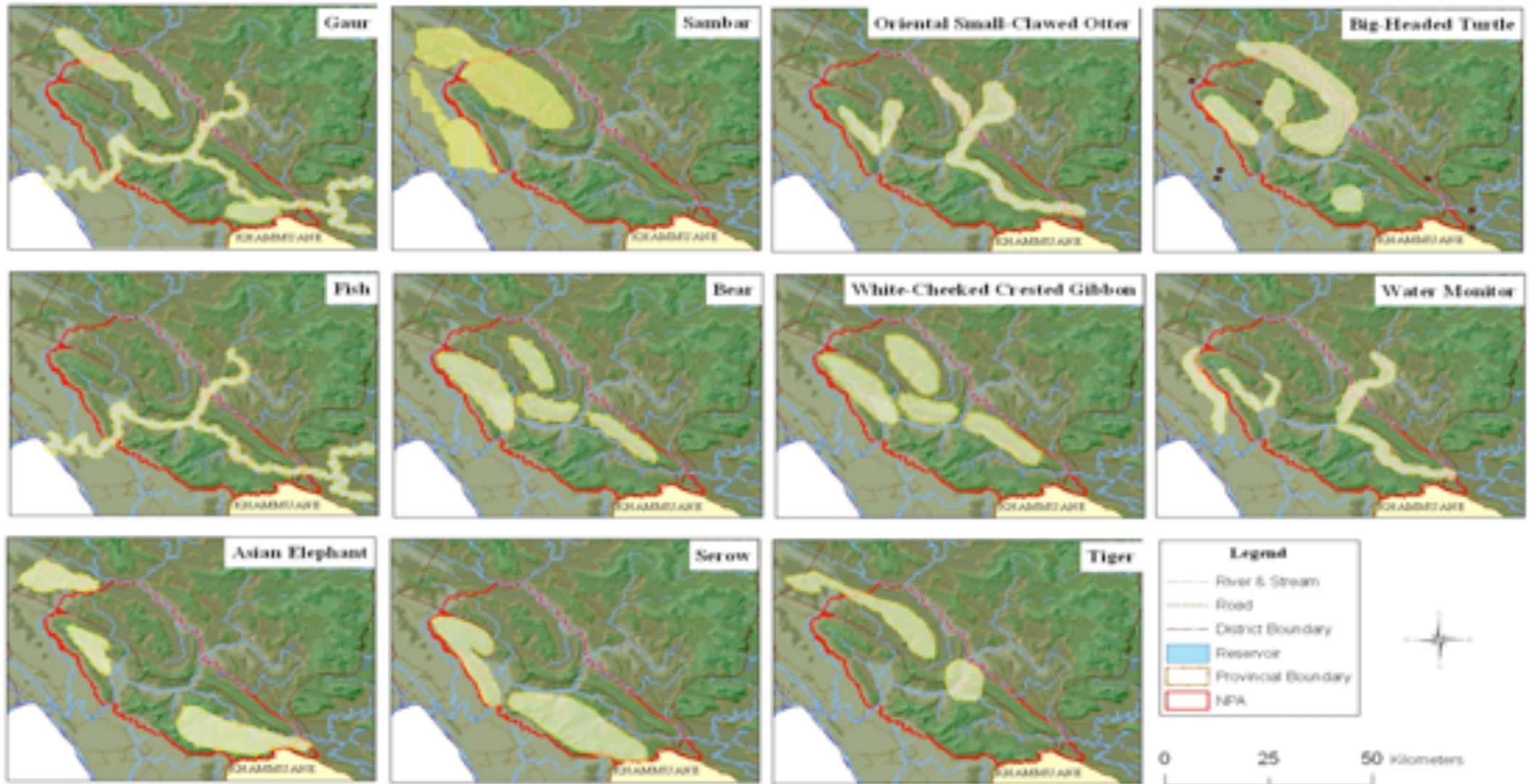
Figure 19: Reported incidences of people from outside the village coming in to hunt

### 6.2.4 Hunting Areas

The land use and wildlife distribution mapping provided a summary of the distribution of the 15 key animal types, for the entire NKNPA from the opinions of villagers and district officials (see figure 20).. Villagers reported hunting areas along streams, around the edges of rice paddies and in conservation forest. Conservation forest is defined as “forests classified for the purpose of conserving nature, preserving and plant and animal species” (GoL 2007). They are zoned into total protection zone (TPZ), controlled use zones (CUZ), corridor zone and buffer zones. Use rights exist for all but the total protection zone of the conservation forest. Total protection zones is for the purpose of protecting the habitat and breeding places of wild animals. There was no TPZ established in any of the target villages or in the NKNPA at the time of this study.

Many of the village conservation forest areas were inside the NKNPA. This points to the NKNPA as an important source of both income and food from NTFP's. For all villages surveyed Land Use Planning (LUP) had been completed (see Appendix 7: LUP Maps). Mapping also identified socially significant sites and recorded local names for these ( Appendix 8: Social Landscapes)

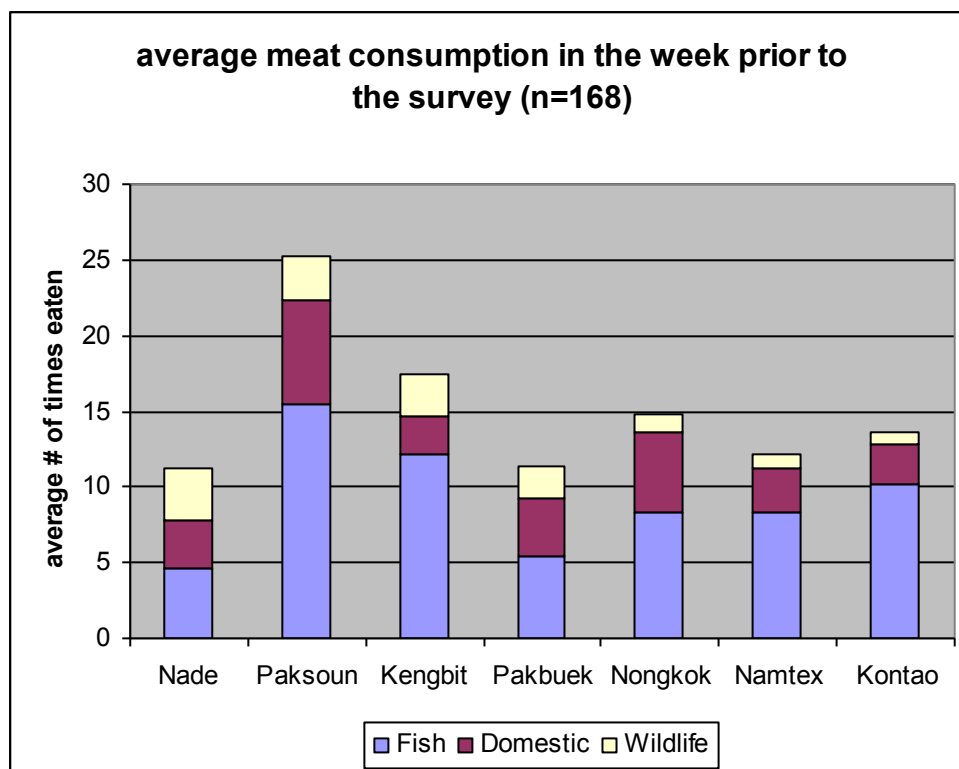
Figure 20: Summary of distribution of wildlife (yellow areas) as reported by villagers and district officers



## 6.3 Wildlife Use

### 6.3.1 General

Villagers (n=168) were asked to report the number of meals consumed in the last week based on three meat categories. Wild, Domestic (all vertebrates excluding fish) and fish. Meat was eaten an average of 5.2 times. On average fish was reported eaten 9.5 times, domestic meat 3.9 times and wildlife 2.1 times in the week prior to the survey.(see figure 22) Wildlife and fish made up over 75% (n=2608) of the meals reported across all households pointing to the importance of wild foods in rural livelihoods.

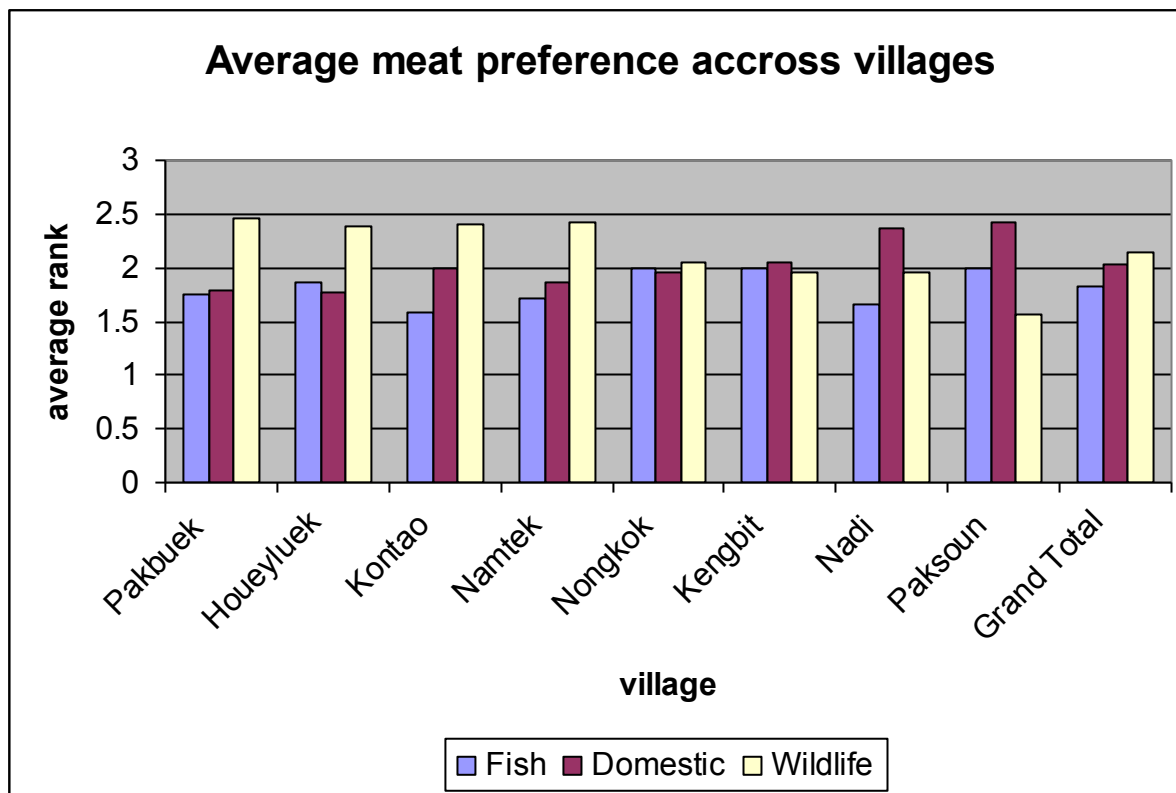


**Figure 21: average meat consumption in target villages**



Across all households (n=168) there was a preference for fish (40%) over both wildlife (31%) and domestic meat (29%). More households preferred wildlife than domestic meat.

Across all households the rank for domestic and wild meat was not statistically different to that of domestic (p=0.05). Ban Paksoun and Kengbit on average preferred wild meat to fish or domestic meat. On average half of villages preferred fish over other meats. (see Figure 22).



**Figure 22: Average meat preference across all villages (1=most preferred, 3= least preferred)**

Omitting ethnic groups with less than 10 respondents shows that on average all ethnic groups other than Men prefer fish. Men prefer domestic meat over fish and wildlife. (see Figure 23)

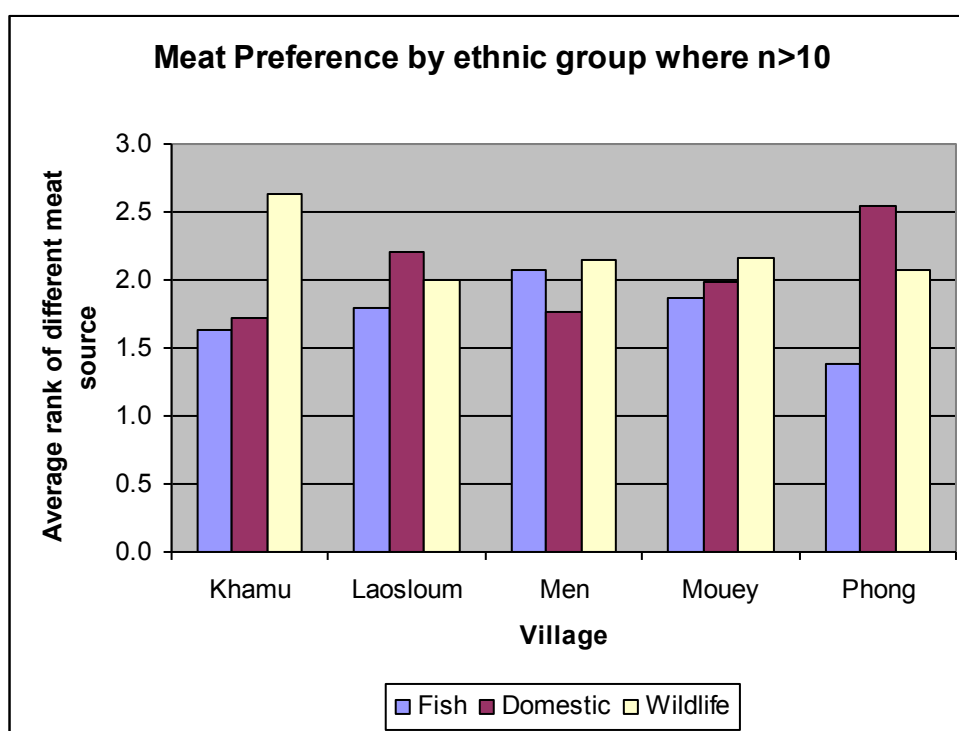


Figure 23: Average rank of meats for ethnic groups where n>=10

### 6.3.2 Animal Specific

Of the thirty two animals included in the survey, the majority (68%) were reported by at least one family per village as eaten once a month. The ranking of animals most frequently eaten on a monthly basis indicated that most are smaller in body size. Of the top ten two are rodents, four are fish, two are birds and two ungulates. The table also highlights the importance of wildlife for protein in the local diets of the communities surveyed.

