The distribution and status of Asiatic black bear *Ursus thibetanus* and Malayan sun bear *Helarctos malayanus* in Nam Et Phou Louey National Protected Area, Lao PDR

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Lorraine Scotson
06.10.10
Table of Contents

1. Introduction 1 - 2
   1.1 Free The Bears Fund Inc. 1
   1.2 Sun bears and black bears 1
   1.3 Laos 2
   1.4 Bears in Laos 2
   1.5 Nam Et Phou Louey National Protected Area, Laos 2

2. Aims and Objectives 3

3. Methodology 4 - 13
   3.1 Study site 4
   3.2 Participating organisations 5
   3.3 Survey team selection and training 5
   3.4 Sample site selection 5 - 6
   3.5 Logistics 7
   3.6 Line transect methodology 7 - 8
   3.7 Data collection 8
   3.8 Species identification 9
   3.9 Data Analysis 9
   Examples of bear sign. Figures 8 – 15 10 - 13

4. Results 14 - 26
   4.1 Transect Details 14 - 15
   4.2 Bear sign density 14 - 18
   4.3 Species identification 18, 20
   4.4 Local interviews 18 – 19, 21
   4.5 Budget 22 - 23
   4.6 Incidental data 24 - 26

5. Discussion 27 - 36
   5.1 The Known Status of Bears in Laos Today 27 - 28
   5.2 The Distribution and Relative Density of Bears in NEPL 28 - 30
   5.3 Threats to Bears in NEPL 31 - 36

6. Conclusions 37 - 38
   6.1 The Status of Bears in NEPL 37
   6.2 Project Constraints 37
   6.3 Recommendations 37 - 38

References

Appendix
1. Introduction

1.1 Free The Bears Fund Inc.

Free the Bears Fund Inc. (FTB) have been operating in Southeast Asia since 1995 and work directly with 3 of the Asian bear species; the Asiatic black bear *Ursus thibetanus*, the Malayan sun bear *Helarctos malayanus* (hereafter sun bear and black bear), and the Indian sloth bear (*Melursus ursinus*). FTB was founded in 1995 by Mary Hutton, Perth, Australia, initially to tackle the issue of illegal hunting and commercial farming of bears for bile extraction. Information on wild populations is desperately in need of updating and FTB are committed to a long-term initiative to expand in-situ conservation of bears in understudied parts of their range. Since 2007, with help from our sponsors, FTB have implemented and supported ranger training and wild bear population monitoring in Cambodia, Vietnam and Lao PDR (hereafter Laos). Our research complements directives of the IUCN-Bear Specialist Groups (BSG) and the International Bear Association (IBA) who view mapping the extant range of bear populations as a top priority.

1.2 Sun bears and black bears

Sun bears and black bears are two of the largest, widest ranging species of land mammal in Southeast Asia. The existing range of the sun bear expands across mainland South East Asia, reaching Bangladesh in the west, crossing into north-eastern India, and goes as far north as Yunnan Province in southern China (Fig. 1). Despite this wide range populations of sun bears are highly fragmented and are under threat from a variety of sources including habitat loss and over-harvesting for illegal trade (Servheen, pers. comm., 2009). Sun bears, recently upgraded from ‘Data Deficient’ to ‘Vulnerable’ on the IUCN red list of endangered species, also persist in the Malaysian islands of Borneo (sub-species *H. m. euryspilus*) and Sumatra; hence the common name of Malayan sun bear (Fredriksen et al., 2008). Black bear populations are also classed as ‘Vulnerable’ by the IUCN. Black bears range from south-eastern Iran east to Myanmar, with scattered populations in southern and north-eastern China, southern Russia Far East, North Korea, South Korea, Japan, Taiwan and Hainan (Fig. 2; Garshelis & Steinmetz, 2008).

![Current distribution and status of Malayan sun bear (2006)](image1)

![Current distribution and status of Asiatic black bear (2006)](image2)

**Figure 1.** Data sources: Political boundaries, VMAPO – National Imagery Mapping Agency; Current distribution/status, experts at the WCS/IUCN-BSG Range Wide Assessment of Asian Bears, Karuizawa, Japan, October 7, 2006; Historical range Erdbrink, (1953) modified by the experts at the workshop.

**Figure 2.** Data sources: Political boundaries, VMAPO – National Imagery Mapping Agency; Current distribution/status, experts at the WCS/IUCN-BSG Range Wide Assessment of Asian Bears, Karuizawa, Japan, October 7, 2006; Historical range Erdbrink, (1953) modified by the experts at the workshop.
1.3 Laos

Laos is landlocked amidst China, Vietnam, Cambodia, Myanmar, and Thailand and has a total land mass of 236,800km². Laos is unique in Southeast Asia with over 40% of forest cover remaining and a human population density of only 22 people/km², by far the lowest in this region (ICEM, 2003). Once known as ‘The Land of a Million Elephants’, Laos is an international biodiversity “hotspot”, home to a wide array of birds, reptiles, amphibians, and mammals, many of national or global significance.

Geographically Laos is placed in a precarious position for preserving its valuable natural resources. Laos is an easy target for its resource-hungry neighbours, with the demand for timber and other wildlife products on the rise to meet the requirements of an international market (Duckworth et al., 1999; Nooren & Claridge, 2001). Over-harvesting for domestic and international trade is the greatest threat to Lao native wildlife (WCS Lao Program, 2003). More than 60 mammal species currently present in Lao are considered to be Globally Threatened (Duckworth et al., 1999). Few species are not exploited in one way or another for food, medicine, pets and decorative use - international trade for all these purposes is particularly significant. Vietnam, China and Thailand represent major consumers of Lao wildlife products. International trade in wildlife is illegal in Laos but cross-border trading is common and largely un-policed, even in the case of highly endangered species such as pangolins, tigers, bears and many species of terrapins (Nooren & Claridge, 2001).

1.4 Bears in Laos

A TRAFFIC and WWF Lao speculated that Laos could represent one of the last remaining strongholds for sun and black bears (Mills & Servheen, 1991). Sun bears have previously been reported from all provinces of Laos (Salter, 1999). The WCS Lao project camera trap data from north-eastern and central Laos indicate that sun bears and black bears remain present to varying degrees with presence related to the extent of wildlife protection in the area (Johnston, 2009, pers. comm.). A genetic study by Dr Gary Galbreath in 2001 discovered a blond colour phase of the black bear which is likely to occur in the Northern Annamite Mountain range of Laos. Research into the genetic variance of bears throughout Laos is ongoing (Galbreath & Heene, 2001). The only other known study was in Bokeo National Park in northern Laos, where the presence of both sun bears and black bears was detected through use of sign and interview-based surveys (Long & Abley, 2008). The use of expert knowledge recently enabled the IBA Bear Specialist Group to create distribution maps for sun bears and black bears. Laos is included in the range of each species (Fig 1 & 2).

1.5 Nam Et Phou Louey National Protected Area, Laos

This study was undertaken in Nam Et Phou Louey (NEPL) National Protected Area (NPA) in northeast Laos bordering Vietnam (Fig. 3). NEPL is the largest out of the 20 NPA’s in Laos, encompassing 5,959 km² of steep rugged mixed evergreen and deciduous forest interspersed by secondary forest and anthropogenic grasslands.
2. Aims and Objectives

A key aim of this project was to provide baseline data for long-term population monitoring and conservation management of sun bear and moon bear in NEPL NPA. The study also formed the pilot season for a national bear population mapping project to be undertaken in completion of a PhD.

Objectives were:

- Train local field staff in sign survey techniques.
- Conduct line transects which have been randomly placed throughout the NPA so as to provide adequate representation of the habitats and environmental pressures throughout the entire area.
- Conduct interview surveys relating to bear distribution and population status in a number of villages of varying ethnic groups throughout the reserve.
- Confirm occurrence and map distribution of sun bear and moon bear throughout the NPA.
- Identify important habitats and environmental variables that favour bear populations.
- Identify major threats to populations and create management recommendations to mitigate these.
- Pilot field and interview techniques to be refined for use in a nationwide survey.
3. Methodology

3.1 Study site

The NEPL NPA encompasses a total area of 5,959 km² located between latitudes 19.85 – 20.05 degrees N and longitudes 103.20 – 103.8 degrees E (www.namet.org). Mixed evergreen and deciduous forest dominates, interspersed by stands of dry evergreen and upper montane forest. Secondary forest, agricultural lands and anthropogenic grasslands are distributed patchily throughout. Steep, mountainous terrain ranges in elevation from 400m – 2257m. Climate is tropical monsoon and annual rainfall is between 1400mm to 1800mm. There is a hot wet season from late April until early September and a cold dry season from late September until early April. Annual temperatures range from 5 – 30 °C (Johnson et al., 2006).

