

Baseline Wildlife Assessment

Grandis Timber Limited
Kompong Speu Province, Cambodia



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Conservation International-Cambodia
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Introduction:

Cambodia is located in a region of high biological diversity. Due to large areas of relatively intact habitats, Cambodia is home to many species of globally threatened wildlife species. Some of the strongholds for terrestrial biodiversity are the Cardamom and Elephant mountains of SW Cambodia, the Eastern and Northern Plains, and the southern tip of the Annamite Mountains in Northeast Cambodia. Although many areas are still not well known, many surveys have been carried out and relatively good knowledge exists on many globally threatened species. The dominating terrestrial habitat types in Cambodia are deciduous and evergreen forests. Large mammals, birds and selected reptiles are among the most studied and known in Cambodia.

Following the regional trend, threat levels to ecosystems and biodiversity are also high in Cambodia, with main issues being land conversion, illegal wildlife trade and development of infrastructure such as dams. Compared to other countries in the region, Cambodia has seen a relatively slow increase in development activities, although this has increased dramatically over the last decade, with many projects planned and underway. Therefore, it is becoming increasingly important that there is a focus on protecting and managing ecosystems and biodiversity to ensure continued presence and services from biodiversity into the future.

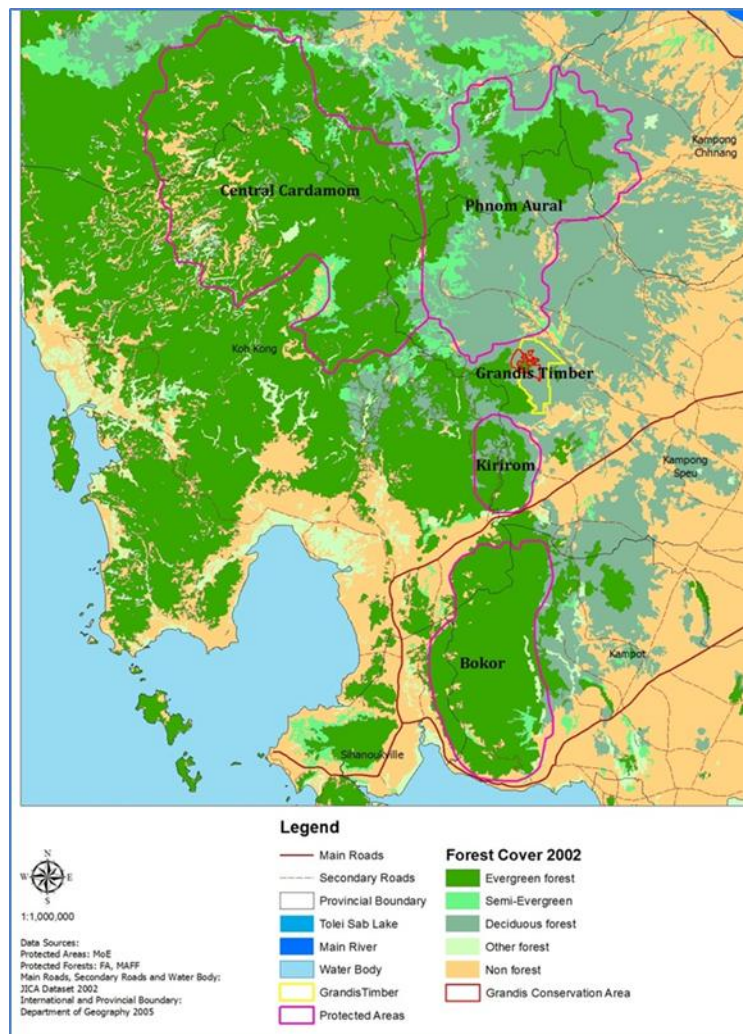
Grandis Timber Limited has developed a strong reputation in Cambodia as a sustainable land investor. A stated goal for Grandis Timber Ltd's Economic Land Concession in Kampong Speu Province is to advance socially and environmentally sustainable practices. Their aim is to pursue this through Forest Stewardship Council (FSC) certification. The FSC Principle 6 states that "Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by so doing, maintain the ecological functions and the integrity of the forest."