Table 3: Wildlife most commonly eaten at least once a month (n=168)

Common Name	Status MAF <sup>1</sup> 0380	Global Threat Status <sup>2</sup>	Status in Lao <sup>3</sup>	CITES	Total
Inornate Squirrel (Squirrels in general)	-	GT-V	LKL	-	16.7%
Puff-Throated Bulbul	-	-	-	-	12.7%
Silver barb <i>Barbodes gonionotus</i> (fish)	-	-	-	-	9.2%
Wild Pig	C	-	LKL	-	7.5%
Hemibagrus wyckoides	-	-	-	-	7.2%
Hoary Bamboo Rat	C	-	-	-	6.5%
Cirrhinus molitorella	-	-	-	-	5.9%
Lesser Mouse Deer	C	-	-	-	4.6%
Bagarius bagarius	-	-	-	-	4.2%
Silver Pheasant	R	-	-	-	3.9%

<sup>1</sup> C=Controlled species R= Restricted following Wildlife Law 0360

<sup>2</sup> According to IUCN Redlist accessed online August 2007

<sup>3</sup> LKL=Little known in Lao PDR, NARL=Not at risk in Lao, PARL= Potentially at risk in Lao (This category includes species that are suspected to be At Risk in Lao PDR but may not have sufficient data or species that are on the border of At Risk in Lao PDR. ARL= At Risk in Lao PDR: is roughly equivalent at a national level to the Globally Threatened categories of IUCN (1996)

Common Name	0380	Status	In Laos	ES	Total
Frog	-	-	-	II	3.6%
<i>Micronema apogon</i> (Catfish)	-	-	-	-	3.6%
Pale-Capped Pigeon	-	-	-	-	3.3%
East Asian Porcupine	C	GT-V	NARL	-	2.9%
Common Palm Civet	-	-	-	-	2.6%
Bengal Monitor	-	-	PARL	I	1.6%
Bronze rat snake	-	-	-	II	1.6%
Black Giant Squirrel	-	-	PARL	II	0.7%
Brown Hornbill	C	G-NT	PARL	II	0.7%
Indochinese Box Turtle	C	GT-CR	ARL	-	0.3%

### 6.3.3 Medicine

A total of 24 animals out of 32 surveyed species, were reported as used for medicine. Of these five are restricted species and ten controlled under MAF regulation 0360. Eight of these are also IUCN redlist category vulnerable or higher. (see Table 4). Animals most frequently reported as medicine include, East Asian Porcupine, Chinese Serow and Gaur. Of the top six species five are globally significant to conservation. Animals reported by the villagers as used for medicine are reported as traded in other locations (see: (Duckworth, Salter et al. 1999; Nooren and Claridge 2001). Eight species were reported as not being used for medicine.

**Table 4: Animals most frequently reported as medicine by percentage of responses (n=168)**

Common Name	Status MAF 0380	Global Threat Status	Status in Lao	CITES	% respondents reporting as medicine
East Asian Porcupine	C	GT-V	NARL	-	45.2%
Chinese Serow	R	GT-V	PARL	I	42.9%
Gaur	R	GT-V	ARL	I	16.7%
Lesser Mouse Deer	C	-	-	-	8.3%
Rhesus Macaque	C	GNT	PARL	II	8.3%
Tiger	R	GT-E	ARL	I	8.3%
Eurasian Otter	R	-	CARL	I	7.1%
Wild Pig	C	-	LKL	-	6.5%
Black Giant Squirrel	-	-	PARL	II	6.0%
Puff-Throated Bulbul	-	-	-	-	4.8%
Pale-Capped Pigeon	-	-	-	-	4.8%
Elephant	R	GT-E	ARL	I	4.2%
Great Hornbill	R	-	ARL	I	4.2%
Sambar Deer	C	-	PARL	-	4.2%
Hoary Bamboo Rat	C	-	-	-	3.6%
Indochinese Box Turtle	C	GT-CR	ARL	-	3.6%
Common Palm Civet	-	-	-	-	3.0%
Bengal Monitor	-	-	PARL	I	3.0%
Water Monitor	C	-	PARL	II	2.4%
Bronze rat snake	-	-	-	II	1.8%
Bagarius bagarius	-	-	-	-	0.6%
Silver Pheasant	R	-	-	-	0.6%
Red Muntjac	C	-	-	-	0.6%
Wreathed Hornbill	R	-	ARL	II	0.6%
Inornate Squirrel	-	GT-V	LKL	-	0.0%
Barbodes gonionotus	-	-	-	-	0.0%
Hemibagrus	-	-	-	-	0.0%

Common Name	Species MAF 0380	Conservation Status	Status in Lao	CITES	% respondents reporting as medicine
wyckoides					
Cirrhinus molitorella	-	-	-	-	0.0%
Frog	-	-	-	II	0.0%
Micronema apogon	-	-	-	-	0.0%
Big-headed Turtle	C	GT-E	ARL	II	0.0%
Brown Hornbill	C	G-NT	PARL	II	0.0%

### 6.3.4 Taboos

All villages reported at least one taboo. In total 51 households reported taboos for wildlife. Seven species were reported as being taboo, for eating or for hunting (see table Table 5). The most frequently mentioned species as being taboo was the Bronze rat snake (n=26) followed by Great hornbill (n=10) and Rhesus Macaque (n=8). Nam Tek showed the highest proportion of households reporting taboos (66.7% n=18). The ethnic group with the highest proportion of taboos reported was the mean (38% n=13). Taboos have been noted as effective as conservation tools (Wadley, Colfer et al. 1997; Xu, Ma et al. 2005), however the extent to which taboos are practiced within the community is linked to their effectiveness as conservation tools (Bennett, Nyaoi et al. 1997; Brooke and Tschapka 2002).

**Table 5: Summary of taboos by village and ethnic group**

Village	Species	Khamu	Lao Loum	Mean	Meuy	MonhLai	Phou Ka	Grand Total
Kengbit	Great Hornbill	-	-	-	-	-	2	2
Kengbit Sum		-	-	-	-	-	2	2
Nong Kok	Bronze rat snake	-	2	2	2	-	-	6
	Rhesus Macaque	-	-	1	-	-	-	1
Nong Kok Sum		-	2	3	2	-	-	7
Houey Leuk	Bengal Monitor	-	-	-	1	-	-	1
	Bronze rat snake	-	-	-	8	-	-	8
Houey Leuk Sum		-	-	-	9	-	-	9
Paksoun	Bronze rat snake	-	-	-	4	-	-	4
	Rhesus Macaque	-	-	-	4	-	-	4
Paksoun Sum		-	-	-	8	-	-	8
Khontao	Bronze rat snake	-	-	-	2	-	-	2
	Great Hornbill	-	-	-	2	-	-	2
	Rhesus Macaque	-	-	-	2	-	-	2
	Wreathed Hornbill	-	-	-	1	-	-	1
Khontao Sum		-	-	-	7	-	-	7
Nadi	Bronze rat snake	-	-	2	-	-	-	2
Nadi Sum		-	-	2	-	-	-	2
Nam Tek	Bronze rat snake	-	-	-	2	2	-	4
	Common Palm Civet	-	-	-	2	-	-	2
	Great Hornbill	-	-	-	4	-	-	4
	Wreathed Hornbill	-	-	-	2	-	-	2
Nam Tek Sum		-	-	-	10	2	-	12
Pak Beuak	Brown Hornbill	1	-	-	-	-	-	1

	Great Hornbill	2	-	-	-	-	-	2
	Wreathed Hornbill	1	-	-	-	-	-	1
Pak Beuak Sum		4	-	-	-	-	-	4
Grand Total		4	2	5	36	2	2	51

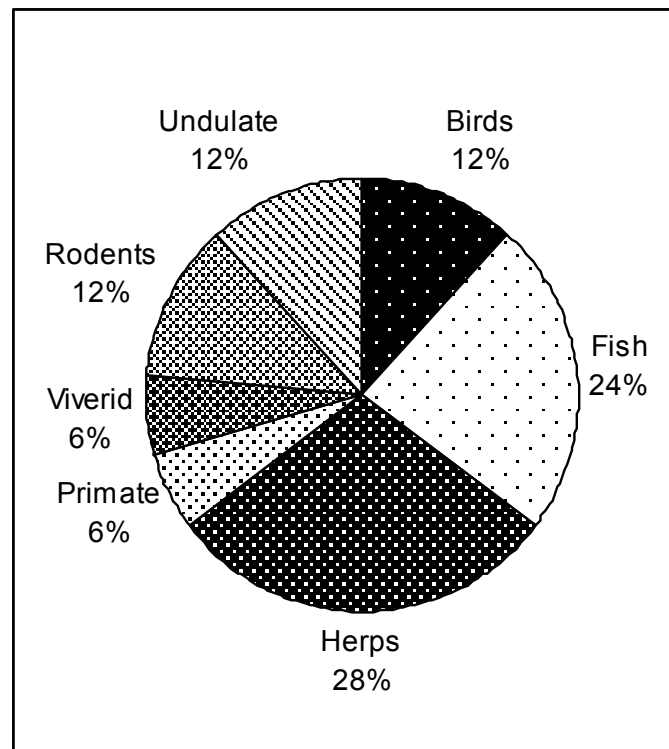
### 6.3.5 Sale

Species reported as never sold were Tiger, Gaur and Elephant. All other species (28) were sold at some time. Seventy-eight percent (n=168) of respondents reported not selling wildlife whereas 22% reported selling at some frequency (weekly, monthly or yearly). Species sold on a monthly basis are shown below in table 4. The most commonly sold species on a monthly basis were inornate squirrel (squirrels), Eurasian wild pig, common palm civet and hoary bamboo rat (bamboo rats in general).

**Table 6: Most frequently sold wildlife on a monthly basis by percentage of respondents (n=168)**

Common Name	Status MAF 0380	Global Threat Status	Status in Lao	CITES	% Selling
Inornate Squirrel	-	GT-V	LKL	-	23.8%
Wild Pig	C	-	LKL	-	23.8%
Common Palm Civet	-	-	-	-	14.9%
Hoary Bamboo Rat	C	-	-	-	13.1%
Silver barb <i>Barbodes gonionotus</i>	-	-	-	-	11.3%
Puff-Throated Bulbul	-	-	-	-	10.1%
Lesser Mouse Deer	C	-	-	-	8.9%
Asian redbtail catfish <i>Hemibagrus wyckioides</i>	-	-	-	-	7.7%
Cirrhinus molitorella	-	-	-	-	7.1%
Frog	-	-	-	II	6.5%
Bagarius bagarius	-	-	-	-	6.0%
Pale-Capped Pigeon	-	-	-	-	4.8%
Silver Pheasant	R	-	-	-	4.8%
<i>Micronema apogon</i> catfish	-	-	-	-	4.2%
Big-headed Turtle	C	GT-E	ARL	II	4.2%
East Asian Porcupine	C	GT-V	NARL	-	4.2%
Red Muntjac	C	-	-	-	4.2%
Water Monitor	C	-	PARL	II	3.6%
Bengal Monitor	-	-	PARL	I	2.4%
Indochinese Box Turtle	C	GT-CR	ARL	-	2.4%
Rhesus Macaque	C	GNT	PARL	II	2.4%
Brown Hornbill	C	G-NT	PARL	II	2.4%
Bronze rat snake	-	-	-	II	1.2%
Chinese Serow	R	GT-V	PARL	I	0.6%
Wreathed Hornbill	R	-	ARL	II	0.6%
Black Giant Squirrel	-	-	PARL	II	0.0%
Elephant	R	GT-E	ARL	I	0.0%
Eurasian Otter	R	-	CARL	I	0.0%
Gaur	R	GT-V	ARL	I	0.0%
Great Hornbill	R	-	ARL	I	0.0%
Sambar Deer	C	-	PARL	-	0.0%
Tiger	R	GT-E	ARL	I	0.0%
<b>Grand Total</b>					<b>5.5%</b>

On a weekly basis, 14 species were reported as being sold. The majority (28% n=14) of these were reptile or amphibian species followed by fish (24%) (see Figure 24)



**Figure 24 : Types of wildlife sold on a weekly basis**

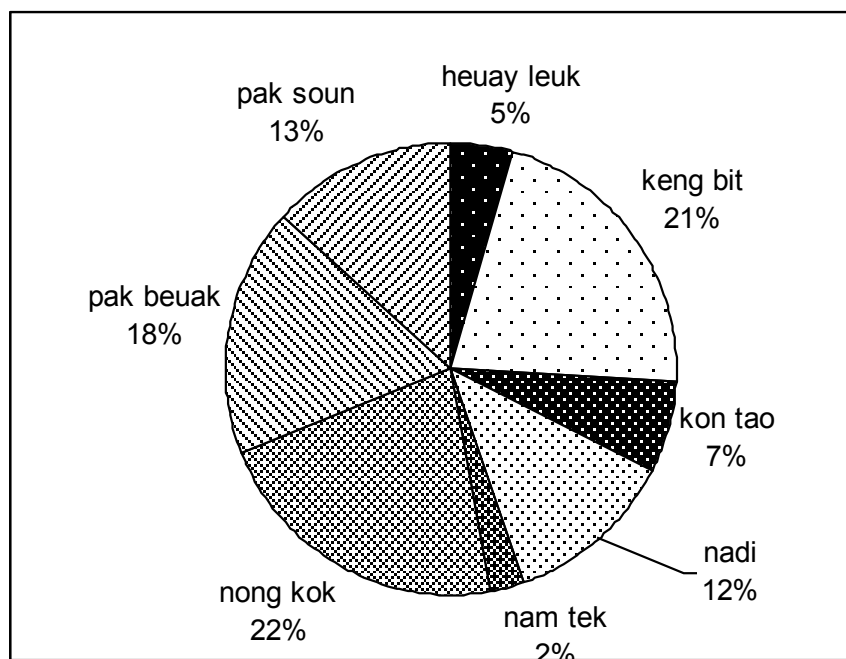
The most frequently reported species sold was *Barbodes gonionotus* (32% n= 168). The most frequently reported animal sold other than fish and amphibians was the Inornate Squirrel (9.5%) (squirrels). Species of note in this weekly sold list include East Asian Porcupine. This species is in particular demand in Vietnam at present for its perceived medicinal value (pers. com. P. Vongphouthong). (see Table 7).