The NPA is categorized into two broad management zones: the core zone (3,000km²) and the buffer zone (2,959 km²)(Fig.4). In the core zone wildlife and habitats are fully protected and entrance denied to all but patrol staff or persons with written permission from the head of the NEPL. Prohibited activities include; forest logging, cutting, hunting, fishing, Non-Timber Forest Product (NTFP’s) collection, agriculture and forest activities, soil excavating, removing ancient valuables, human settlement and all development related activities. The management zone has fewer restrictions but only for villagers living within the boundaries and along the border. Locals can collect NTFP’s, cut trees for building houses (with written permission), fish and hunt certain species within specified hunting seasons or with adherence to any specified management protocol (Forestry Law number 13/NA, dated 9/11/2005).

Figure 4. Nam Et - Phou Louey National Protected Area. The yellow line marks the park’s boundary. Land within the red line is classed as the ‘Core zone’ (3,000km²). The area outside the red line is a controlled zone or ‘Buffer zone’ (2,959 km²).
3.2 Participating organisations

The NEPL NPA is jointly managed by the Wildlife Conservation Society and the Provincial Agricultural and Forestry Department (PARFO) of Houaphan Province. A research permit was granted by PARFO, Houaphan with the work conducted by FTB in partnership with WCS. WCS provided staff, office facilities, logistical support and some use of vehicles. Project costs were funded jointly by the International Bear Association, Perth Zoo, Australia and Free the Bears Fund Inc (see 4.5 Budget).

3.3 Survey team selection and training

The field team consisted of 5 permanent members: Lorraine Scotson (FTB) acted as the project coordinator with Oudone Phaphothong (WCS) acting as team leader for the local staff. Mr Wongphet, Mr Mai Heim and Mr Sengilo were sourced from local villages within the NEPL and individually had up to 10 years past experience working on wildlife monitoring projects with WCS (Fig. 5). During an introductory week team members were given training in bear sign survey techniques and Dr Vichith Lamxay, a botanist from the National University of Laos, Vientiane, conducted a 3-day training course in habitat classification, tree identification and plant sample collection.

3.4 Sample site selection

To select transect start locations random points were generated using the ‘random point generator’ in Hawths Tools, Ark GIS 9.3. 30 points were generated with an enforced minimum distance of 10 km between points. 4 of these points were subsequently eliminated due to unsuitability (i.e. were unreachable or in non-forested areas), as advised by the WCS Tiger team, leaving 26 potential survey points (Fig. 6). A final 20 transect points were selected taking the completion schedule and field logistics into consideration. Field work was initially expected to take 3 months to complete however this proved unrealistic and extra funding was sourced to allow an extension of the field season to 4 months.
Figure 6. Map of NEPL showing randomly generated sample site selection. Red circles indicate final selection of 20 transects.
3.5 Logistics

Motorbikes were the primary method of transport around the field site. It was concluded that hiring a car and driver would be too expensive and restrictive in comparison. A large agricultural dirt bike, Yamaha AG200, (previously owned) carried one team member and the bulk of the equipment. Two small Chinese scooters were purchased from Luang Pabang to carry 4 team members (Fig. 7). Other forms of transport, such as raft, boat, tractor, hire car and bus were used whenever necessary.

Vienstong town was used as a base as this is the location of the WCS headquarters and the Provincial Agriculture and Forestry Office of Houaphan Province. We rented a house to store equipment and accommodate the team on breaks from the field. Renting a house proved cheaper and more convenient than using guesthouse accommodation. Accommodation in villages was normally at the house of the Village Chief. This was useful for sourcing temporary field assistants, rice supplies and interview candidates.

We embarked on each field trip with 7-8 team members; 5 of the permanent field team and up to 3 temporary local staff used for local expertise, carrying supplies, trail clearing and cooking. This arrangement allowed for any unexpected absence of 1 permanent team member (through sickness or family commitments) without any negative impact on field work.

The average field kit weighed between 15 – 25 kg, depending on the length of the field trip. The basic field kit carried by every member of the team consisted of; hammock, rain cover, sleeping bag, water-bottle, torch, spare clothes and toiletries. Other supplies were divided proportionately between team members: - Rice rations were calculated at 1kg per person per day. Dried buffalo or beef was prepared in advance and around 3kg taken to feed 8 people for a 6 day trip. Other supplies included tinned fish (1 can per 2 people/day) dried fish and instant noodles (2 packs per person/day). Garlic, dried chillies and MSG were used for seasoning and forest vegetation (mushrooms, edible plants, etc) gathered opportunistically. Ovaltine and instant coffee were rationed at one pack per person each day. Other essential equipment included; rice cooker, cooking pot, bowls, spoons, 2 machetes, candles, lighters, batteries, zip-lock bags and strong bin liners.

3.6 Line transect methodology

Transect start points were chosen randomly in advance and fell within a range of forest types. Forest type often changed within transects so the exact distance of each type surveyed was recorded. Table 1 describes how each habitat type was classified. Each line transect was conducted by a team of 4-5 people. A direction (north, south, east or west) was chosen randomly in advance and one person (temporary local staff) acted as navigator, leading the way on the midline with use of a compass and machete. One person walked the midline, measuring the length of the transect with a ten meter rope, monitoring the rest of the team and recording all data. 1-2 people were assigned to zigzag along 5 metre strips on either side of the mid-line, searching for bear sign and communicating finds back to the data collector. For continuity, team members held the same role for all transects although, to avoid bias, they alternated on sides of the midline.

Field equipment consisted of a compass, map and GPS unit (Garmin GPSmap 76C x) for navigation and 10 metre and 5 metre lengths of rope for measuring the widths and length of transects. 150cm flexible measuring tapes were used to measure the circumference of tree trunks at breast height. Templates of fresh and recent claw marks were recorded in a ring-bound note pad.
### Table 1. Definition of habitat categories.

<table>
<thead>
<tr>
<th>Habitat Category</th>
<th>Type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed evergreen and deciduous</td>
<td>This forest type is dominant in NEPL characterised by a mixture of evergreen and deciduous tree species (&gt;50%) with some bamboo.</td>
<td></td>
</tr>
<tr>
<td>Secondary forest</td>
<td>Dominated by banana trees, bamboo, small trees, lots of undergrowth and many insects, often adjacent to fields and agricultural land.</td>
<td></td>
</tr>
<tr>
<td>Bamboo forest</td>
<td>Area is covered by bamboo stands with a crown cover of less than 5%. There are often many ants and termite nests in this habitat type.</td>
<td></td>
</tr>
<tr>
<td>Grasslands</td>
<td>Open grasslands with a crown cover of less than 20%. These areas have often been forested in the past and have been cleared due to logging, shifting cultivation or other heavy disturbance.</td>
<td></td>
</tr>
</tbody>
</table>

### 3.7 Data collection

Elevations were recorded at the start, middle and end points of each transect. All instances of bear sign within transect boundaries were recorded in a standardised data sheet (Appendix 1). Any bear sign falling out-with transect boundaries were not recorded. If there was any doubt the 5 metre rope was used to determine whether sign should be recorded. If a tree with sign was only partially within the transect boundaries the sign was counted. Examples of sign found on transects are illustrated by Figures 8 - 15.

Claw marks, bear’s nest, broken bee’s nest, digging sites, scat, tracks and trails were all recorded as 1 sign. Claw marks on climbed trees were also recorded as one sign. In the situation where claw marks of different age categories were observed on one tree the most recent sign was recorded.

Sign were allocated to broad age categories; Fresh (1-3 months), Recent (3-12 months), Old (1-2 years) and Very Old (>2 years) (Table 2). The age of sign was decided through a combination of expertise and protocol. Steinmetz & Garshelis (2010) found that claw marks from climbing events can be placed in broad age categories and that wood hardness and seasonal effect had little consequence on aging rates. Sign were assigned to the above age categories using aging characteristics from Steinmetz and Garshelis (2010) and with the collective experience of the field team.

### Table 2. Definition of age categories used in collection of sign data.

<table>
<thead>
<tr>
<th>Age Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh</td>
<td>Sign estimated to be aged less than 3 months. Claw marks have fine woody grit within gouge and distinct sharp edges (Fig. 8). Footprints and faeces always classed as Fresh due to short life span of these sign (Fig. 9). Dig sites will usually have clearly disturbed, fresh soft dirt scattered around. Live insects and eggs can be seen at particularly fresh digs (Fig. 15).</td>
</tr>
<tr>
<td>Recent</td>
<td>Sign estimated to be aged 3 – 12 months. Claw marks are void of woody grit, becoming smooth and hard with new bark growth spreading across the inside of the gouge. Edges are faded and less distinct than Fresh marks. Dig sites will have hardened dirt clumps and are often covered with fallen leaves, sticks and other vegetation (Fig. 12).</td>
</tr>
<tr>
<td>Old</td>
<td>Sign estimated to be aged between 1 – 2 years. Claw marks are filled by wood re-growth or bark which builds around the edges. Edges are often raised out from the tree trunk (Fig.14).</td>
</tr>
<tr>
<td>Very Old</td>
<td>Sign estimated to be aged more than 2 years. Claw marks are stretched and distorted considerably due to tree growth. Bark re-growth often results in claw marks being pushed out from tree trunk (Fig. 14).</td>
</tr>
</tbody>
</table>
3.8 Species identification

Claw marks on trees will be categorised by species using the identification method described by Steinmetz & Garshelis (2007). A paper template will be used to record all fresh and recent (within 1 year) claw marks encountered during transects or incidentally on route to and from transect locations. Markings that are deemed to be older than 1 year or visibly distorted by tree growth will not be recorded to avoid misleading measurements.