A first step in addressing this is to understand the biodiversity of the site and how to best to maintain this. This report describes a baseline biodiversity survey of the site conducted by Conservation International-Cambodia, and provides detailed description of recorded key species and recommendations for best management practices given biodiversity present.

Methodology

Survey Site

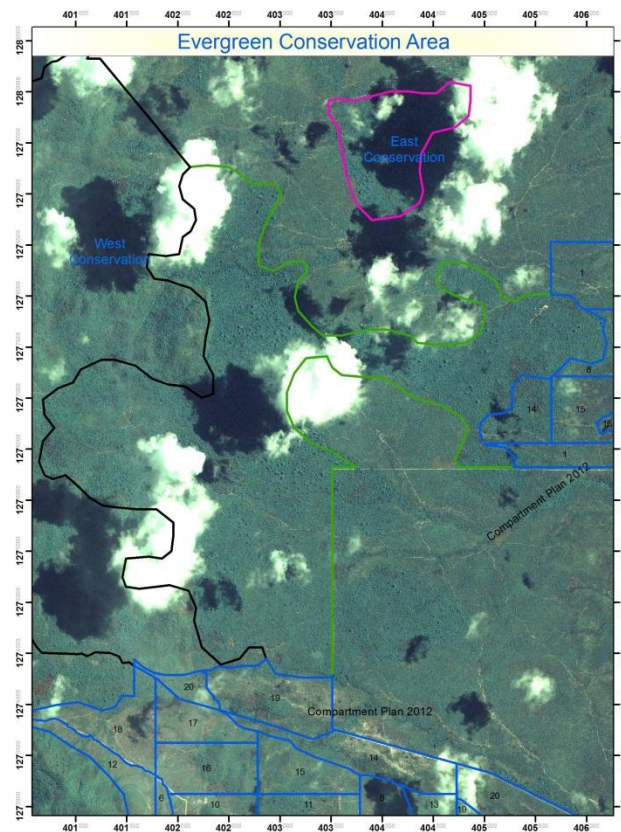
The Economic Land Concession managed by Grandis Timber Ltd is located in Kampong Speu Province, Aural District, and covers 13,727 ha. The concession was established in 2008 for the production of teak wood. The concession is nestled between Mount Aural Wildlife Sanctuary to the north, Kirirom National Park to the south and the Central Cardamom Protected Forest to the northwest.



Map showing SW Cambodia with protected areas and Grandis ELC outlined.

Several small villages are located to the north, east and south of the concession. The main livelihood activities for people living here is charcoal production, livestock raising and small-scale rice cultivation.

The Grandis Timber ELC has allocated approximately 2,260 ha for conservation. The conservation area can be defined by three compartments: The East part of the conservation zone which covers just over 109 ha is locally believed as the spiritual forest (Hornng Khloy Forest) and is non-contiguous from the rest of the conservation zone; an Evergreen zone which covers 965 ha, and the West of the conservation zone which covers 1,185 ha located at the border of the concession and possesses a stream which provides year-round water. The West of the conservation area is dominated by deciduous forest although it looks similar to evergreen forest. This area is being intensively used by charcoal makers, and it is very degraded.



Map showing the three conservation zones within Grandis ELC, the east zone outlined in pink, and the west and evergreen zones outlined in black and green.

The habitat in the conservation areas comprises mostly dry deciduous forest, with pockets of semi-evergreen and evergreen forest on the hillside of the small hill. Bamboo grass is commonly present everywhere under the canopy of deciduous forest and at the open area. There are only two permanent water sources within the conservation zone; a small river flow along the border of the West conservation area and a small part of the evergreen conservation zone is swampy. During the dry season, parts of the river dry up leaving fragmented pools.