**Table 7: Wildlife sold on a weekly basis by percentage of responses**

Common Name	Global Threat Status	Status in Lao	CITES	Total
Silver barb <i>Barbodes gonionotus</i>	-	-	-	32.0%
Frog	-	-	-	16.3%
<i>Cirrhinus molitorella</i>	-	-	-	9.5%
Inornate Squirrel	GT-V	LKL	-	9.5%
Asian redbellied catfish <i>Hemibagrus wyckoides</i>	-	-	-	7.5%
Puff-Throated Bulbul	-	-	-	6.8%
Bagarius bagarius	-	-	-	3.4%
<i>Micronema apogon</i> (fish)	-	-	-	3.4%
Hoary Bamboo Rat	-	-	-	2.7%
Wild Pig	-	LKL	-	2.7%
Bronze rat snake	-	-	II	1.4%
Common Palm Civet	-	-	-	1.4%
East Asian Porcupine	GT-V	NARL	-	1.4%
Pale-Capped Pigeon	-	-	-	1.4%
Bengal Monitor	-	PARL	I	0.7%

### 6.3.6 Local Prices

Overall 17.4% (n=5376) of households responded with prices of wildlife. The highest proportion of households giving price per Kg or individual for species were Nong Kok (29.8% n=672), Keng bit (29.2% n=672) and Pak Beuak (24.2% n=768) see (Figure 25). These correspond to villages identified as “hotspots” in the wildlife trade (Hallam, Lynam et al. 2007). Nongkok and Kengbit are close to highway 8 that is a major road to Vietnam. Ban Phak Beuak has a military camp of about 270 soldiers.

**Figure 25: Percentages of households reporting prices to wildlife**

Average prices for wildlife sold varied from 600,000kip for a Eurasian otter (likely representing all large otters) (200,000-1,000,000 kip) to 2050 kip for a puff throated bulbul (small songbirds). The

average across all species per individual was approximately 54,000kip (n=28) and for price by the kilo approximately 25,500kip (n=28).

Higher value animals included big headed turtles (266,486 kip/kg), Red Muntjac (140,000 per individual) and the Otter (600,000 kip). However a price was only reported for Otter in four households. No prices were recorded for Elephant, Gaur or Tiger (see Table 8). The percentage of households offering information on prices varied from 65% to 2% of households (n=168).



**Table 8: Average price<sup>4</sup> of wildlife sold**

Common Name	Avg. individual	n (indvl)	Avg. Kg	n (kg)	%HH
Wild Pig	33,500	6	13,224	104	65.5%
Frog	4,000	2	10,714	86	52.4%
Inornate Squirrel	5,436	77	9,600	5	48.8%
Barbodes gonionotus	6,000	1	10,729	70	42.3%
Common Palm Civet	35,833	18	12,094	48	39.3%
Lesser Mouse Deer	42,404	52	30,000	11	37.5%
East Asian Porcupine	48,750	4	13,518	56	35.7%
Hoary Bamboo Rat	18,583	50	12,857	7	33.9%
Cirrhinus molitorella	0	0	13,684	49	29.2%
Bagarius bagarius	0	0	15,592	49	29.2%
Silver Pheasant	35,171	41	79,000	8	29.2%
Big-headed Turtle	296,364	11	266,486	35	27.4%
Puff-Throated Bulbul	2,050	43	0	0	25.6%
Hemibagrus wyckoides	0	0	15,980	42	25.0%
Red Muntjac	140,000	1	17,378	37	22.6%
Bengal Monitor	27,500	4	16,939	33	22.0%
Water Monitor	18,100	5	10,467	30	20.8%
Indochinese Box Turtle	23,556	9	29,568	22	18.5%
Micronema apogon	0	0	19,577	26	15.5%
Chinese Serow	0	0	17,979	26	15.5%
Pale-Capped Pigeon	6,071	21	0	0	12.5%
Rhesus Macaque	37,375	8	12,350	12	11.9%
Black Giant Squirrel	48,333	15	13,500	2	10.1%
Brown Hornbill	16,000	13	15,000	1	8.3%
Bronze rat snake	13,278	9	10,667	3	7.1%
Sambar Deer	0	0	16,900	10	6.0%
Great Hornbill	34,875	8	15,000	2	6.0%
Wreathed Hornbill	26,364	9	15,000	1	6.0%
Eurasian Otter	600,000	4	0	0	2.4%
Elephant	0	0	0	0	0.0%
Gaur	0	0	0	0	0.0%
Tiger	0	0	0	0	0.0%

Ranking relative to the sample size of each type of animal rather than the total sample size, gave an indication of what was being commonly sold relative to its abundance. I.e: if a species was caught it would more likely to be sold relative to other species. Several species are of note in this respect and include, Eurasian Otter, Chinese Serow, Great Hornbill, Chinese box turtle and Asian Porcupine.

<sup>4</sup> Prices are in LAK Lao Kip at the time of data collection 10,000 was approximately equal to 1 USD  
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### 6.3.7 Origin of buyers

Across all villages trade was mostly (64% n=168) within the village followed by people from other villages (29% n=168).

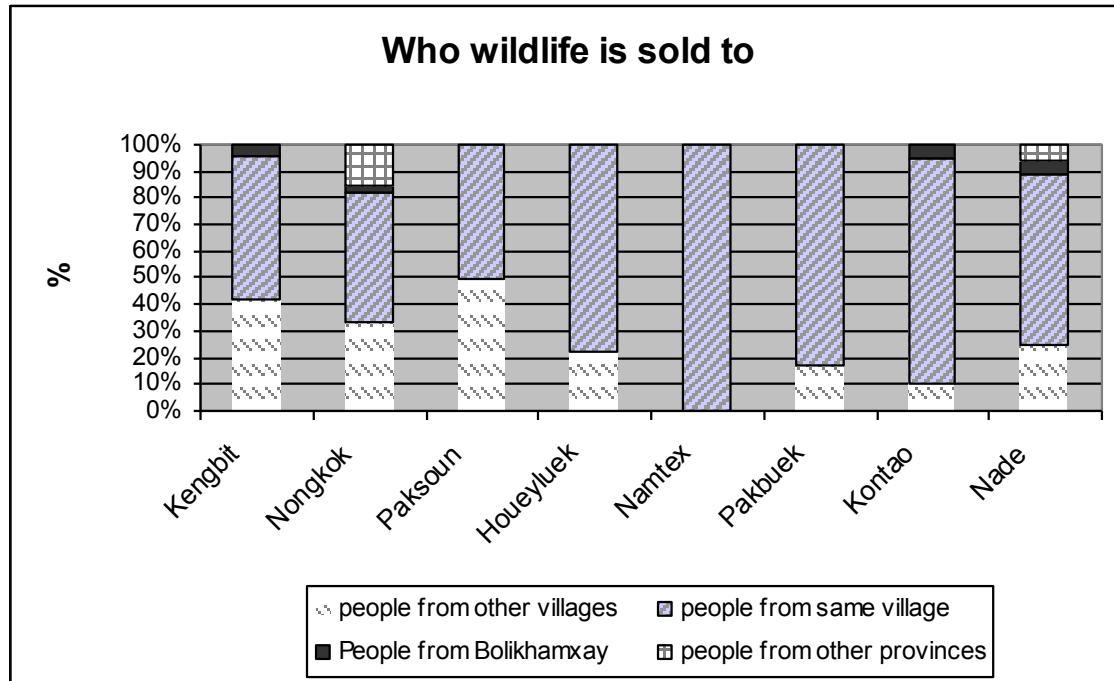
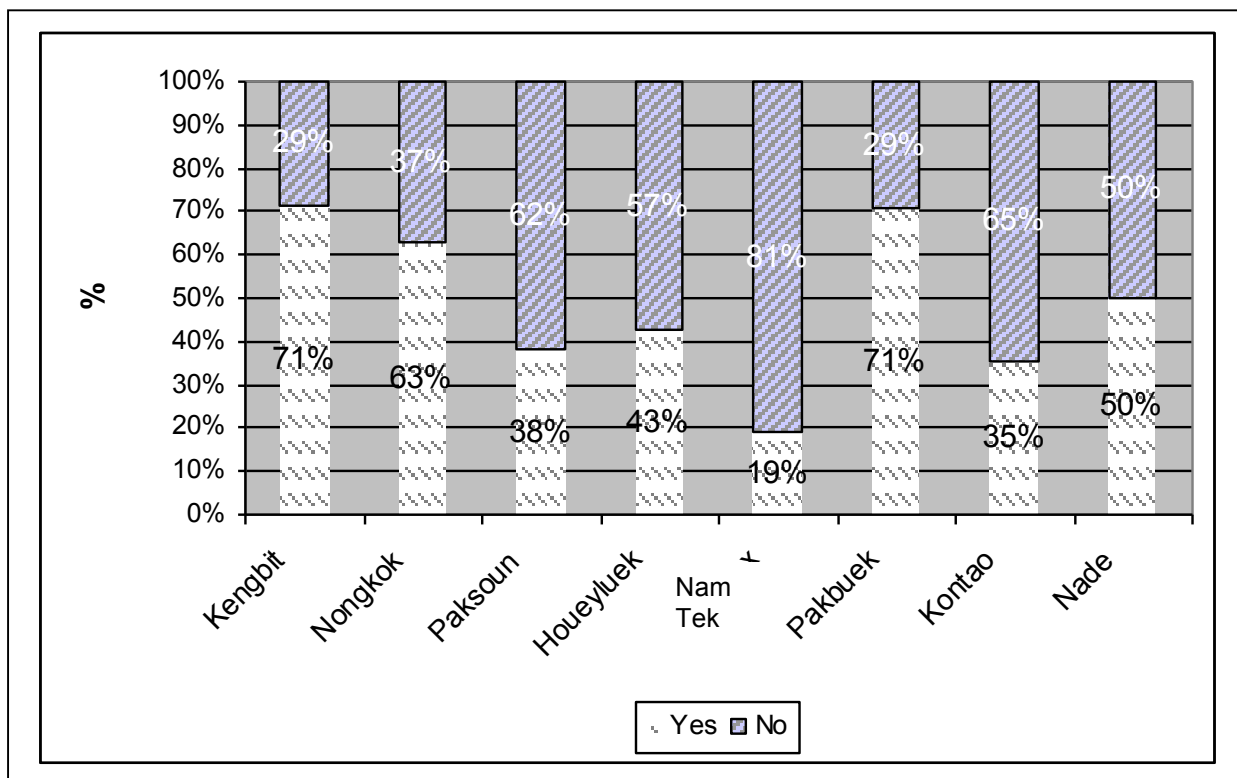


Figure 26: Origin of wildlife buyers

Villages closer to major trade routes reported a higher incidence of people from outside their own village than local trade within the village. Nam Tek reported that all trade was intra-village (**Error! Reference source not found.**)

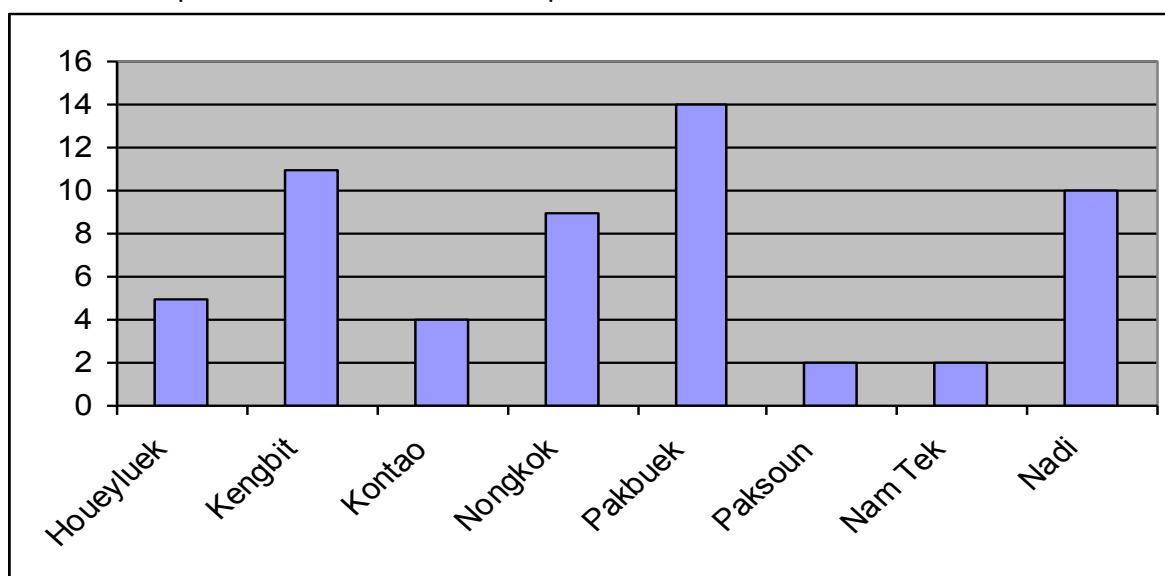
Accross all villages when asked if people came to the village to buy wildlife, villagers responded 50% yes and 50% no. However this varied between villages considerably. The villages where most outsiders came to buy wildlife were Pak Buek (71% n=24), Kengbit (71% n=21) and Nongkok (63% n=21). Kengbit and Nongkok are both within 10km of international highway. Nam Tek reported the lowest incidence of outsiders coming to buy wildlife at 19% (n=21).