Table 3. Claw mark reference table adapted from Steinmetz & Garshelis (2008).

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-claw (cm)</td>
<td>width (cm)</td>
<td>claw-width (cm)</td>
</tr>
<tr>
<td>Black bear</td>
<td>&gt; 6.6</td>
<td>&gt; 9.0</td>
</tr>
<tr>
<td>Sun bear</td>
<td>&lt; 6.0</td>
<td>&lt; 6.2</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>6.0-6.6</td>
<td>6.2-9.0</td>
</tr>
</tbody>
</table>

Fruit trees, ant nests and termite nests were counted along transects to obtain a measure of food abundance. Tree species were identified using the local name and samples were taken to be stored in alcohol in for subsequent identification by the Botany department of the Lao National University of Vientiane.

Interviews were conducted in all villages used as access points to transects. As the field team generally boarded with the village chief, he was asked to identify up to 5 viable candidates to interview. Interviewees were selected by taking their expertise of the local region into account, in particular their knowledge of the forest and wildlife. The set questionnaire used in all interviews is shown in Appendix 2.

3.9 Data Analysis

Data were analysed using Microsoft Excel, SPSS 17.0 and Ark GIS v9.3. Claw mark templates were analysed for species i.d using the claw mark reference table (Table 3; Steinmetz & Garshelis 2008).
Examples of bear sign in different age categories (Fig. 8 - 15)

Figure 8. Fresh claw marks from climbing events occurring less than three months previous. Claw marks have distinct edges with no bark re-growth (left). Claw marks often have residual flakes of freshly disturbed bark curled beneath the gouges (right). On tree species with soft/runny inner sap, fresh claw marks can be recognised by visible sap leakage (right).

Figure 9. Bear scat (left) and footprints (right) are always classed as Fresh due to the short longevity of these sign in the forest environment. Detectability of these types of sign is extremely low and directly linked to environmental conditions. Scat can disintegrate and be washed away quickly in wet, humid conditions. Footprints are only detectable on certain substrates, i.e. by a river or moist ground in banana tree patches. Tracks are more likely to be encountered tracks after a period of rain when the ground is soft.
Figure 10. Bear claw marks on the base of a destroyed banana tree. Bears will chew the stalks of banana leaves for their sweet sap, pulling the entire tree to the ground in the process.

Figure 11. A freshly broken bees nest. No bark regrowth has occurred, indicating this event occurred less than 3 months previously.

Figure 12. Recent digging, judged to be more than 3 months but less than 1 year, will have a distinct hole but be filled with forest debris. The earth will be hard and compact and clumps of hardened old dirt can still be found close by (left). Recent claw marks have some new bark growth within the gouge marks and around the edges resulting in edges less sharp/distinct as those of a fresh claw mark. Recent marks are void of woody grit and residual flakes of bark (right).
Figure 13. Bears build nests as either sleeping or eating platforms. Nests are usually v-shaped in appearance and built close to the trunk of a tree. Ground nests, made by a collection of branches, twigs and leaves, are a rarer sight (left). Tree nests are often characterised by large branches broken inwards to form the base of the nest (right). Secondary sign, such as scat, footprints and claw marks, can confirm that the nest has been constructed by a bear, for example, a fresh bear scat was found adjacent to this ground nest (left).

Figure 14. Old claw marks are classed as more than a year old. Considerable re-growth of bark can be seen within the gouges and there is a total absence of woody grit (left). Very old claw marks, more than 2 years old, are shallow in depth if not level or even producing from the tree trunk (right). Distortion of claw marks more than 1 year old is evident due to growth of the tree.
Figure 15. Fresh dig sites, classed as less than three months old, will be freshly disturbed, relatively clear from forest debris and surrounded by soft clumps of soil. If a digging is particularly fresh, i.e. within hours or days, then live insects (ants, termites) are often seen within the hole (left), broken termite mound (right), broken bamboo or rotten wood. Care must be taken to distinguish between bear digs and other animals that leave similar sign such as wild pigs, porcupines and pangolins. Local staff can normally distinguish between these species with confidence.
4. Results

4.1 Transect Details

19 straight line transects were completed between the 18th of January 2010 and the 11th of May 2010 (Fig. 16). Transects ranged in length from 100 – 500 meters and were 10 metres wide, taking an average of 2hrs 17mins to complete (min; 1hr 35min; max; 3hrs 26min). The total transected area was 9.04 hectares (90,400m²). Fig. 17 shows exact areas of forest covered according to forest type. Refer to Table 1 in Methodology for the definition of each forest type.

![Figure 17. Total area (9.04 ha) sampled according to forest type. Total area of each forest type sampled is a result of the random locations of transects.](image)

The mean distance of transect start point from a human settlement was 8.53 km (SD = 3.85, max = 16.26, min = 1.9). Field trips typically took 4 or 5 days to complete each transect (max = 6, min = 1). Mean elevation of transect ranged from 565m – 1688m (mean = 1160, SD = 310.38). 12 transects were located in the Core Zone, 6 in the Buffer Zone and 1 outside the park boundaries.

4.2 Bear sign density

A total of 144 individual bear sign were recorded over 19 transects. Transects varied in size so values have been converted to sign per ha. No sign were observed on 2 of the 19 transects. Mean sign per ha over all habitat types in NEPL is 17.26 (SD = 14.99). When differentiating between forest types, mixed-evergreen forest has the highest sign density at 22.41 per ha (SD = 22.03, Fig. 18). Average density of Fresh and Recent sign in mixed-evergreen forest is 16.89 per ha (SD = 17.48).

Sign were predominantly claw marks on climbed trees, accounting for almost 80% of data. Other sign include; tree and ground nests (6.25%), broken bee’s nests (4.9%), digging (4.9%), footprints (2%) scat (1.4%) and trails (0.69%) (Fig. 19). More than 40% of sign were Fresh – less than 3 months old and 30% of sign was older than 1 year old (Fig. 20).

Bear claw marks were observed on a minimum of 45 different tree species. Scientific names are not yet available and will be provided as an update to this report once the samples have been processed. Claw marks were found on trees ranging from 9.5 – 86 cm diameter at breast height (DBH). Mean DBH was 37 cm (SD = 15.9). Mean height of tree was 15m (SD = 7.3).

Linear regression shows a positive correlation between bear sign density per ha and elevation. The slope is estimated to be 11.59, with the standard error of this estimate at 4.049, p = 0.011 (Fig. 21). There is no significant relationship between bear sign density and either the distance to nearest village or the density of fruit trees. Fig. 22 compares the mean sign per ha in the Core zone and Buffer Zone of NEPL. The mean sign per ha in the core zone is slightly higher than the buffer zone. However, an independent 2-tailed t-test reveals the difference is not significant (t = -0.140, p = 0.890).
Figure 16. Final transect locations. One point was moved due to environmental constraints (indicated by black arrow) and one point was cancelled due to time constraints.
Figure 18. The average sign per ha according to forest type. Mixed evergreen forest has the highest density of sign.

Figure 19. Type of bear sign observed within transects. Claw marks on climbed trees formed almost 80% of the total recorded sign.
Figure 20. Age categories of bear sign. Almost 70% of sign observed on transects were with 1 year old.

Figure 21. Relationship between mean elevation and the density of sign per ha.
4.3 Species identification

Claw mark templates were analysed for species identification from 58 different locations. Up to 3 templates were taken from each climbing event and the claw widths averaged to increase the accuracy of the result. 42 (72%) of the samples were identified as Asiatic black bear and 16 (28%) identified as sun bear (Appendix 3). Asiatic black bear claw marks were found at a mean elevation of 1178m (min = 506, max = 1663). Sun bear claw marks were found at a mean elevation of 1434m (min = 935, max = 1717). Claw mark templates were collected opportunistically and during transects. Mother and cub activity, represented by large and small claw marks of the same age on the same tree, was recorded in 6 different locations. Analysis of adult claw marks revealed 5 of these marks to belong to black bears. The remaining marks were unidentified (Fig. 23).

4.4 Local interviews

We conducted 52 interviews (51 male, 1 female) in 14 villages within the NEPL NPA. Interviewees were members of 6 ethnic groups and two religions (Table 4). The average age of interviewee was 49 years old with the average time of residency in respective villages being 41 years. Appendix 2 shows the standard questionnaire used in all interviews.

Asiatic black bear and sun bear were reported as being present in forested areas surrounding all 14 villages. Populations were said to be declining in 7 areas, stable in 1, and increasing in 3. The reliability of this data is uncertain which will be discussed further in Chapter 5. Villagers were often reluctant to talk about hunting however hunting of bears for trade was reported by at least one person in 10 out of 14 villages. In the remaining 4 villages the existence of hunting was not confirmed although it is suspected that it does occur (Table 4). Hunting of bears was most commonly reported to be with guns but also included; foot snares, explosive snares, and arrow spring snares.