**Figure 27: Do outsiders come to buy wildlife in your village?**

This information (Figure 27) contrasts with that presented in Fig. 26. e.g.: Nam Tek above. This is most likely due to the illegality of the trade and the fear of punishment. Hedemark 2006 reports that Vietnamese salesmen on bicycles were seen in Nam Tek. They are known to trade goods for wildlife (Hedemark 2006). This highlights the usefulness of triangulation in collecting sensitive data.

Interviewers took notes on where respondents said buyers came from. By looking at these and the number of responses we can surmise hotspots for trade both at the source and the sink.



**Figure 28: Number of respondents giving details on buyer origin**

Ban Pakbeuak, Kengbit, Nadi and Nongkok had the most people report specific locations for buyers that came to their villages this we can infer that these are hotspots for source of wildlife. (see figure 30 ).

Lak Sao was the most often reported origin of buyers next to Pakkading. From this we can infer that these areas are important sinks for wildlife. Table 9, shows village and origin of traders.

**Table 9: Origins of buyers reported each village**

<b>Village Name</b>	<b>Sold to</b>	<b># responses</b>	
Houeyluek	PAKKADING	1	
	PAKPANG	1	
	PAKSOUN	3	
Houeyluek Total		5	
Kengbit	GENERAL PASSERS BY	1	
	Lak 20	9	
	NONGKOK	1	
Kengbit Total		11	
Kontao	BOLIKHAN	1	
	NAKOUN	1	
	PAKKADING	1	
	TADEUA	1	
Kontao Total		4	
Nadi	GENERAL PASSERS BY	4	
	HUABAK	1	
	Lak 20	3	
	PAKSANE	2	
Nadi Total		10	
Namtek	GENERAL PASSERS BY	1	
	STAFF	1	
Namtek Total		2	
Nongkok	Lak 20	5	
	NITHIN	1	
	THAILAND	1	
	VIANTIANE	2	
Nongkok Total		9	
Pakbuek	BOLIKHAN	3	
	HEUAYLEUK	1	
	PAKKADING	6	
	PAKSANE	2	
	PHONSI	1	
Pakbuek Total		13	
Paksoun	HADSAYKHAM	2	
Paksoun Total		2	

## **6.4 Wildlife Populations**

### **6.4.1 Animal abundance**

Household perceptions of the decline in wildlife numbers was generally consistent with the threat status assigned to animals both nationally and globally. The ranking exercise indicated that animals listed in Duckworth et al. (1999) under various categories of risk in Lao PDR were more commonly reported by households to be decreasing in abundance. This is consistent with previous work from Na Ha protected area ( see(Johnson, Singh et al. 2003). However, there are some exceptions to this. Aggregating the results for perceptions of abundance across species allows assessment of perceptions of stability and increase as well as decrease. This turned up some notable contradictions. Species where percentage response was greater in the increase category included Gaur, Pale-capped pigeon and Silver Pheasant. Except for Gaur the other

species are relatively common. However, Gaur is considered At risk in Lao (Duckworth, Salter et al. 1999) and is classified vulnerable globally (IUCN 2004) as compared to the other two species.

Species where perception of stability was greatest included: Tiger, Puff throated bulbul, Great Hornbill, Hoary Bamboo Rat, Bronze rat snake and Elephant. Notably, Tiger, Elephant and Great Hornbill are considered at risk in Lao.

Possible explanations for perceived increases and stability could be that the animals are more locally abundant or have become more visible in the last 10 years. (see Table 10)

**Table 10: Perceptions of abundance (n=168)**

Species	Global Threat Status	Status in Lao	%Decrease	%Same	%Increase	N
Big-headed Turtle	GT-E	ARL	-84.5%	12.1%	3.4%	58
Eurasian Otter		CARL	-82.8%	10.3%	6.9%	29
Cirrhinus molitorella			-78.5%	10.8%	10.8%	65
Lesser Mouse Deer			-70.8%	12.4%	16.8%	113
Bengal Monitor		PARL	-65.0%	20.0%	15.0%	80
Hemibagrus wyckoides			-63.9%	24.6%	11.5%	61
Indochinese Box Turtle	GT-CR	ARL	-63.5%	26.9%	9.6%	52
East Asian Porcupine	GT-V	NARL	-59.2%	24.3%	16.5%	103
Barbodes gonionotus			-58.4%	18.8%	22.8%	101
Water Monitor		PARL	-57.6%	29.3%	13.0%	92
Red Muntjac			-56.3%	23.8%	20.0%	80
Bagarius bagarius			-56.0%	28.0%	16.0%	75
Common Palm Civet			-52.9%	19.0%	28.1%	121
Micronema apogon			-52.3%	36.4%	11.4%	44
Black Giant Squirrel		PARL	-51.9%	31.5%	16.7%	54
Chinese Serow	GT-V	PARL	-50.9%	26.4%	22.6%	53
Sambar Deer		PARL	-48.6%	45.7%	5.7%	35
Wreathed Hornbill		ARL	-46.0%	38.0%	16.0%	50
Rhesus Macaque	GNT	PARL	-43.8%	28.1%	28.1%	89
Wild Pig		LKL	-42.6%	24.3%	33.1%	148
Brown Hornbill	G-NT	PARL	-42.5%	27.4%	30.1%	73
Inornate Squirrel	GT-V	LKL	-40.8%	23.9%	35.2%	142
Frog			-35.8%	29.9%	34.3%	134
Silver Pheasant <sup>1</sup>			-35.5%	23.6%	40.9%	110
Bronze rat snake <sup>2</sup>			-32.9%	42.5%	24.7%	73
Hoary Bamboo Rat <sup>2</sup>			-32.4%	42.2%	25.5%	102
Great Hornbill <sup>2</sup>		ARL	-30.0%	48.3%	21.7%	60
Gaur <sup>1</sup>	GT-V	ARL	-25.8%	16.1%	58.1%	31
Pale-Capped Pigeon <sup>1</sup>			-21.3%	35.1%	43.6%	94
Tiger <sup>2</sup>	GT-E	ARL	-20.6%	61.9%	17.5%	63
Puff-Throated Bulbul <sup>2</sup>			-12.7%	44.1%	43.2%	118
Elephant <sup>2</sup>	GT-E	ARL	-10.9%	51.5%	37.6%	101

Note: 1=Species where perception of increase is greatest, 2=Species where perception of stability is greatest

Lao ICR status: ARL = At Risk;  
in Lao ICR: PARL = Potentially at  
Risk in Lao ICR; LKL = Little  
Known in Lao ICR; NARL = Not at  
Risk in Lao and Global threat  
status: (GT-E) = Globally  
Threatened - Endangered; (GT-V) =  
Globally Threatened - Vulnerable;  
(GNT) = Globally Near-Threatened;  
(DQ) = Data Deficient from  
Duckworth et al. (1999).

### 6.4.2 Wildlife Conflict

The majority of households (61% n=168) reported conflict with animals in the past ten years. Of the 61% of people responding, 85% (n=104) reported raiding of crops as the major conflict and 15% reported killing of livestock as a problem. No killing or injuring of humans was reported.

The highest proportion of respondents reporting problems were from Nonkok, Nadi, Pak Beuak and Kengbit. These villages reported most problems were with elephants except for Nadi who reported problems with Wild pigs. The most common responses of people to these problems were to a) guard fields, b) shoot or snare problem animals, or c) use dogs to chase away the problem animals (see Figure 29).

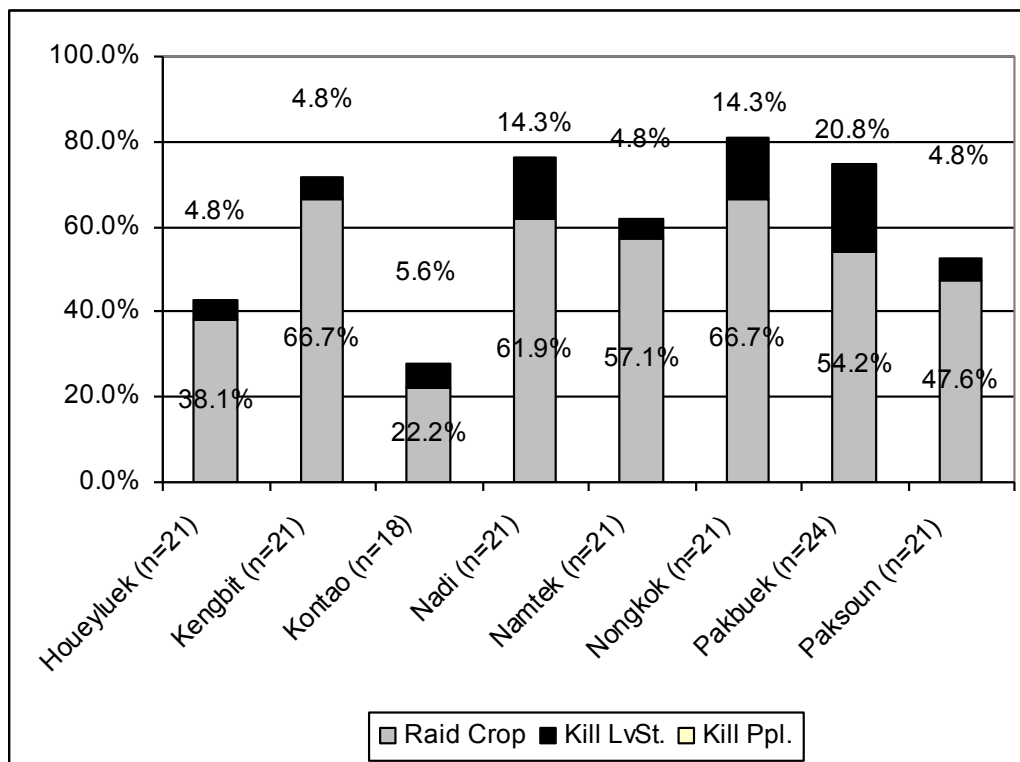


Figure 29: Human wildlife conflicts

### 6.4.3 Comparison across categories

Table 11 compares the relative frequency of wildlife hunting, sale, use and abundance across animals. The ranking combines those animals with the highest percentage of responses for hunting, weekly food, monthly sale and abundance across villages. Fish were grouped.

The 10 most hunted animals include 3 ungulates, 2 rodents, 1 bird, 1 primate, 1 reptile and a 1 viverrid. These species were also frequently sold. Species most frequently eaten include frog, fish, small rodents (squirrels) and small songbirds (eg: puff throated bulbul). Species frequently eaten were also relatively frequently sold suggesting that sale is often opportunistic. Exceptions to this were frogs as they were frequently eaten but not as commonly sold. Bamboo rats are more likely to be sold if caught; likewise Big headed turtles are more likely to be sold because of the high price.

Of the top ten species for hunting, six are controlled species and one is restricted (MAF 2007). For restricted species hunting is legally prohibited in the wet season (May-October).

Out of the top ten species nine are also used for medicine.