11 villages reported annual bear-related crop raiding and consistently claimed that sweetcorn crops were targeted most frequently. Other commonly raided crops include; pumpkin, watermelon, sweet potato and cucumber. Both species of bear were blamed for crop damage although villagers often reported that sun bears
Raid crops more frequently than black bears. Crop raiding peaks during the wet season from August until October when sweetcorn crops are ripening. Methods used to deter bears from crop fields include; loud banging when bears are sighted, fires around field perimeters, foreign structures built around field perimeters and strong smelling soap rubbed on cloth, hung around field perimeters and scarecrows. A number of villagers discussed lethal methods such as setting explosive and arrow spring snares to kill bears upon entering fields, hiding in fields with guns to shoot invading bears or following the tracks from fields to hunt bears with guns.

Due to time constraints during interviews, local knowledge on bear ecology was not extensively explored. However, black bears are described as being the shyer of the two species, tending to live in remote forested areas far away from villages. Conversely, sun bears are frequently reported as inhabiting secondary forest, close to villages. Sun bears are also described as being very aggressive, not scared of humans and likely to attack if encountered in the forest or in crop fields, especially in the case of a mother with cubs.

Villagers were again reluctant to divulge knowledge regarding trade in bears and bear parts. Feet of both species were reported to sell from 100,000 – 600,000 kip (~ $12 - $72 US). A cub sells for up to $500 and a pair of cubs around $750. The price of cubs will increase with weight and age. Sun bear bile is said to be more expensive than black bear bile. One ‘bier’ (5g) of sun bear bile is quoted on average to be $230. One ‘bier’ of black bear bile is quoted on average to be $145. Bones of both species fetch 50,000 – 100,000 kip ($6 - $12) per kg.

Traditionally, Lao people have used bile as medicine for hundreds of years as a treatment for a variety of ailments such as arthritis, rheumatism, dizziness, weakness and cuts and bruises (the list is exhaustive). In the past decade international demand has risen and bears and bear derivates are in demand from consumers in Vietnam and China. We had several reports of Vietnamese traders crossing the border into Laos and empowering locals to hunt and sell wildlife. Villagers reported that travelling salesmen will give snares, guns and ammunition to locals with the added incentive that if they hunt successfully he will purchase their quarry on his next visit. Wildlife is thus caught to order with an emphasis put on particularly valuable species such as pangolin, tiger and bear.
Figure 23. Location of Asiatic black bear and Sun bear in NEPL from positively identified claw mark templates. Red stars show the location of mother and cub claw marks. 5 of the 6 cub marks were identified as Asiatic black bear while 1 was undetermined (circled in red).
Table 4. A summary of the interview survey results.

<table>
<thead>
<tr>
<th>Village</th>
<th>District</th>
<th>Ethnicity/Religion</th>
<th>No. of people Interviewed</th>
<th>Species present</th>
<th>Population* Status</th>
<th>Hunting</th>
<th>Conflict</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ban Hoy Tuen</td>
<td>Viangthong</td>
<td>Yaow/Animist</td>
<td>3</td>
<td>2</td>
<td>Declining</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Kon Ngua</td>
<td>Phon Sai</td>
<td>Kmu/Animist</td>
<td>2</td>
<td>2</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Yes</td>
</tr>
<tr>
<td>Ban Puntong</td>
<td>Phon Sai</td>
<td>Kmu/Animist</td>
<td>2</td>
<td>2</td>
<td>Increasing</td>
<td>Unknown</td>
<td>No</td>
</tr>
<tr>
<td>Ban Leng</td>
<td>Viangthong</td>
<td>Dtag Deng/Animist</td>
<td>4</td>
<td>2</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Yes</td>
</tr>
<tr>
<td>Ban Bor</td>
<td>Viangthong</td>
<td>Lao/Buddhist</td>
<td>3</td>
<td>2</td>
<td>Unknown</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Samsoom</td>
<td>Viangthong</td>
<td>Kmu/Animist</td>
<td>4</td>
<td>2</td>
<td>Stable</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Muang Gao</td>
<td>Viangthong</td>
<td>Dtag Deng/Animist</td>
<td>4</td>
<td>2</td>
<td>Declining</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Muang Pher</td>
<td>Viangthong</td>
<td>Dtag Dam/Animist</td>
<td>3</td>
<td>2</td>
<td>Declining</td>
<td>Unknown</td>
<td>Yes</td>
</tr>
<tr>
<td>Hoy Ma</td>
<td>Xam Neua</td>
<td>Hmong/Animist</td>
<td>1</td>
<td>2</td>
<td>Declining</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sop Ka</td>
<td>Xam Neua</td>
<td>Dtag Gaa/Buddhist</td>
<td>4</td>
<td>2</td>
<td>Declining</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Ban Tam La Tay</td>
<td>Phon Sai</td>
<td>Lao Puan/Buddhist</td>
<td>4</td>
<td>2</td>
<td>Declining</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Ban Nakood</td>
<td>Phon Sai</td>
<td>Lao Puan/Buddhist</td>
<td>4</td>
<td>2</td>
<td>Declining</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Ban Hoy Piang</td>
<td>Vieng Kham</td>
<td>Kmu/Animist</td>
<td>4</td>
<td>2</td>
<td>Increasing</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Ban Sakok</td>
<td>Vieng Kham</td>
<td>Lao/Buddhist</td>
<td>4</td>
<td>2</td>
<td>Increasing</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*these data are considered unreliable due to inconsistencies in interview techniques
4.5 Budget

Project running costs totalled US$13,585.62. This was an increase of $2305.62 on the projected budget. This increase is due to the field season being extended by 1 month when it was apparent the 3 month time frame for field work was unrealistic. The final budget summary is shown on Table 5.

An important objective of FTB is that field projects generate a positive impact on local economies. Table 6 provides a breakdown of specific budget items that generate income for the local area of the NEPL NPA.

Table 6. Breakdown of financial input into the local economy in the NEPL NPA area.

<table>
<thead>
<tr>
<th>Budget category</th>
<th>Description</th>
<th>Amount (US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent staff</td>
<td>1 Team Leader (WCS staff)</td>
<td>$3,450</td>
</tr>
<tr>
<td></td>
<td>3 local field assistants</td>
<td></td>
</tr>
<tr>
<td>Porters, local guides</td>
<td></td>
<td>$850</td>
</tr>
<tr>
<td>Temporary staff</td>
<td>Technical support from National University, Vientiane</td>
<td>$620</td>
</tr>
<tr>
<td>Local food, board and field supplies</td>
<td>Food and board including base accommodation and overnight stays in villages. Field supplies and equipment sourced from local traders.</td>
<td>$4,000</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>$8,920</td>
</tr>
</tbody>
</table>

Figures have been rounded to the nearest ten.
Table 5. Budget summary of all project expenses.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Source of Funding</th>
<th>Total Cost</th>
<th>International Bear Association</th>
<th>Perth Zoo, Australia</th>
<th>Free the Bears Fund Inc.</th>
<th>4Personal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$13,585.62</td>
<td>$5,000</td>
<td>$4,500</td>
<td>$2,000</td>
<td>$2,085.93</td>
</tr>
<tr>
<td>1 Personal services and wages</td>
<td></td>
<td>$5,969.31</td>
<td>2,350</td>
<td>2,115</td>
<td>940</td>
<td>564.31</td>
</tr>
<tr>
<td>2 Equipment, supplies and expenses</td>
<td></td>
<td>$5,018.67</td>
<td>1,500</td>
<td>1,350</td>
<td>1,060</td>
<td>1,108.67</td>
</tr>
<tr>
<td>3 Travel</td>
<td></td>
<td>$2,597.95</td>
<td>1,150</td>
<td>1,035</td>
<td>0</td>
<td>412.95</td>
</tr>
</tbody>
</table>

*Funding sources were allocated proportionally to budget categories in relation to the amount granted. 1Including a living stipend for the project leader and all wages for the permanent local staff. 2Including all accommodation costs, equipment, first aid and food supplies for the field team. 3Including all domestic and international travel, 2 motorbikes for transport at the field site and petrol and vehicle maintenance throughout. It was considerably cheaper to purchase 2 motorbikes than to use hired vehicles. 4Any deficit of funding was paid for personally by the project leader.*
4.6 Incidental data

Other wildlife

Data on species observed incidentally during field trips were recorded on an opportunistic basis, as shown in Figures 24 - 31. Additionally, gibbons (spp. *unknown*) were heard singing on the 18.02.2010, south of lat/long: 20.26220536 / 103.34201734. Tracks of up to 4 elephants were recorded near Phati ranger station in early April 2010 (Fig. 31).

![Figure 24. Chinese four eyed turtle *Sacalia quadriocellata*. Status: Endangered (IUCN). Observed 12.01.10 at lat/long: 20.39128 / 103.3263.](image)

![Figure 25. Impressed tortoise *Manouria impressa*. Status: Vulnerable (IUCN). Observed 05.05.2010 at lat/long: 20.11094 / 103.1291.](image)

![Figure 26. Emperor Newt *Tylototriton shanjing*. Status: Near Threatened (IUCN). Observed 05.05.2010 at lat/long: 20.10103 / 103.1628.](image)

![Figure 27. Aisatic Dohle print *Cuon alpinis*. Status: Endangered (IUCN). Observed on 17.02.10 at lat/long: 20.37307271 / 103.49805141.](image)
Figure 28. Tiger tracks *Panthera tigris corbetti*. Status: Endangered (IUCN). Observed on 26.01.2010 at lat/long; 19.93641621 / 103.11791584.

Figure 29. Indian Bison/Gaur dung *Bos gaurus*. Status: Vulnerable (IUCN). Observed on 28.01.2010 at lat/long 19.9327 / 103.1104 (nearest known reference point).

Figure 30. Big cat scrape (tiger?) observed 05.04.2010 at lat/long: 20.408091 / 103.6046.
Figure 31. Locations of incidental species observation (sign data only).
5. Discussion

5.1 The Known Status of Bears in Laos Today

Distribution

Knowledge of the distribution and status of sun bears and black bears in Laos is limited due to a lack of scientific research. Deuve (1972) reported that sun bear distribution was widespread throughout every province in Laos. A report included in an action plan for bears worldwide, compiled by the IUCN bear specialist group throughout the 1990’s, states that sun bears are probably widely distributed throughout the country with an exception of the heavily settled and cultivated areas of the Mekong plain (Salter, 1999). In 1991 a joint report from TRAFFIC and WWF, speculated that Laos could represent a global stronghold for both species (Mills and Servheen, 1991).

Figure 32. Sun bear and Asiatic black bear distribution in Laos (IUCN, 2006). Data sources: Political boundaries, VMAPO – National Imagery Mapping Agency; Current distribution/status, experts at the WCS/IUCN-BSG Range Wide Assessment of Asian Bears, Karuizawa, Japan, October 7, 2006; Historical range Erdbrink, (1953) modified by the experts at the workshop.

In 2006 the WCS/IUCN-BSG Range Wide Assessment of Asian Bears Workshop used expert opinion to map the extant range of sun bears and black bears throughout Southeast Asia and Malaysia. For Laos, these maps show the known range of both species as identical, occurring exclusively within NPA’s (Fig. 32). The book ‘A Guide to the Large Mammals of Lao PDR’ published by John WK Parr in 2009 displays the range of both species as spread nationwide. The IUCN BSG’s for both species met during 2009 and 2010. At the International Symposium for the Asiatic black bear in Taiwan, David Garshelis (co-chair of the International Bear Association) observed that the status of black bear in Laos is largely unknown and populations could number below 1000 individuals. At a meeting for the Sun Bear Specialist Group at the IBA conference in May 2010, Gabriella Fredriksson (co-chair of SBSG) observed that the status of the sun bear in Laos remains virtually unknown with trade and habitat loss representing the principal drivers of population decline. Sun bears and black bears are thought to occur in at least 20 out of 22 NPAs in Laos. Tracks, sightings and camera traps images have been recorded in Bokeo (North), Nam Et Phou Louey (North), Nam Kading (South), Nakai Nam Theun (South), Xe Sap (South), Xe Piane (South) and Dong Ampham (South) National Protected Areas (Chanthavy Vongkhamheng, pers. comm., 2010). Sun bears are generally considered to be more abundant in the southern lowlands of Laos but there are no scientific data to back this up. In 2001 a genetic study by Dr Gary Galbreath discovered a blond colour phase of the black bear occurring in the northern Annamite Mountain range of Laos (Galbreath & Heene, 2001). A sign survey in Bokeo NPA, northwest Laos confirmed the presence of both species (Long & Abley, 2008). Camera trap data from north-eastern and central Laos indicates that sun bears and black bears are still present to varying degrees (Johnston, pers. comm., 2009). Finally, and most recently, as discussed by this report, both species were confirmed present in the NEPL NPA as of May 2010.

Examination of the most recently available land cover maps for Laos shows that a total area of around 126,000 km² of potential habitat remains (FIDP 2002). This comprises of 9 different forest types, the following listed in order of dominance; upper and lower mixed-deciduous, dry dipterocarp, upper and lower dry evergreen, coniferous, bamboo, mixed coniferous and broadleaf and savannah/open woodland (WCS Lao
Program forest classifications). Thus over 50% of land cover in Laos represents potential bear habitat. However, forests are fragmented by logging, agriculture, roads and other human-related developments and are thought to be contracting at up to 0.7% per year (Duckworth et al., 1999). Fragmented habitats will result in patches of forest insufficient to host viable bear populations but it is unknown to what extent this occurs. Land designated as National Biodiversity Conservation Areas (NBCA’s) totals 13% of forested areas, with an additional 9% as Provincial Protected Areas and District Protected Areas. This leaves 28% of potential bear habitat with no protected status. It is also important to note that even protected area may be under little or no form of active management and protection.

**Bile farming in Laos**

Since 2006, following the ban on farming bears for bile extraction in Vietnam, several bile farms have appeared in Laos, commonly operated by Vietnamese families. There are now at least 6 farms in operation located in Vientiane, Pakse, Luang Prabang, Syabori and Boton. The number of farmed bears totals over 100, the majority being black bears; with less than 5% thought to be sun bears. It is assumed that all animals originate directly from wild populations in Vietnam, Cambodia and Laos (data supplied by Free the Bears Fund Inc. 2010). Free the Bears Fund Inc. has been working with the Lao Government since 2008 to close existing bile farms and prevent more from opening. This process is hampered by unclear legislation and lack of political support. Given the pattern of massive wild population decline in Korea and Vietnam, where bile farming has been practised since the early 1980s, it is reasonable to assume that bile farming in Laos can only spell disaster for wild bear populations.

5.2 The Distribution and Relative Density of Bears in Nam Et Phou Louey

**Sign index**

Measuring an ‘index of abundance’ by way of the belt-transect method is advocated by the IUCN-BSG as a standardized technique for bear population monitoring (Fredriksson & Steinmetz, 2007). Sign density per ha can be compared with other areas, informing us of relative spatial abundance (Steinmetz & Garshelis, 2010). In recent years this technique has been used in Cambodia, Laos, Thailand and Vietnam (Heng et al., 2006; Long & Abley, 2008; Scotton, 2009; Steinmetz, 2010). In the NEPL NPA the average sign per ha within mixed deciduous forest is 22.41. Fig. 33 shows the average sign per ha in NEPL relative to other protected areas in Southeast Asia.

![Figure 33](image.png)

**Sign age ratio**

Almost 70% of sign in NEPL was categorised as Fresh or Recent (within 1 year) and density of Fresh and Recent sign per ha was 16.89. It was previously thought that a ratio of sign age skewed toward Fresh is an indicator of an increasing population and visa versa. However, using a population model simulation,
Steinmetz and Garshelis (2010) have demonstrated that the ratio of sign ages is an unreliable indicator of population trends or even relative population density. Old sign is a poor indicator of bear abundance as it persists in the environment for more than 24 months; much longer than Fresh and Recent sign. Density of Fresh and Recent sign are most useful for monitoring population trends over time as they respond relatively rapidly to population change, thus more closely corresponding to the number of bears in an area. In fact, in the same study, a simulation model illustrated that within 3 months of bear numbers increasing 10-fold, the number of fresh marks increased by the same magnitude (Steinmetz & Garshelis, 2010). While ratio of sign age is not a good indicator of population trends, it still might be useful in comparisons of current use of different areas by bears. For example, NEPL has a relatively high ratio of Fresh and Recent sign if compared against Cat Tien National Park, Vietnam, Bokeo National Park, Laos and Ratanakiri, Cambodia (Long & Abley, 2008; CI Bear Team, 2008; Scotson 2009; Fig. 34) suggesting a higher degree of current use by bears. This could be due to differences in bear abundance or a difference in habitat use due to food availability at the time these observations were made (Steinmetz, pers. comm., 2010). However given that NEPL is under intensive active management by WCS in an unbridled effort to save the remaining tiger population, it is likely that successful anti-poaching law enforcement and habitat control has led to larger bear population densities than other areas.

Figure 34. The ratio of sign age in NEPL relative to other study sites. Data are taken from sign surveys in Cat Tien National Park, Vietnam, Bokeo National Park, Laos and Ratanakiri, Cambodia (Long & Abley, 2008; CI Bear Team, 2008; Scotson, 2009). These data suggest that current bear activity in NEPL is much higher than other sites.

Relative abundance of Asiatic black bear and sun bear

Claw mark templates collected during transects and opportunistically on route to transects represent 58 separate climbing events of which 42 (72%) were identified as black bear and 16 (28%) identified as sun bear. The resulting ratio of 2.57:1 of black bear to sun bear sign suggests that NEPL has a higher density of black bear that sun bear. Due to a known bias in the claw mark identification method, designed by Steinmetz and Garshelis (2008), the sun bear portion of the sample is likely to slightly inflated by the inclusion of young black bears erroneously identified as sun bear.