Table 11: Comparison of Hunting, Use, Sale and Abundance

Common Name	MAF 0360	Eaten Weekly	Hunt with Gun	Hunt with Snare	Medicine	Sold Monthly	Decrease	increase	Stable	n Abundance
Wild Pig	C	4	55	103	11	40	43%	33%	24%	148
Common Palm Civet	-	2	36	90	5	25	53%	28%	19%	121
Inornate Squirrel	-	14	18	97	0	40	41%	35%	24%	142
Lesser Mouse Deer	C	0	5	91	14	15	71%	17%	12%	113
East Asian Porcupine	C	2	8	71	76	7	59%	17%	24%	103
Silver Pheasant	R	0	7	71	1	8	35%	41%	24%	110
Rhesus Macaque	C	0	42	22	14	4	44%	28%	28%	89
Red Muntjac	C	0	17	44	1	7	56%	20%	24%	80
Bengal Monitor	-	1	2	57	5	4	65%	15%	20%	80
Water Monitor	C	0	6	49	4	6	58%	13%	29%	92
Pale-Capped Pigeon	-	2	6	43	8	8	21%	44%	35%	94
Chinese Serow	R	0	11	19	72	1	51%	23%	26%	53
Brown Hornbill	C	0	22	4	0	4	42%	30%	27%	73
Black Giant Squirrel	-	0	20	6	10	0	52%	17%	31%	54
Hoary Bamboo Rat	C	4	0	18	6	22	32%	25%	42%	102
Great Hornbill	R	0	14	2	7	0	30%	22%	48%	60
Wreathed Hornbill	R	0	11	4	1	1	46%	16%	38%	50
Sambar Deer	C	0	12	3	7	0	49%	6%	46%	35
Puff-Throated Bulbul	-	10	2	10	8	17	13%	43%	44%	118
Indochinese Box Turtle	C	0	0	12	6	4	63%	10%	27%	52
Bronze rat snake	-	2	3	7	3	2	33%	25%	42%	73
Big-headed Turtle	C	0	0	8	0	7	84%	3%	12%	58
Frog	-	24	0	4	0	11	36%	34%	30%	134
Eurasian Otter	R	0	2	0	12	0	83%	7%	10%	29
Fish (combined)	-	82	0	0	1	61	62%	16%	23%	346
Elephant	R	0	0	0	7	0	11%	38%	51%	101
Tiger	R	0	0	0	14	0	21%	17%	62%	63
Gaur	R	0	0	0	28	0	26%	58%	16%	31
Grand Total		147	299	835	321	294	46%	25%	29%	2604

## 7. Conclusions and Recommendations

This study found that a wide variety of animals are hunted and used for food and medicine by villages in the NPA management zone. Species are hunted throughout the year with peak hunting seasons in the wetter months of July-November. Most hunting is done using snares and for larger sized animals (>2kg) a combination of these are used. Many of the best hunting areas were identified as being within village conservation forest or within the NKNPA, pointing to the value of these habitats as sources of food.

Outsiders coming into village areas was reported in all villages. This could represent cause for species decline (Tungittiaplakorn and Dearden 2002) and for rural livelihoods (Clendon 2001; Krahn 2005) if adequate village rules do not exist or are poorly enforced.

Overall there is a preference for fish as a protein source. Wildlife was ranked lowest in preference between fish, domestic and wild meat, however, some wildlife species (especially squirrels) were shown to be eaten at least as frequently as some fish, and in at least 2 villages (Paksoun and Kengbit) wildlife was the preferred protein source. Encouraging the sustainable management of these protein sources will help to ensure diverse and resilient livelihood systems for villagers.

Taboos on eating or hunting were reported for seven species but were not widely reported in the villages surveyed. The encouragement, or reviving of taboos can be effectively used as a wildlife management tool (Xu, Ma et al. 2005) and should be investigated in those villages where belief in taboos is still strong.

Generally, wildlife species were reported to be in decline including those that are important for food. Those that were reported hunted more frequently corresponded to high consumption and sale rates and also corresponded to local and international threat categories for species. Animals reported with a higher price and reported as sold more frequently had a higher perception of decline suggesting that hunting is unsustainable and is driven by the demand for the products. However several exceptions in this pattern (ie: perceived increases in some globally threatened species) point to the need for caution when using perceptions as an indicator of local abundance. The decline in species abundance has important repercussions for livelihoods and conservation of biodiversity in the NKNPA.

Wildlife human conflict was reported in all villages. The major human wildlife conflict reported in villages was that of crop raiding. The main species involved were Elephant and wild pig. These issues will need to be addressed by NKNPA management with villages as they are seen as a negative aspect of wildlife.

Recommendations generated from this data include:

### Enforcement

- Enforce provincial governors decree 003 that prohibits all hunting of wildlife with discretion in villages
- Enforcement of this decree and relevant national and international level legislation for all traded wildlife on major travel routes, in urban centers and at border crossings within Bolikhamxay province.
- Enforcement should occur in the wet season not just the dry.

### Community management

- Involve communities surrounding the park in management of the NKNPA and ensure direct input into decisions made in their immediate area.



- Plan with villagers to develop recovery plans and investigate sustainable off takes for important food species.
- Village Rules for hunting should be made. These should address snare use, number of hunters, zones, seasons and species
- Villagers should be involved in the active patrolling and enforcement of their rules. Rules should be recognized at all levels of government.
- Involve villagers directly in monitoring of NKNPA setting up village conservation teams
- Consider the possibility of incentive programs for active contribution to conservation goals.
- Stop outsiders from hunting and buying wildlife as this is a major source of nutrition and more important than cash.

## **Zoning**

- Zoning is crucial for the management of wildlife within the NKNPA and should be a priority action and is supported in national legislation (MAF 2003)

### *Core zone*

- Demarcation should be done in conjunction and in consultation with local communities who use the NKNPA
- Core Zone size needs to be sufficient to ensure viable populations of most species the NPA aims to manage,
- Once set up core zones need to be actively enforced by joint NPA and village teams, and ongoing education will be needed in both urban and rural populations to ensure the zones are understood.

### *Managed zones*

- This survey suggests that hunting from outsiders is commonplace in villages. This means that the likely amount of hunting and extraction is underestimated in these surveys. Managed zones need to include zones for **exclusive** rights of villagers to hunt and use the resources in their area. These rights need to be officially recognized at all levels of government and need to be enforceable and villagers should be given resources and rights to enforce these laws within their villages.
- Support should be given from NPA staff to assist villagers in managing their village areas

## **Education**

- Ongoing education of communities surrounding the NKNPA to the value and importance of globally significant species, the value of biodiversity and the relevant laws should be continued.
- Education on the wildlife and aquatic law and especially the category I, II and III species (MAF 2007)

## **Research**

- This report supports studies by (Krahn 2005) and (Clendon 2001) that point to the importance of wild meat as an important protein source for in rural diets. The management should work with villagers to better understand the relative importance of wild meat. This should be used to guide wildlife management in the park.

- Social research into attitudes and behavior of wildlife consumption and cultural aspects of the practice need to be better understood. This will inform on management and on the tailoring of interventions and education campaigns.
- Further research is needed into the demographics and attitudes of people involved in the illegal trade in wild animals locally and regionally to better understand ways to bring about positive behavioral change and where to focus resources to this end.

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## Appendix 1: Training Modules and Schedule

Date	Day	Time	Activity	Who
17/01/2006			Travel to Paksan	All
18/01/2006	1		<b>INTRODUCTION</b>	
		8:00 8:15	Introductions	Dtick / AJ
		8:15 8:45	Review schedule and objectives of this study	Dtick / AJ
		8:45 9:15	Review schedule for training	Dtick / AJ
			<b>BREAK</b>	
18/01/2006	1		<b>NBCA AND WILDLIFE MANAGEMENT</b>	
		9:30 10:00	NBCA- definition, regulations and map	?Manisang phet
		10:00 10:30	People in NBCA - ethnic groups and customs	?Manisang phet
		10:30 11:00	Goal and activities of this project in the NPA	?Manisang phet
		11:00 11:30	Wildlife Management and Conservation	AJ
			<b>LUNCH</b>	
18/01/2006	1		<b>RESEARCH METHODS I - MAPS</b>	
		13:00 14:00	Orientation - reading a topo map and using GPS	CH/AR
		14:00 14:30	Introduction to Participatory mapping and GIS	CH/AR
		14:30 15:00	Practice - Making a map of FTS	CH/AR
		15:00 16:00	Transfer to GIS Frame and checking	All
		16:00 16:30	Review results. Make comments and changes	
19/01/2006	2		<b>RESEARCH METHODS I - MAPS cont.</b>	
		8:00 9:00	Thematic Layers introduction to methods	CH/AR
		9:00 9:45	Practice methods: Hunting	CH/AR
		9:45 10:00	Review results. Make comments and changes	CH/AR
			<b>BREAK</b>	
19/01/2006	2			
		10:15 11:00	Practice Methods: Fishing	CH/AR
		11:00 11:15	Review results. Make comments and changes	CH/AR
		11:15 12:00	Practice Methods: Agriculture	CH/AR
		12:00 12:15	Review results. Make comments and changes	CH/AR
			<b>LUNCH</b>	
19/01/2006	2			
		13:30 14:30	Data Checking using GPS	AR/CH
		14:30 15:30	Field check of data and gaining extra data	AR/CH
		15:30 16:00	Review results. Make comments and changes	AR/CH
20/01/2006	3		<b>RESEARCH METHODS II - ANIMAL NAMES</b>	
		8:00 10:00	Animal identification and Lao names	AJ/Dtick
			<b>BREAK</b>	
		10:15 11:00	Interview techniques with local villagers	AJ/Dtick

		<b>11:00</b>	<b>11:30</b>	How to make a list of local wildlife names	AJ/Dtick
		<b>11:30</b>	<b>12:00</b>	Practice - Make a list of wildlife names in Hmong	AJ
		<b>12:00</b>	<b>12:30</b>	Review results. Make comments and changes	All
		<div>LUNCH</div>			
<b>20/01/2006</b>	<b>3</b>	<b>RESEARCH METHODS III - INTERVIEWS</b>			
		<b>13:30</b>	<b>14:30</b>	How to conduct the household interview	AJ/Dtick
		<b>14:30</b>	<b>15:30</b>	Practice the interview in office.	AJ/Dtick
		<b>15:30</b>	<b>16:00</b>	Review results. Make comments and changes.	AJ/Dtick
<b>21/01/2006</b>	<b>4</b>	<b>RESEARCH METHODS IV - WHO TO INTERVIEW</b>			
		<b>8:00</b>	<b>9:00</b>	Identifying Households/Specialist groups?	AJ/Dtick
		<div>BREAK</div>			
<b>21/01/2006</b>		<b>FIELD PREPARATION AND LOGISTICS</b>			
		<b>9:15</b>	<b>11:15</b>	Finalize data forms and materials for field test	AJ/Dtick
		<b>11:15</b>	<b>12:15</b>	Finalize logistics for field test	AJ/Dtick
		<div>LUNCH</div>			
<b>21/01/2006</b>	<b>##</b>	<b>VILLAGE FIELD TEST</b>			
		Go to village; collect village information			Team
		Conduct household interviews ;return to office			Team
<b>23/01/2006</b>		<b>REVIEW AND MODIFY METHODS</b>			
		<b>8:00</b>	Introductions and village relations		Team
			Making the Village Map		Team
			Making the animal list		Team
			Selecting the households - wealth ranking		Team
		<b>16:00</b>	Interviewing households		Team
<b>24/01/2006</b>		<b>FINALIZE RESEARCH SCHEDULE</b>			
		<b>8:00</b>	Villages		All
			Teams		All
		<b>12:00</b>	Equipment		All

## **Appendix 2: General Wildlife data**

# Appendix 3: Species specific data

## Question 4

SCI_NAME	Status MAF 0380	Global Threat Status	Status in Lao	CITES	BODY size	Type	Q4	W	M	Y	Z	Total
<i>Macaca arctoides</i>	C	GNT	PARL	II	M	O		0	0	41	127	168
<i>Paradoxurus hermaphroditus</i>					M	O		2	8	80	78	168
<i>Sus scrofa</i>	C		LKL		L	U		4	23	94	47	168
<i>Cervus unicolor</i>	C		PARL		L	U		0	0	11	157	168
<i>Muntiacus muntjak</i>	C				M	U		0	0	38	130	168
<i>Bos gaurus</i>	R	GT-V	ARL	I	L	U		0	0	0	168	168
<i>Naemorhedus sumatraensis</i>	R	GT-V	PARL	I	L	U		0	1	19	148	168
<i>Callosciurus inornatus</i>		GT-V	LKL		S	R		14	51	52	51	168
<i>Hystrix brachyura</i>	C	GT-V	NARL		S	R		2	9	61	96	168
<i>Lutra Lutra Linnaeus</i>	R		CARL	I	M	R		0	0	0	168	168
<i>Tragulus Javanicus</i>	C				S	U		0	14	57	97	168
<i>Ratufa Bicolor</i>			PARL	II	S	R		0	2	18	148	168
<i>Rhizomys pruinosus</i>	C				S	R		4	20	60	84	168
<i>Panthera tigris</i>	R	GT-E	ARL	I	L	O		0	0	0	168	168
<i>Elephas maximus</i>	R	GT-E	ARL	I	L	O		0	0	0	168	168
<i>Lophura nycthemera</i>	R				s	B		0	12	41	115	168
<i>Columba Punicea</i>					s	B		2	10	31	125	168
<i>Hemixos flavala</i>					s	B		10	39	35	84	168
<i>Buceros bicornis</i>	R		ARL	I	s	B		0	0	14	154	168
<i>Aceros undulatus</i>	R		ARL	II	s	B		0	0	11	157	168
<i>Anorrhinus Tickelli</i>	C	G-NT	PARL	II	s	B		0	2	25	141	168
<i>Platystemon megacephalum</i>	C	GT-E	ARL	II	S	H		0	0	6	162	168
<i>Cuora galbinifrons</i>	C	GT-CR	ARL		S	H		0	1	24	143	168
<i>Varanus salvator</i>	C		PARL	II	S	H		0	1	49	118	168
<i>Varanus bengalensis</i>			PARL	I	S	H		1	5	53	109	168
<i>Ptyas zoazys</i>				II	S	H		2	5	24	137	168
<i>Hoplobatrachus rugulosus</i>				II	S	H		24	11	95	38	168
<i>Bagarius bagarius</i>					S	FSH		5	13	44	106	168
<i>Cirrhinus molitorella</i>					S	FSH		14	18	32	104	168
<i>Hemibagrus wyckoides</i>					S	FSH		11	22	22	113	168
<i>Micronema apogon</i>					S	FSH		5	11	24	128	168

<i>Barbodes gonionotus</i>					S	FSH		47	28	25	68	168
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Question 5 and 6