It is important to consider that the higher ratio of black bears could be misleading due to differences in tree climbing rates between species. Sun bears have been observed to include a high proportion of invertebrates in their diet which could lead to a more terrestrial lifestyle (Wong et al., 2002). Furthermore, Steinmetz, 2009 reported that along sign transects in Thung Yai Naresuan Wildlife Sanctuary, all predated nests of stingless bees were by sun bears, observing that a smaller body size and long tongue could be specialist adaptations to an insectivorous diet (broken bees nests formed less than 5% of observed sign in NEPL). However, it is likely that sun bears exhibit spatial differences in behaviour patterns throughout their range. Evidence suggests that in the aseasonal tropical evergreen forests of peninsular Malaysia, Borneo and Sumatra, sun bear behaviour is quite different that in the seasonal forest mosaic of mainland Southeast Asia. Main sign observed along sign transects in Borneo was sign on the ground left from feeding on invertebrates (Fredriksson, pers. comm., 2010). Conversely, in Thailand, Vietnam and Laos, where sun bears and black bears occur sympatrically with shared diet preferences, sign data are dominated by claw marks on trees (>70%)(Long & Abley, 2008; Scotson, 2009; Steinmetz, 2009).
Despite this potential to misinterpret the higher sign ratio of black bears it is probable that in NEPL sun bears do occur in lower densities. In the high elevations of NEPL (400m – 2257m) we would expect black bears to occur at high densities than lower elevations. Asiatic black bears are known to predominate at higher elevations and to favour mixed-deciduous forest (Steinmetz, 2009). In NEPL elevation and sign density are found to be positively correlated (Fig. 21, Chapter 3: Results). Sun bears have been observed at up to 2,100m but do appear to favour lower elevations. Additionally, sun bear density seems to have a natural gradient, occurring at low densities in the northern parts of their range and increasing further south into Malaysia and Indonesia (Fredriksson et al., 2008). During village interviews, locals did report that Asiatic black bear were more numerous and confirmed this species tendency to utilize montane habitats. It was often stated that sun bear were more active closer to villages as are less shy of humans and prone to utilizing secondary forest and even agricultural lands. Thus, taking numerous factors into consideration and despite the possibility of a difference in tree climbing rates between species, it seems reasonable to conclude that sun bears occur at lower densities than black bears in the NEPL NPA.

It is worth mentioning here that it is not uncommon to hear reports of a third bear species in Laos. Villagers in Ban Toupe, Bokeo National Park, describe a species larger and more aggressive than black bear with a yellow chest marking. Similar claims were made by villagers from the Elephant Watch Tower ecotourism project in Ban Na, Vientiane Province (pers.obs., 2008). From village interviews in NEPL there were 5 separate reports, in 5 villages, of a third bear species. Dr Gary Galbreath, a DNA specialist mapping genetic drift of bears in Laos, has heard varying descriptions of a third bear species over the last decade but feels that the lack of consistency in believed morphology could suggest this information is unfounded (Galbreith, pers. comm., 2009). Further dampening these claims, during a visit to the Luang Pahbang bear rescue sanctuary following completion of our field work, members of my team identified different captive black bear individuals as separate species based on differing body shape and coat length.

**Distribution of bears in NEPL**

Fresh and Recent sign were recorded along 14 out of 19 transects. Transects were widespread and included all habitat types giving a good representation of the entire NEPL NPA. Although no sign were observed along 2 transects, this was due to random chance and did not indicate zero bear activity as we did observe sign near by. Data suggest a trend of bears favouring higher elevations in NEPL. Average sign density was observed to be slightly higher in the core zone than the buffer zone but not significantly so. Steinmetz, 2009 found that fruiting tree density is the best predictor of bear distribution. As yet I have not explored the relationship between fruit tree density and bear activity and following the formal identification of tree samples these data will be examined further. I found no relationship between sign density per transect and distance to the nearest village. This was an unexpected result as Long & Abley (2008) observed a moderate negative effect on sign density with increasing proximity to a human settlement in Bokeo National Park. This could be due to my sample size being insufficiently large as to detect a relationship.

From this survey I am confident that sun bears and black bears are active to varying degrees throughout all forested areas of the NEPL. Both species are known to occur sympatrically throughout much of mainland Southeast Asia (Fredriksson et al., 2008; Steinmetz & Garshelis 2008; Steinmentz, 2009). Claw mark identification combined with reports from villagers confirm that this also the case in NEPL although it is likely that black bears occur in higher numbers than sun bears. Fig. 23 in Chapter 4: Results shows the locations of sun bears and black bears as identified by claw marks on climbed trees. Locations of mother and cub activity are also displayed.

**Bear ecology in NEPL**

As mixed-deciduous forest is the dominant forest type in NEPL, all of the 19 randomly placed transects comprised of at least some of this habitat (6.78 ha). Secondary forest, bamboo forest and grasslands made up such a small part of the area sampled (~15%) that it is meaningless to statistically compare habitat use. However, sign were found to varying degrees in all habitat types, reflecting a generalist foraging strategy and diet. Samples were collected from 45 different tree species which were identified by locals as a fruiting tree which bears feed from. Samples are being processed by the Botany Department of the National University in Vientiane to verify scientific names and ecological information. Thus these data will be presented and discussed in an ecological context as an update to this report, as and when they become available.
5.3 Threats to Bears in Nam Et Phou Louey

Habitat disturbance could also be a threat, this being the common problem with the majority of endangered species worldwide. The major threat to bears in NEPL identified by this study was overharvesting for commercial trade and human-bear conflict.

**Habitat disturbance**

Evidence of human disturbance and illegal activities were discovered regularly within NEPL. Areas of burnt land were often encountered and buffalo raising grounds were observed to radiate many kilometres away from villages (Fig. 35-36).

**Figure 35.** Areas of burnt off land are common as hunters use this to aid poaching. Burning stimulates growth of new shoots which in turn attracts ungulates to graze. In the barren landscape of burnt land, animals are easy to spot and shoot.

**Figure 36.** Agricultural grazing grounds are slowly but steadily encroaching into natural bear habitat. Cattle farmers will patrol to check their herds with guns, shooting wildlife opportunistically.
Hunting and trade

Unlike some other parts of the world, bears do not hold a place in cultural or religious beliefs of people in Laos. One exception is the Kri ethnic group who have a taboo against killing bears and other large mammal species such as tiger and rhino (Duckworth et al., 1999). For the majority, bears are considered only as a commodity. Traditionally, Lao people hunted bears for use of the bile in Traditional Medicine. Nowadays, it is far more lucrative to sell bears and bear products internationally (Mills & Servheen, 1991). Bears are hunted mainly with guns but also with large mammal snares, arrow spring snares and explosive traps. Bears can be shot opportunistically by people with guns (Fig. 38), and also by hunting expeditions specifically targeting bears. The peak hunting season is in the wet season, from June – September. During this time fruiting trees are at their most abundant and thus bears are foraging more actively. The wet ground makes it easier for hunters to detect bear tracks in the mud and the heavy rain masks the sound of a hunter approaching. Another peak hunting season is breeding season, from Jan – March. Throughout northern Laos it is common to hear reports of hunters stealing cubs from caves and hollows of trees whilst the mother is away foraging.

Laos represents a major supplier of wildlife products to neighbouring countries such as Vietnam and China (Nooren & Claridge, 2001). For at least the past 3 decades, international trade in wildlife has been the major cause of decline of many endangered animal populations in Laos. Bears are specifically targeted due to the use of bear bile in Traditional Chinese Medicine (TCM) (Duckworth et al., 1999). Bear gall bladders are known to produce a large amount of the active ingredient ursodeoxycholic acid which has medicinal benefits for rheumatism and arthritis (and used for many other things). NEPL’s proximity to the Vietnam border puts it in an extremely vulnerable position. Villagers were normally reluctant to discuss hunting and trade activities due to ongoing anti-poaching and anti-trading enforcement teams being active under the management of WCS. However, we did receive numerous reports that hunting and trade of bears continues to persist and it is likely that trading wildlife represents a significant source of rural income. One villager told me that there is a local saying that if a man is seen riding a new motorbike he is ‘riding a bear’.

Table 6 compares the price of bear parts in Laos and Vietnam (Xuang Dang, 2007). The price of a live animal seems to be lower in Laos than other countries. Cubs were reportedly offered as low as $10 in Vientiane in 1991 (Mills & Servheen 1991 & 1992). Bears and bear derivates have been traded internationally in Laos since at least the 1980s. Reports suggest that historically, southern regions have been more heavily poached. There is now concern that there is an increasing focus on NEPL by international wildlife traders (Johnson, pers. comm., 2010). Locals from NEPL told me that although bile and cubs has been traded for decades, the demand for bear paw has only arisen in the last 5 years.