M	ENG_NAME	SCI_NAME	Q5	J	F	M	A	M	J	J	A	S	O	N	D	Total	Q6	G	B	S	D	O
1	Rhesus Macaque	<i>Macaca arctoides</i>		9.0	9.0	5.6	5.6	6.2	9.6	9.0	12.4	9.0	8.4	10.0	6.3	100		42	0	22	0	0
2	Common Palm Civet	<i>Paradoxurus hermaphroditus</i>		8.3	8.3	7.3	6.2	6.0	8.5	9.3	9.8	8.5	9.8	9.8	8.3	100		36	2	90	0	2
3	Wild Pig	<i>Sus scrofa</i>		5.1	3.3	3.1	3.1	4.9	8.4	10.9	12.4	14.2	15.3	12.2	7.1	100		55	0	103	7	0
4	Sambar Deer	<i>Cervus unicolor</i>		-	3.6	-	-	-	14.3	21.4	21.4	10.7	8.1	11.7	8.7	100		12	0	3	0	0
5	Red Muntjac	<i>Muntiacus muntjak</i>		5.5	5.5	5.5	6.2	8.0	11.8	11.8	11.8	10.7	9.3	7.3	6.6	100		17	0	44	3	2
6	Gaur	<i>Bos gaurus</i>		2.8	4.7	4.7	4.7	8.4	12.1	14.0	13.1	10.3	8.4	8.4	8.4	100		0	0	0	0	0
7	Chinese Serow	<i>Naemorhedus sumatraensis</i>		8.2	6.1	6.1	4.1	9.2	14.3	10.2	11.2	12.2	9.2	4.1	5.1	100		11	0	19	0	0
8	Inornate Squirrel	<i>Callosciurus inornatus</i>		7.3	8.1	7.6	7.3	7.3	7.9	9.4	9.2	9.7	9.0	9.4	7.9	100		18	23	97	2	16
9	East Asian Porcupine	<i>Hystrix brachyura</i>		7.1	7.8	5.8	5.2	5.8	8.7	11.0	8.7	8.7	8.7	12.3	10.0	100		8	0	71	10	6
10	Eurasian Otter	<i>Lutra Lutra Linnaeus</i>		6.7	6.7	6.7	6.7	6.7	6.7	6.7	13.3	13.3	13.3	6.7	6.7	100		2	0	0	0	4
11	Lesser Mouse Deer	<i>Tragulid Javanicus</i>		11.5	11.3	8.7	7.1	6.1	7.9	8.3	7.5	7.5	7.5	7.9	8.5	100		5	0	91	0	0
12	Black Giant Squirrel	<i>Ratufa Bicolor</i>		5.7	4.5	4.5	3.4	6.8	9.1	11.4	9.1	10.2	11.4	12.5	11.4	100		20	0	6	4	0
13	Hoary Bamboo Rat	<i>Rhizomys pruinosus</i>		9.3	9.7	8.3	7.3	7.5	8.1	8.5	8.5	7.9	7.5	8.9	8.5	100		0	0	18	1	86
14	Tiger	<i>Panthera tigris</i>		5.7	7.5	7.5	5.7	7.5	7.5	5.7	11.3	9.4	11.3	11.3	9.4	100		0	0	0	0	0
15	Elephant	<i>Elephas maximus</i>		9.1	8.3	5.3	6.1	6.1	6.8	7.6	10.6	14.4	9.8	7.6	8.3	100		0	0	0	0	0
16	Silver Pheasant	<i>Lophura nycthemera</i>		12.7	12.7	10.4	8.1	7.1	6.5	5.2	4.9	6.2	6.8	7.8	11.7	100		7	1	71	0	0
17	Pale-Capped Pigeon	<i>Columba Punicea</i>		7.0	8.0	8.0	8.6	8.0	10.2	6.4	5.9	7.0	8.6	12.3	10.2	100		6	4	43	0	5
18	Puff-Throated Bulbul	<i>Hemixos flava</i>		13.7	14.4	11.3	10.6	9.7	5.4	5.2	4.7	5.0	5.4	6.6	8.0	100		2	14	10	0	70
19	Great Hornbill	<i>Buceros bicornis</i>		12.2	10.2	4.1	4.1	6.1	6.1	4.1	10.2	10.2	12.2	14.3	6.1	100		14	2	2	0	3
20	Wreathed Hornbill	<i>Aceros undulatus</i>		18.4	15.8	5.3	2.6	5.3	2.6	5.3	5.3	2.6	2.6	21.1	13.2	100		11	1	4	0	0
21	Brown Hornbill	<i>Anorrhinus Tickelli</i>		10.0	11.1	12.2	5.6	6.7	7.8	6.7	6.7	2.2	3.3	14.4	13.3	100		22	3	4	0	4
22	Big-headed Turtle	<i>Platysternon megacephalum</i>		11.8	11.8	10.5	9.2	8.3	6.6	7.0	5.7	5.3	5.3	8.8	9.6	100		0	0	8	4	40
23	Indochinese Box Turtle	<i>Cuora galbinifrons</i>		7.9	8.5	8.5	6.8	7.3	11.9	11.9	10.2	7.9	5.1	6.8	7.3	100		0	0	12	5	29
24	Water Monitor	<i>Varanus salvator</i>		5.0	5.5	5.5	7.5	12.1	17.1	15.6	12.1	9.0	5.5	2.5	2.5	100		6	0	49	4	9
25	Bengal Monitor	<i>Varanus bengalensis</i>		3.0	3.7	4.9	7.3	19.5	24.4	15.9	9.8	4.9	4.3	1.2	1.2	100		2	0	57	8	3
26	Bronze rat snake	<i>Ptyas zoazys</i>		10.7	12.3	9.8	9.8	10.7	9.0	10.7	8.2	4.9	4.1	4.9	4.9	100		3	1	7	0	29
27	Frog	<i>Hoplobatrachus rugulosus</i>		0.7	0.7	0.4	1.1	15.5	36.7	26.3	10.8	5.4	1.1	0.4	1.1	100		0	1	4	1	127
28	Bagarius bagarius	<i>Bagarius bagarius</i>														100		0	0	0	0	67

				7.3	5.9	4.1	4.1	5.5	8.2	8.7	9.1	13.2	15.1	11.9	6.8							
29	<i>Cirrhinus molitorella</i>	<i>Cirrhinus molitorella</i>		8.3	7.3	6.7	7.6	7.9	8.3	8.3	8.9	8.3	8.6	11.1	8.9	100		0	0	0	0	64
30	<i>Hemibagrus wyckoides</i>	<i>Hemibagrus wyckoides</i>		8.3	9.3	7.3	6.2	8.7	10.0	9.3	9.0	8.7	8.3	7.6	7.3	100		0	0	0	0	58
31	<i>Micronema apogon</i>	<i>Micronema apogon</i>		9.2	8.6	5.9	5.3	5.9	8.6	7.2	8.6	7.2	10.5	13.2	9.9	100		0	0	0	0	41
32	<i>Barbodes gonionotus</i>	<i>Barbodes gonionotus</i>		8.1	8.6	8.1	8.0	8.4	9.6	8.4	8.1	8.3	8.7	8.4	7.2	100		0	0	0	0	100

Questions 7-10

M	ENG_NAME	SCI_NAME	Q7	INDIVIDUAL	n	KG	n	Q8	1/w	1/m	1/y	N	Tot8	Q9	n	y	Q10	l	D	S
1	Rhesus Macaque	<i>Macaca arctoides</i>		37,375	8	12,350	12		2	4	22	140	168		154	14		25	39	25
2	Common Palm Civet	<i>Paradoxurus hermaphroditus</i>		35,833	18	12,094	48		3	25	38	102	168		163	5		34	64	23
3	Wild Pig	<i>Sus scrofa</i>		33,500	6	13,224	104		1	40	69	58	168		157	11		49	63	36
4	Sambar Deer	<i>Cervus unicolor</i>		NA	NA	16,900	10		0	0	10	158	168		161	7		2	17	16
5	Red Muntjac	<i>Muntiacus muntjak</i>		140,000	1	17,378	37		0	7	31	130	168		167	1		16	45	19
6	Gaur	<i>Bos gaurus</i>		-	-	-	0		0	0	0	168	168		142	28		18	8	5
7	Chinese Serow	<i>Naemorhedus sumatraensis</i>		-	-	17,979	26		0	1	23	144	168		97	72		12	27	14
8	Inornate Squirrel	<i>Callosciurus inornatus</i>		5,436	77	9,600	5		18	40	25	85	168		168	0		50	58	34
9	East Asian Porcupine	<i>Hystrix brachyura</i>		48,750	4	13,518	56		0	7	53	108	168		92	76		17	61	25
10	Eurasian Otter	<i>Lutra Lutra Linnaeus</i>		600,000	4	-	0		0	0	4	164	168		157	12		2	24	3
11	Lesser Mouse Deer	<i>Tragulus Javanicus</i>		42,404	52	30,000	11		7	15	41	105	168		154	14		19	80	14
12	Black Giant Squirrel	<i>Ratufa Bicolor</i>		48,333	15	13,500	2		0	0	17	151	168		159	10		9	28	17
13	Hoary Bamboo Rat	<i>Rhizomys pruinosus</i>		18,583	50	12,857	7		5	22	30	111	168		162	6		26	33	43
14	Tiger	<i>Panthera tigris</i>		-	-	-	0		0	0	0	168	168		155	14		11	13	39
15	Elephant	<i>Elephas maximus</i>		-	-	-	0		0	0	0	168	168		161	7		38	11	52
16	Silver Pheasant	<i>Lophura nycthemera</i>		35,171	41	79,000	8		0	8	41	119	168		167	1		45	39	26
17	Pale-Capped Pigeon	<i>Columba Punicea</i>		6,071	21	-	0		1	8	9	150	168		159	8		41	20	33
18	Puff-Throated Bulbul	<i>Hemixos flavala</i>		2,050	43	-	0		12	17	14	125	168		160	8		51	15	52
19	Great Hornbill	<i>Buceros bicornis</i>		34,875	8	15,000	2		0	0	10	158	168		161	7		13	18	29
20	Wreathed Hornbill	<i>Aceros undulatus</i>		26,364	9	15,000	1		0	1	9	158	168		149	1		8	23	19
21	Brown Hornbill	<i>Anorrhinus Tickelli</i>		16,000	13	15,000	1		0	4	10	154	168		166	0		22	31	20
22	Big-headed Turtle	<i>Platysternon megacephalum</i>		296,364	11	266,486	35		1	7	38	122	168		166	0		2	49	7
23	Indochinese Box Turtle	<i>Cuora galbinifrons</i>		23,556	9	29,568	22		3	4	29	132	168		149	6		5	33	14
24	Water Monitor	<i>Varanus salvator</i>		18,100	5	10,467	30		1	6	28	133	168		164	4		12	53	27
25	Bengal Monitor	<i>Varanus bengalensis</i>		27,500	4	16,939	33		3	4	30	131	168		162	5		12	52	16
26	Bronze rat snake	<i>Ptyas zoazys</i>		13,278	9	10,667	3		0	2	10	156	168		164	3		18	24	31
27	Frog	<i>Hoplobatrachus rugulosus</i>					86		12	11	63	82	168		158	0		46	48	40

				4,000	2	10,714														
28	Bagarius bagarius	Bagarius bagarius		-	-	15,592	49		12	10	27	119	168		150	1		12	42	21
29	Cirrhinus molitorella	Cirrhinus molitorella		-	-	13,684	49		15	12	21	120	168		140	0		7	51	7
30	Hemibagrus wyckoides	Hemibagrus wyckoides		-	-	15,980	42		15	13	14	126	168		166	0		7	39	15
31	Micronema apogon	Micronema apogon		-	-	19,577	26		4	7	16	141	168		166	0		5	23	16
32	Barbodes gonionotus	Barbodes gonionotus		6,000	1	10,729	70		25	19	26	98	168		168	0		23	59	19

**Appendix 4: List of Wildlife species (species in bold were mapped)**

	Common Name	Lao Name	Scientific Name	Status MAF 0380
<b>Σ</b>				
1	Rhesus Macaque	ລິງວອກ	<i>Macaca arctoides</i>	C
2	Common Palm Civet	ເຫງືອ້ມ	<i>Paradoxurus hermaphroditus</i>	
3	<b>Wild Pig</b>	ໝູປ່າ	<i>Sus scrofa</i>	C
4	<b>Sambar Deer</b>	ກວາງ	<i>Cervus unicolor</i>	C
5	Red Muntjac	ຟາ	<i>Muntiacus muntjak</i>	C
6	<b>Gaur</b>	ກະທົງ	<i>Bos gaurus</i>	R
7	<b>Chinese Serow</b>	ເຍືອງຜາ	<i>Naemorhedus sumatraensis</i>	R
8	Inornate Squirrel		<i>Callosciurus inornatus</i>	
9	East Asian Porcupine	ເຫມີ້	<i>Hystrix brachyura</i>	C
10	<b>Eurasian Otter</b>	າກໃຫຍ່	<i>Lutra Lutra Linnaeus</i>	R
11	Lesser Mouse Deer	ຟາໄກ້	<i>Tragulus Javanicus</i>	C
12	Black Giant Squirrel	ກະຮອກດຳໃຫຍ່	<i>Ratufa Bicolor</i>	
13	Hoary Bamboo Rat	ອີ້	<i>Rhizomys pruinosus</i>	C
14	<b>Tiger</b>	ເສືອໂຄງ	<i>Panthera tigris</i>	R
15	<b>Elephant</b>	ຊ້າງ	<i>Elephas maximus</i>	R
<b>B</b>				
16	Silver Pheasant	ກຂວາຫຼັງຂາວ	<i>Lophura nycthemera</i>	R
17	Pale-Capped Pigeon	ກເຂົາ	<i>Columba Punicea</i>	
18	Puff-Throated Bulbul	ກຂວກ	<i>Hemixos flava</i>	
19	<b>Great Hornbill</b>	ກກົກຄຳ	<i>Buceros bicornis</i>	R
20	<b>Wreathed Hornbill</b>	ກກົກຄຳເອີມ	<i>Aceros undulates</i>	R
21	Brown Hornbill	ກແກງ	<i>Anorrhinus Tickelli</i>	C
<b>H</b>				
22	Big-headed Turtle	ເຕົ້າຫົວໃຫຍ່	<i>Platysternon megacephalum</i>	C
23	Indochinese Box Turtle	ເຕົ້າເຫລືອງ	<i>Cuora galbinifrons</i>	C
24	<b>Water Monitor</b>	ເຮ້ຍ	<i>Varanus salvator</i>	C
25	<b>Bengal Monitor</b>	ແລ	<i>Varanus bengalensis</i>	
26	Bronze rat snake	ງູສິງທອງ	<i>Ptyas zoazys</i>	
27	Frog	ກົບ	<i>Hoplobatrachus rugulosus</i>	
<b>F</b>				
28	Cat Fish		<i>Bagarius bagarius</i>	
29	Carp		<i>Cirrhinus molitorella</i>	
30	??		<i>Hemibagrus wyckoides</i>	
31	??		<i>Micronema apogon</i>	

32	??	<i>Barbodes gonionotus</i>
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32 Total species in hunting study

Total species to map =15

## Appendix 5: Questionnaire

### HOUSEHOLD INTERVIEW

In each village, conduct structured interviews with the head of the household and family in the 15 households selected and arranged by the village headman seeking answers to the following questions.