<table>
<thead>
<tr>
<th>Item</th>
<th>US $ (exchange rate @ 8459 kip/$)</th>
<th>Vietnam (2007)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single cub/pair</td>
<td>$500/$750</td>
<td>$1100 - $1600 (per animal)</td>
</tr>
<tr>
<td>Paw</td>
<td>$12 - $72</td>
<td>$33.3 per kg</td>
</tr>
<tr>
<td>Bile (per gram) Sun bear/Black bear</td>
<td>$46/$29</td>
<td>$5.8 – $6.7 per cm³</td>
</tr>
<tr>
<td>Bones (kg)</td>
<td>$6 - $12</td>
<td>Unknown</td>
</tr>
</tbody>
</table>
Vietnam data are from Xuang Dang, 2007. Prices from Laos are averaged or ranged from answers from local interviews. Sample size is small due to a general reluctance to answer questions regarding hunting and trade practices. Notably, sun bear bile was consistently quoted as being more valuable than black bear bile.

There is clearly a high international demand for black bear derivatives although in NEPL sun bear bile is usually quoted as the most expensive. This contradicts the common assumption that black bear bile is more coveted due to a higher concentration of Ursodeoxycholic acid (Table 6). Locals reported that this is because sun bear are rarer than black bear and its bile is a golden colour, “Bii Kham”, and considered to be a higher quality. Black bear bile is described as common or black bile. Sun bears could also be more vulnerable to hunting due to a bolder nature and a tendency to come closer to villages than black bears, favouring lower elevations and utilizing resources in secondary forests.

Despite the high pressures on wildlife in NEPL, sign of hunting in the forest was low relative to Cat Tien National Park, Vietnam. In Cat Tien the survey team encountered countless snares and hunters camps during every trip into the forest. Bullets were found scattered on the forest floor, animals lying dead in snares, members of the field team were caught in wire-loop snares and on one occasion, we actually found a poacher setting a snare. NEPL is in stark contrast; during 5 months of field work in NEPL, we did not find a single snare. We did occasionally observe hunters camps and access trails in the forest thought to be left by poachers but nothing to the extent witnessed in Cat Tien (Fig. 39). However, large areas of burnt grasslands were observed more frequently in the NEPL.

**Figure 39.** Bamboo cages left by poachers in NEPL, designed to carry small mammals such as primates.

**Bear-human conflict**

Conflict due to a shared interest in resources is common throughout the whole world, in all areas where humans and bears overlap. Competition for the same resources can lead to situations dangerous to both man and beast. Attacks on humans by sun bears and black bears are thought to be rare in comparison to other bear species such as Grizzly (brown) bears *Ursus arctos horribilis* and Polar bears *Ursus maritimus* (Herrero, 1999). Although this problem is poorly documented in Laos it has been reported in Xe Bang Nouan NPA, Sangthong District and Luang Namtha Province where 10% of people interviewed between 1989 and 1993 reported bears as crop pests (Duckworth *et al.*, 1999).

In Laos, rural communities rely heavily of forest products for survival and time spent in the forest collecting resources bears use can lead to conflict situations. An example in NEPL is the year round collection of bamboo shoots, “Nor Khom”. Bamboo is gathered every day with villagers spending many hours searching and gathering in the forest. However, stories of bear attacks are common in NEPL and I’m told that at some point every village will have experienced this problem. Locals reported that an encounter with a bear can be dangerous, particularly in the case of a mother with cubs.

Conflict situations more frequently arise when bears enter crop fields to steal food. All interviews included a section of questions to explore human-bear conflict issues resulting from bear-related crop damage. Results of the interview surveys were surprising. Bear related crop-raiding was reported in 10 out of 14 villages (71.4%). Most of the interviewees had first hand accounts and many crop farmers reported experiencing this on a yearly basis (Table 4: Chapter 4: Results). Reports indicate that crop fields located far from villages and in close proximity to bear habitat were most likely to suffer damage. Some villages that had in the past farmed crops far from the village and then subsequently moved fields to areas close by had experienced a cessation of crop-raiding. Reports of bears attacking humans are common and often related to a mother with cubs being encountered in a crop field. Villagers reported being very scared of seeing bears in the fields and said they would generally run away if they saw a bear or signs that a bear had been there recently.

As the NPA management implements strict law enforcement concerning the illegal killing of wildlife, farmers were reluctant to talk about any negative counter measures taken against bears to prevent crop raiding. There were, however, several ‘second hand’ reports that bears would be shot if a gun was at hand and that in some instances luring bears to crop fields or corn stores was used as a method of selective hunting. Methods of deterring bears include; creating foreign structures around fields that would make bears too nervous to enter, building scarecrows and rubbing strong smelling soaps on cloths that were hung around
the field perimeter. More serious measures included hiding in fields with a gun to shoot a bear on arrival or setting explosive snares and landmines around the field perimeter so as to kill visiting bears.

Crop theft by bears has a negative impact on both bears and humans. Bears risk being killed by counter measures taken by farmers thus being a threat to individual animal welfare as well as to the health of the entire population. In addition to adults being killed there are continuous reports (nationwide) of cubs being found in crop fields and taken into captivity by humans to be subsequently sold. Humans run the risk of being attacked if they encounter a bear in a field, in particular a mother with cubs and especially if they have no method to defend themselves against attack. Considering the high level of bear attacks in NEPL it is unsurprising the level of negative feeling towards crop-raiding bears. No attempt has been made to quantify the amount of crops that can be lost as a result of theft by bears but presumably it is a significant amount.

An ongoing management issue in NEPL is the placement of ‘Sanams’, which are livestock raising areas located away 1 to 5 hours walking distance from villages and normally adjacent to forested areas. Villagers use these areas to rear buffalo, pigs, goats, chickens, and ducks as well as to plant a variety of crops. The average Sanam size is 82 ha (WCS data, 2010). Sanam’s are unregulated in the buffer zone of NEPL but closely regulated in the core zone. During 2008-2009 WCS relocated 6 out of 38 Sanams in the core zone and relocated 17 more (WCS data, 2010). Sanams located in the core zone of NEPL create opportunities for illegal activates such as hunting, deforestation and opium cultivation.

**Threats across NEPL**

NEPL is a large and diverse area with 98 villages of varying ethnicity located in and around the park boundaries. Our interview surveys included Lao nationals as well as people from the following 5 ethnic groups; Hmong, Dtay Deng, Dtay Dam, Kmu, and Lao Puan. The Protected Area management team and internal/external researchers commonly recognise several distinct regions within NEPL so these are referred to here with regard to the main perceived threats to bear populations. Please refer to Table 4 in Results for a list of each village visited per region. Fig. 40 is a map illustrating the results of line transects averaged per region.

- **Viangthong district**

The index of abundance in Viangthong district is 15.5 sign per ha (n=9). The first major threat to this region is the international wildlife trade. Vietnamese traders cross the border and trade regularly with local wildlife poachers. It is presumed that wildlife are caught and traded as part of a long established and highly organised network. Bears of both species are particularly targeted as there is a high cash incentive. A check point and wildlife enforcement team operate in Muang Xon, relying on an information network that regularly inspects vehicles for illegal wildlife. However, traders are thought to be well informed and willing to transport wildlife through the forest or via the rivers to avoid detection.

Secondly, human-bear conflict is common in this district with annual crop-raiding reported by 5 out of 6 villages. By entering fields bears can be vulnerable to farmers with guns or even explosive snares set around the field perimeter. Humans can be vulnerable to attack if they encounter a bear in the field, especially if it is a mother with cubs. There is intensive collection of bamboo from the forest in this region, a resource shared by bears and humans. Chance encounters in the forest can be dangerous for both humans and bears.

- **Xam Neu (Phati Substation)**

This index of bear sign abundance in Xam Neu district is 8 sign per ha (n=3). This is very low compared to the park average. The primary threat to this region is the strong military presence. Over a thousand soldiers are reported to live in camps and therefore have access to guns and forested areas in which to hunt. Westerners are forbidden to enter this region due to heightened security measures following attempted revolt by Hmong tribes in 2003. Survey teams reported high habitat disturbance in this region with much land converted for agriculture and large areas of species poor secondary forest. Annual bear related crop raiding was reported as was local hunting and wildlife trade.

- **Vieng Kham**

The index of bear sign abundance in Vieng Kham district is 34.4 sign per ha (n = 2). We completed two transects in this region so the sample size is low – this included one transect in poor quality secondary forest and the other in rich, remote mixed-evergreen montane forest. The high index is due to the sign count in the latter. We found a high number of hunter’s camps along the river in this region. Locals claim that the
majority of hunting is from poacher’s crossing over from a neighbouring region. Habitat encroachment from buffalo raising grounds was evident.

- **Phon Sai**

The average index of abundance for this region is very low at 5.3 sigh per ha (n = 3). In the field we witnessed large areas of burnt grasslands in areas more than 2 days walk from the nearest village and forested areas appeared highly fragmented. Locals reported high annual bear related crop-raiding events.