First, show the household the map that was made by the headman group. Point out the landmarks on the map (mountains, rivers, location of the village, trails, roads, etc) Then ask them if they have any questions about the map or if they would like to add anything to it .

Household Background Information: Now complete the background information on the household about the name of the household head, number of people in the family, ethnicity, how long the village and this family have been in this location. We assume that the longer a village has been in this location, the more knowledge they will hold about the status of the wildlife resources.

Now show them the local wildlife list that was made by the headman group. Show them each of the picture cards with the local names of the animals that live in the village area that was provided by the headman.

Use of wildlife for food in the household

Q1. In your household, how many times each week do you eat:  
domestic meat (all vertebrates other than fish)?  
fish ?  
wildlife (vertebrates other than fish)?  
How: Record the response for each.

Q2. If you have a choice of domestic meat, fish or wildlife, which you prefer to eat the most? The least?  
How: Circle best, medium and least for each of the following depending on their answer  
domestic meat (all vertebrates other than fish)  
fish  
wildlife

USING ALL OF THE CARDS OF ANIMALS THAT ARE FOUND IN THE VILLAGE AREA, FOR EACH ANIMAL CARD, ASK THE FOLLOWING QUESTIONS. RECORD THE INFORMATION ON THE HOUSEHOLD CHECKLIST.

Q3. How often do you eat THIS animal?  
How: Tick one of the following:  
eat at least once a week,  
do not eat each week but eat at least once each month,  
do not eat every 6 months but eat at least once each year.  
Less than once each year  
Never  
Use pictures of a calendar to label the five piles.

Note: Assume households may use wildlife for food but may not be harvesting it themselves.

Q4. WHEN do people hunt for THIS animal?

How: Tick the months when this animal is hunted

Note: We assume people can read and understand a calendar or that interviewers will be able to translate seasonal activities by the household to a 12 month calendar format.

Q5. HOW do people hunt for THIS animal?

How: Tick any of the following: gun, crossbow, snare, dogs, other

Note: We assume people can read and understand a calendar or that interviewers will be able to translate seasonal activities by the household to a 12 month calendar format.

Q6. On average, how much do people in your village sell THIS animal for?

How: Record value.

Q7. On average, how often is THIS animal sold from the village?

How: Tick one of the following

at least once a week,

not each week but at least once each month, and

not each month at least once this year.

never

Use pictures of a calendar to label the four choices.

Note: We assume households may not be afraid to say that the village is selling wildlife even though it is against the law. We assume people are less likely to give truthful information about their household sale or trade of wildlife than village sale or trade.

Q8. Do you use THIS animal for medicine?

How: Tick if yes.

Q9. Have the numbers of THIS animal increased, decreased or stayed the same in the last ten years?

How: Tick either increase, decreased and stayed the same.

Note: We assume villagers can accurately judge how long a time period of ten years is.

RECORD THE ANSWERS TO THE FOLLOWING QUESTIONS ON THE DATA SHEET

Q10. Do people from outside of your village come to HUNT any of the animals that are found in your village area?

How: Record yes or no.

Note: We assume people will not feel afraid to tell the truth.

Q11. Who do people in your village SELL wildlife to?

How: Tick any of the following.

neighbors in your village

people from another village

people from Luang Namtha town

people from outside of LNT province.



Q12. Do people come to your village to ASK TO BUY animals?

How: Respond yes or no.

Q13. In the last ten years, has your household had any problems with wildlife:

raiding your crops? Tick if yes

killing your livestock? Tick if yes

hurting or killing people? Tick if yes

If yes, to any of these problems, what ideas do you have about what could be done to stop this problem?

## Appendix 6: General Village data summary

Village Name	Ethnic group	Data	Total
Houeyluek	Mouey	Average of Yrs lived in Village	26.1
		Average of Age of village	34.9
		Average of Children	3.0
		Average of woman	1.8
		Average of Men	1.8
		Average of # population in household	6.6
	Yor	Average of Yrs lived in Village	12.0
		Average of Age of village	32.0
		Average of Children	2.0
		Average of woman	2.0
		Average of Men	3.0
		Average of # population in household	7.0
Houeyluek Average of Yrs lived in Village		25.4	
Houeyluek Average of Age of village		34.8	
Houeyluek Average of Children		3.0	
Houeyluek Average of woman		1.8	
Houeyluek Average of Men		1.8	
Houeyluek Average of # population in household		6.6	
Kengbit	Kha	Average of Yrs lived in Village	10.0
		Average of Age of village	10.0
		Average of Children	3.8
		Average of woman	2.0
		Average of Men	1.6
		Average of # population in household	7.4
	Laoskang	Average of Yrs lived in Village	10.0
		Average of Age of village	10.0
		Average of Children	2.0
		Average of woman	1.0
		Average of Men	1.0
		Average of # population in household	4.0
	Men	Average of Yrs lived in Village	7.4
		Average of Age of village	10.0
		Average of Children	3.2
		Average of woman	1.6
		Average of Men	1.6
		Average of # population in household	6.4
	Mouey	Average of Yrs lived in Village	7.1
		Average of Age of village	10.0

Village Name	Ethnic group	Data	Total
		Average of Children	2.1
		Average of woman	1.5
		Average of Men	1.6
		Average of # population in household	5.2
Kengbit Average of Yrs lived in Village			8.0
Kengbit Average of Age of village			10.0
Kengbit Average of Children			2.8
Kengbit Average of woman			1.6
Kengbit Average of Men			1.6
Kengbit Average of # population in household			6.0
Kontao	Mouey	Average of Yrs lived in Village	13.5
		Average of Age of village	16.0
		Average of Children	3.8
		Average of woman	1.6
		Average of Men	1.7
		Average of # population in household	7.1
Kontao Average of Yrs lived in Village			13.5
Kontao Average of Age of village			16.0
Kontao Average of Children			3.8
Kontao Average of woman			1.6
Kontao Average of Men			1.7
Kontao Average of # population in household			7.1
Nade	Laoskang	Average of Yrs lived in Village	33.0
		Average of Age of village	33.0
		Average of Children	0.0
		Average of woman	1.0
		Average of Men	2.0
		Average of # population in household	3.0
	Laosloum	Average of Yrs lived in Village	12.0
		Average of Age of village	27.7
		Average of Children	3.7
		Average of woman	2.7
		Average of Men	1.3
		Average of # population in household	7.7
	Men	Average of Yrs lived in Village	17.0
		Average of Age of village	33.0
		Average of Children	3.0
		Average of woman	1.0
		Average of Men	1.0
		Average of # population in household	5.0
	Mouey	Average of Yrs lived in Village	18.6
		Average of Age of village	28.4
		Average of Children	2.6

Village Name	Ethnic group	Data	Total
		Average of woman	1.4
		Average of Men	1.9
		Average of # population in household	6.1
	Phong	Average of Yrs lived in Village	17.7
		Average of Age of village	33.0
		Average of Children	3.4
		Average of woman	2.0
		Average of Men	1.9
		Average of # population in household	7.3
	Phoun	Average of Yrs lived in Village	27.0
		Average of Age of village	33.0
		Average of Children	1.0
		Average of woman	1.0
		Average of Men	1.0
		Average of # population in household	3.0
Nade Average of Yrs lived in Village		18.3	
Nade Average of Age of village		31.0	
Nade Average of Children		2.9	
Nade Average of woman		1.8	
Nade Average of Men		1.8	
Nade Average of # population in household		6.5	
Namtex	Laoskang	Average of Yrs lived in Village	15.5
		Average of Age of village	18.5
		Average of Children	2.0
		Average of woman	1.5
		Average of Men	1.5
		Average of # population in household	5.0
	Mongkhao	Average of Yrs lived in Village	3.0
		Average of Age of village	5.0
		Average of Children	4.0
		Average of woman	1.0
		Average of Men	1.0
		Average of # population in household	6.0
	Monglay	Average of Yrs lived in Village	2.9
		Average of Age of village	5.0
		Average of Children	4.9
		Average of woman	1.9
		Average of Men	1.7
		Average of # population in household	8.4
	Mouey	Average of Yrs lived in Village	3.8
		Average of Age of village	7.7
		Average of Children	3.4

Village Name	Ethnic group	Data	Total
		Average of woman	1.7
		Average of Men	1.9
		Average of # population in household	7.1
Namtex Average of Yrs lived in Village			4.5
Namtex Average of Age of village			7.6
Namtex Average of Children			3.8
Namtex Average of woman			1.7
Namtex Average of Men			1.7
Namtex Average of # population in household			7.2
Nongkok	Laosloum	Average of Yrs lived in Village	21.5
		Average of Age of village	32.0
		Average of Children	2.0
		Average of woman	3.0
		Average of Men	2.0
		Average of # population in household	7.0
	Men	Average of Yrs lived in Village	12.7
		Average of Age of village	32.0
		Average of Children	3.5
		Average of woman	1.3
		Average of Men	1.7
		Average of # population in household	6.5
	Mouey	Average of Yrs lived in Village	9.6
		Average of Age of village	32.0
		Average of Children	3.0
		Average of woman	2.0
		Average of Men	1.7
		Average of # population in household	6.7
	Pao	Average of Yrs lived in Village	6.5
		Average of Age of village	32.0
		Average of Children	4.5
		Average of woman	1.5
		Average of Men	2.0
		Average of # population in household	8.0
Nongkok Average of Yrs lived in Village			11.5
Nongkok Average of Age of village			32.0
Nongkok Average of Children			3.2
Nongkok Average of woman			1.8
Nongkok Average of Men			1.7
Nongkok Average of # population in household			6.8
Pakbuek	Khamu	Average of Yrs lived in Village	5.2
		Average of Age of village	7.5
		Average of Children	3.3