- **Tam La**

This region has a high index of abundance at 34.4 sign per ha (n = 2). The main threat to this area is habitat encroachment from agriculture plantations and buffalo raising grounds. Locals reported a high rate of deforestation in the past few decades. People in this region are strict Buddhists and are renowned for their honest nature and adherence to anti-poaching laws. We did hear several claims that hunters cross into this region from a neighbouring district. Historically there was a military airstrip in this region and to this day a very high amount of unexploded ordinance lies scattered across the land (Fig. 41). Somewhat ironically, unexploded ordanance could be discouraging people from visiting some areas of the forest. We had to relocate a transect point due to reports that someone was killed by a land mine as recently as 2005.

![Figure 41. Locals find novel uses for much of the metal left over from the war.](image)
Figure 40. Bear sign densities throughout NEPL. Pie charts show relative sign density and age proportions for 5 areas; Phon Sai, Tam La, Vieng Kham, Xam Neua and Viangthong. Size of pie chart relates to the average sign density of transects in respective areas.
6. Conclusions

6.1 The Status of Bears in Nam Et Phou Louey

Laos could be globally significant for sun bear and black bear populations due to its high cover of potential habitat (>50%) and a low human population (22 people/km²). This study marked the first of its kind in this country and provided valuable and encouraging information on the status of bears in Laos. NEPL has a high density of bears relative to other regions in Vietnam and Thailand when using sign index as a measure of abundance. This could be largely attributed to the long term management and conservation initiatives of WCS which has turned NEPL into a model for conservation, sustainable use, ecotourism, education, culture and scientific research.

Identification of scratch marks on trees confirmed that both sun bear and black bear are active in all areas of NEPL with black bears occurring in higher densities. Low numbers of sun bears could be due to a natural population gradient which decreases moving into the northern parts of their range. Sun bears could be more vulnerable to poachers as they venture closer to villages than black bear and exhibit bolder behaviour towards humans. Poachers may also favour sun bears as their bile has a higher market value.

Bear populations in NEPL are threatened by habitat disturbance (shifting cultivation, livestock grazing, logging, collection of NTFP’s and other illegal forest activities). However, hunting for the international wildlife trade poses an even bigger threat. Laos is rich in resources in comparison to neighbouring countries with bears likely to be far more abundant. Bears and bear parts are sold at lower prices in Laos than other countries and the proximity to Vietnam makes NEPL an attractive source for Vietnamese traders.

The intensity of human-bear conflict issues in NEPL was a surprising result of this study. Both species are raiding crops on an annual basis, putting both bears and humans in danger. The level of human-caused mortalities is unknown, as is the annual volume of crop damage. A further study into the driving factors of human-bear conflict is necessary to understand this problem and explore methods of mitigation.

6.2 Project Constraints

This project marked the first independent research study in NEPL. For the benefit of future researchers I will detail the main project constraints.

Due to time constraints, we began our field work in early January thus our field season did not make full use of the dry season. The wet season begins in late April/early May (annual variation) and is restrictive on field activities. Wet roads and forest make progress slow, dangerous and more expensive. Locals will often show great reluctance to work in the wet. I recommend that field studies begin in late September/early October so as to fully utilize the dry season. Researchers new to NEPL should make full use of the vast experience of the WCS Tiger monitoring team and consult with them carefully in advance when planning field activities.

This study was piloting interview techniques to be used in a large scale national survey. We found that when questioned regarding trade, hunting and bear population status, locals gave unreliable responses. This is thought to be due to the high levels of awareness in NEPL concerning the protected area laws, objectives and enforcement activities. Locals would much rather tell you there is no hunting, no trade and that population levels are increasing. Future interview surveys may benefit from the exclusion of ‘authority figures’ during interview. I suspect that my presence, as a westerner, had an negative impact on interviews, as did my field team who are well known as staff of WCS in most of the villages. Most (but not all) locals are reluctant to give honest responses as it could have negative repercussions on them.

6.3 Recommendations

The Bear Specialist Group recently proposed the identification of Bear Conservation Units (BCU’s) - important habitat blocks for the long-term survival of bears. The findings from this study suggest the NEPL should be considered as one of these areas. Bear activity in NEPL seems to be relatively high compared to other sites in Southeast Asia and the future looks optimistic. While in comparison other protected areas have a less than certain future, long term management by WCS gives NEPL the capacity to protect and monitor bears populations concurrently with already established wildlife protection projects. The successful conservation of bears represents an opportunity to increase the ecological value of NEPL on a national and global scale.
This project has laid the necessary framework for long term population monitoring while bringing the issue of bear conservation to the forefront of the minds of park management staff. Bears should not be underestimated in their value to the ecosystem and could also represent a good indicator species. Payton et al., 1999 outline a clear protocol for successful bear conservation. The long term goals of successful bear population management in NEPL should include:

- Identify threats & issues to wild bear populations.
- Prioritize threats.
- Develop methods & criteria to address issues.
- To minimize human caused mortalities arising from conflict (crop-raiding) and resource competition (shared habitat use).
- Maintain suitable habitat and populations.
- Increase public knowledge and support (regionally, nationally and globally).

Table 7. Future recommendations and actions for NEPL

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Human- bear conflict study</strong> - further investigation on the causes of conflict and subsequent methods of mitigation</td>
<td>In process – an MSc student from the National University in Vientiane is developing a research project to address this recommendation (for further information contact author).</td>
</tr>
<tr>
<td><strong>Repeat sign transects</strong> - monitor changes in distribution and trends in population</td>
<td>Repeat sign transect survey using original transect locations every 2 to 3 years.</td>
</tr>
<tr>
<td><strong>Seasonal protection activities</strong> – target anti-poaching and trading enforcement efficiently and effectively.</td>
<td>January to March is peak season for cub trade (Identify and protect mother and cub sites); July and August is peak season for hunting adults.</td>
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<tr>
<td><strong>Further bear research</strong> - promote NEPL as a model site for bear research in Laos &amp; Southeast Asia.</td>
<td>Example studies; wild bear collar study, scat survey (using scat detector dogs), re-release of orphaned cubs.</td>
</tr>
</tbody>
</table>

This study has served as a first step, collecting baseline data on distribution and identifying the main threats to populations. Enhancing the conservation status of bears in NEPL can now be achieved with some logical next steps which are detailed in Table 7. WCS and the Lao Government have made NEPL a model for conservation, sustainable use, ecotourism, culture and scientific research. I propose that NEPL should also become a model for the research and conservation of bears.
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Parr, W.K. 2009. A guide to the large mammals of Lao PDR. Publisher unknown


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### Appendix 1. Data sheet

**Age categories**
- < 3 months = Fresh (F)
- < 1 year = Recent (Rc)
- < 2 year = Old (O)
- > 2 year = V.Old (VO)

**Common Sign types**
- scratch marks on trees = SM
- broken bees nest = BBN
- broken termites mound = BTM
- digging = DG

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<th>Dist. on trans. (north)</th>
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<th>Side of trans (L/R)</th>
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<th>Age (cat)</th>
<th>Circ. Tree (cm)</th>
<th>Height Tree (m)</th>
<th>Height Sign</th>
<th>Alive/Dead</th>
<th>Species No.</th>
<th>comments, hunting, food sign</th>
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Appendix 2. Interview questions

Introduction:

- What is your name?
- What is your age?
- How long have you lived in this village?
- What is your main job?
- What is your educational background?
- How many people are in your family?
- What is your annual income?

Assessing population status and threats:

- Are there bears living in this area?
- How do you know?
- Do you like having bears living near by?
- What do you like/dislike about bears?
- How many species of bears are there?
- How do you know?
- Can you describe the characteristics of each species?

Only continue the interview at this stage if the interviewee gives realistic answers for the previous questions. If unrealistic then abandon the interview (politely!). If reliable then continue with questions on population status and threats:

- Have black bear numbers been increasing, decreasing or stable in the past 10 years?
- Have sun bear numbers been increasing, decreasing or stable in the past 10 years?
- How many sun bears have you seen in the last 10 years?
- How many black bear have you seen in the last 10 years?
- What makes you think the population is increasing/decreasing?
- Do some people in the area hunt bears (locals or outsiders)?
- How many bears do you know of have been hunted from this area in the last 10 years?
- How many bears would you estimate are killed each year in this area?
- Is bear hunting targeted at a specific species or are both hunted equally?
- Is one species easier to hunt than the other?

Human bear conflict session:

- Do bears cause damage to your crops/livestock?
- How do you know it is bears and not some other animal?
- Which species of bear is more commonly in your crops?
- What time of year does this normally occur?
- What kind of crops/livestock do they steal?
- How do people deal with bears in your crop fields/pastures?
- Do you know of bears being killed in crop fields?
- If so, how do they do it?
- If so, what is done with the parts of the bear afterwards?
- Do hunters specifically target bears or do they catch them incidentally during other wildlife hunting/snares
- How do hunters hunt for bears?

_Use of bears and bear parts:_

- What is the price for a gall bladder?
- What is the price for a bear paw?
- What is the price for a live bear cub?
## Appendix 3. Scratch mark identification

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