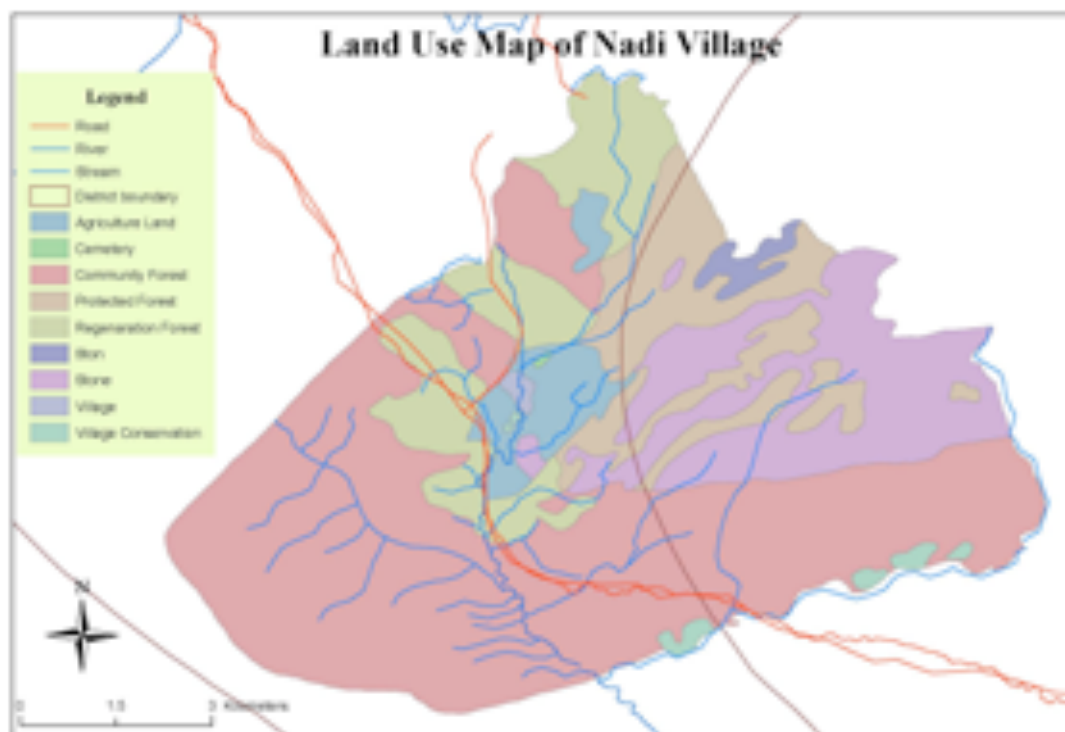
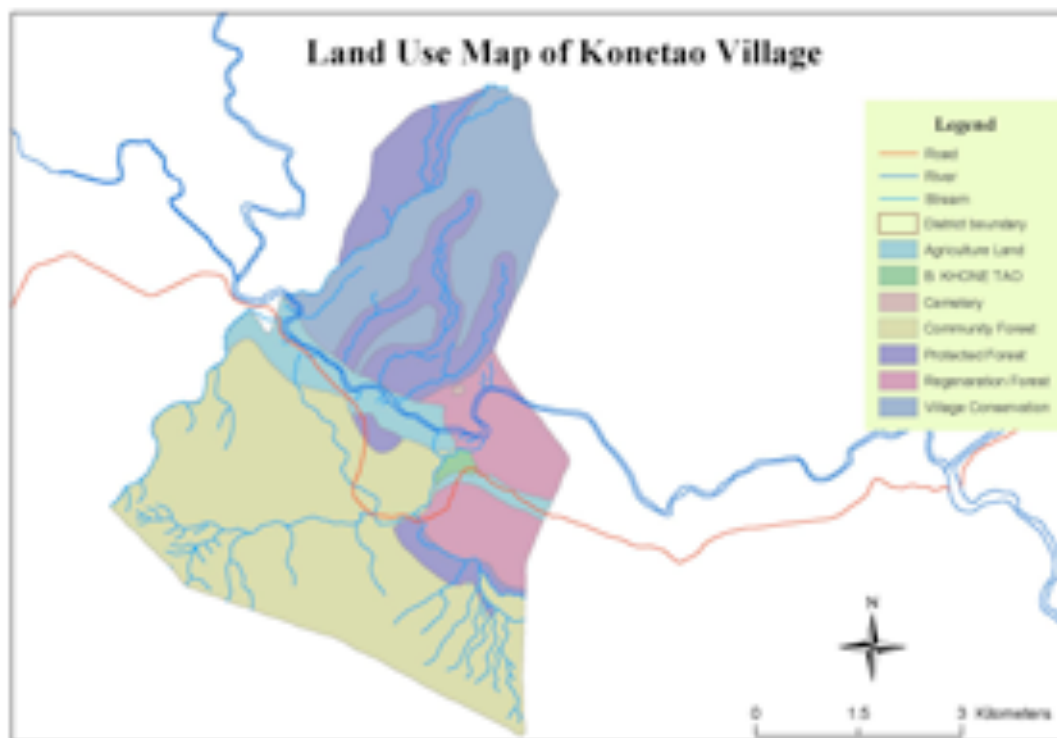
Village Name	Ethnic group	Data	Total
		Average of woman	1.5
		Average of Men	1.8
		Average of # population in household	6.6
	Laosloum	Average of Yrs lived in Village	5.3
		Average of Age of village	8.0
		Average of Children	2.8
		Average of woman	1.0
		Average of Men	1.3
		Average of # population in household	5.0
	Men	Average of Yrs lived in Village	8.0
		Average of Age of village	8.0
		Average of Children	0.0
		Average of woman	1.0
		Average of Men	1.0
		Average of # population in household	2.0
	Mouey	Average of Yrs lived in Village	6.0
		Average of Age of village	8.0
		Average of Children	2.0
		Average of woman	1.3
		Average of Men	1.3
		Average of # population in household	4.7
	Phong	Average of Yrs lived in Village	6.0
		Average of Age of village	8.0
		Average of Children	2.0
		Average of woman	1.5
		Average of Men	2.0
		Average of # population in household	5.5
	Phouthai	Average of Yrs lived in Village	7.0
		Average of Age of village	8.0
		Average of Children	2.0
		Average of woman	1.0
		Average of Men	1.0
		Average of # population in household	4.0
	Thaidam	Average of Yrs lived in Village	2.0
		Average of Age of village	8.0
		Average of Children	0.0
		Average of woman	1.0
		Average of Men	1.0
		Average of # population in household	2.0
	Yo	Average of Yrs lived in Village	5.0
		Average of Age of village	8.0

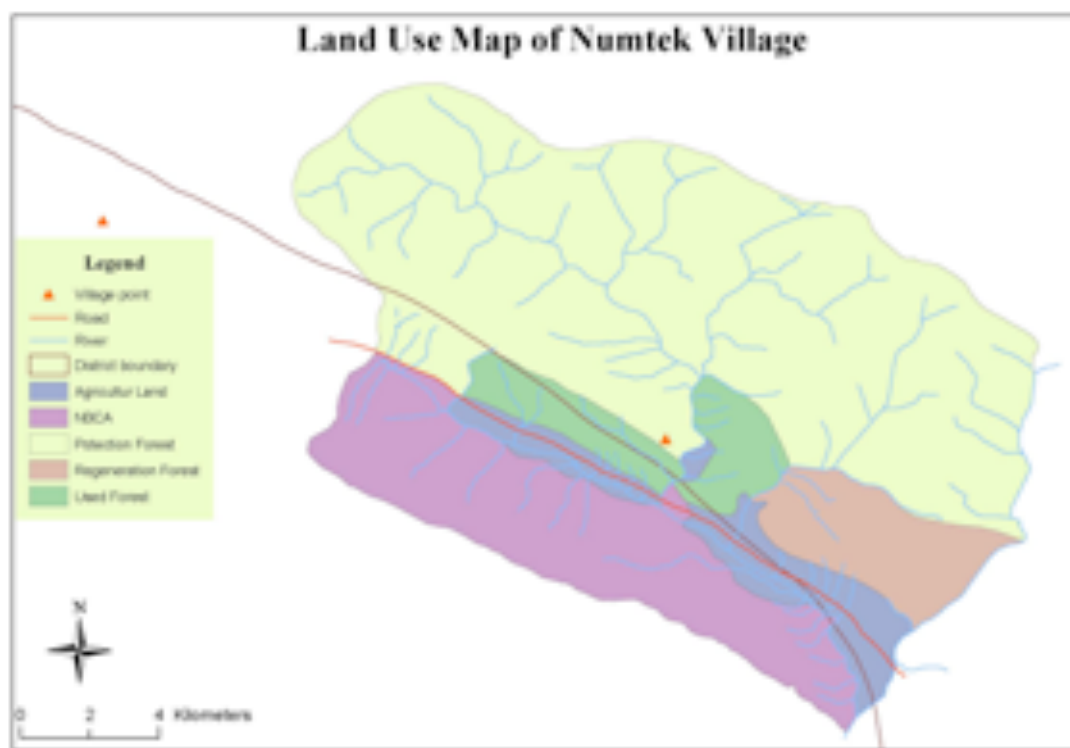
Village Name	Ethnic group	Data	Total
		Average of Children	4.0
		Average of woman	1.0
		Average of Men	1.0
		Average of # population in household	6.0
Pakbuek Average of Yrs lived in Village			5.4
Pakbuek Average of Age of village			7.8
Pakbuek Average of Children			2.6
Pakbuek Average of woman			1.3
Pakbuek Average of Men			1.5
Pakbuek Average of # population in household			5.5
Paksoun	Laosloum	Average of Yrs lived in Village	10.0
		Average of Age of village	61.0
		Average of Children	2.0
		Average of woman	1.0
		Average of Men	1.0
		Average of # population in household	4.0
	Mouey	Average of Yrs lived in Village	26.4
		Average of Age of village	58.1
		Average of Children	2.3
		Average of woman	1.5
		Average of Men	1.5
		Average of # population in household	5.2
Paksoun Average of Yrs lived in Village			25.6
Paksoun Average of Age of village			58.2
Paksoun Average of Children			2.3
Paksoun Average of woman			1.4
Paksoun Average of Men			1.4
Paksoun Average of # population in household			5.1
Total Average of Yrs lived in Village			14.0
Total Average of Age of village			24.5
Total Average of Children			3.0
Total Average of woman			1.6
Total Average of Men			1.7
Total Average of # population in household			6.3

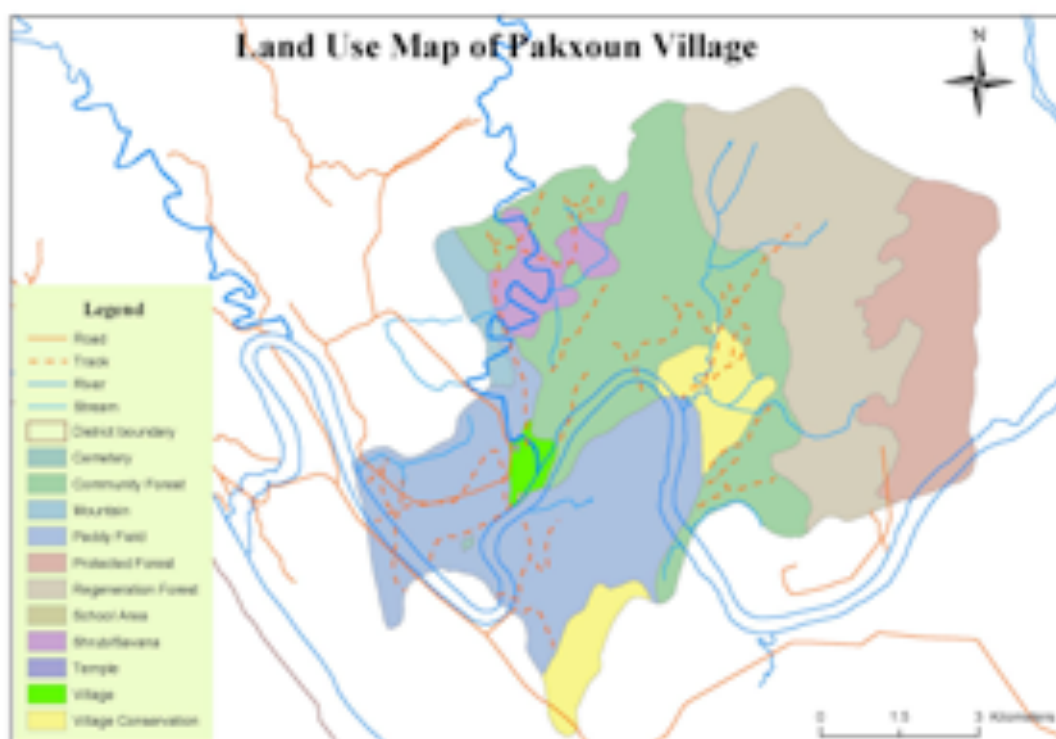
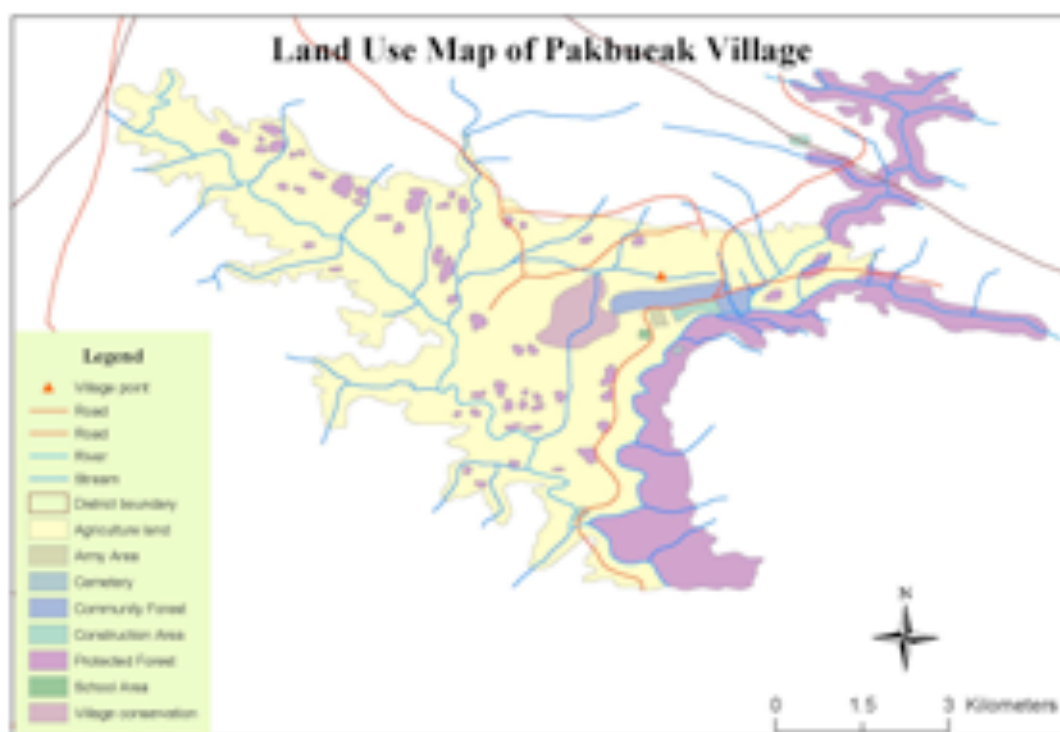
## Appendix 7: LUP Maps











## **Appendix 8: Social Landscapes**