The geography varies from flat areas and small hills, ranging from 130m to 260m elevation. Most of the evergreen or semi-evergreen forest was found on the hillsides or in the more swampy areas which saw less human activity. The area in general is quite dry.

The surveys were carried out in two blocks, the first started on 14th of December 2012, when the forest still looked green after the rainy season. The second survey started on 23rd January 2013, where the deciduous forest had already dropped leaves, and the bamboo grass had turned dry. Forest fire started by hunters and charcoal makers occurred throughout the area including conservation areas during the survey.



Photos showing low canopy, open deciduous forest habitat within the conservation zones of Grandis ELC.



*Photos showing evergreen habitat (*note haze from fires) and a mixture of deciduous, semi-evergreen and evergreen habitat in the conservation zone of Grandis ELC.*



Swampy area and small river habitat

Socio-economic survey

To compliment data collected from wildlife surveys we undertook a series of semi-structured interviews with local people from the two small villages of Reaksmey (132 households) and Samki (75 households) located to the north-east of the concession. Of the surrounding communities, the villages surveyed are located nearest to the conservation zones.

To carry out the survey CI-Cambodia developed and utilized a questionnaire (see Appendix 1) focusing on villagers' knowledge and use of the forest, its wildlife and other natural resources. To aid identification of observed wildlife we used a series of photos showing different species, and interviewees were asked to point out species they have encountered in the area. We targeted hunters, non-timber forest product (NTFP) collectors, and charcoal makers for the survey, as they regularly move around in the forested areas and have the best knowledge on resident wildlife. The interviews were carried out informally either in groups or individually. Interviewees were selected randomly within the criteria.

In total, CI-Cambodia conducted 11 interviews (6 from Reaksmey and 5 from Samki Village) were undertaken from 11th to 12th December 2012.

Camera Trapping

To identify presence of large mammals in the area we employed 14 camera traps (11 Wildgame W8E and 3 LTL Acorn 5210A). The camera traps were set at places where we expected to capture animals such as along animal paths, water sources, saltlicks and places where we found animal signs such as tracks. The cameras were set at least 100m apart to reduce frequency of capturing the same individual on consecutive cameras. The cameras were set from 13th December 2012 to 28th January 2013.

To avoid movement of the cameras, they were attached to trees which were big enough to withstand strong wind. The cameras were generally set at 30-50cm height above the ground as

this normally provide good photos of most species, however a few traps were set higher to accommodate topography and features. An elastic cord was used to tie each camera to the tree to prevent movement. For security, each camera was placed in a metal box, and locked to the tree with a padlock. Furthermore, cameras were concealed as best possible not to scare away passing wildlife.

Each camera was programmed to capture at 1 minute interval and 3-image trigger. This setting focuses on the presence of the species, rather than behavior. 4GB memory cards were used, and the photos have 8MP resolution (on Wildgame) and 12MP (on Acorn). The camera traps were in place from 53 to 55 days in each location. During the trapping time, all cameras were checked and memory cards were replaced on 7th and 8th of January 2013 to avoid the loss of data.



Photo showing setting of a camera trap on a fallen tree across a small stream, and mist net set for birds.

Opportunistic Sampling

Opportunistic sampling is gathering whatever information possible by walking quietly through the various habitats both by day and night (using torches). Direct observations, sounds, tracks and signs (such as scats and claw marks) were recorded. Photos were taken when possible. Sampling during the night time is useful for recording nocturnal species such as frogs, some birds, mammals and reptiles. When using a flashlight it is possible to detect eye shine from mammals, which is particularly useful for locating species dwelling in trees such as civets and lorises.

Turtles & Tortoises

To survey for freshwater turtles we placed specially designed non-harmful mesh turtle traps in water bodies such as ponds and streams. Twelve specially designed turtle traps were used. Each trap was baited with fruits, vegetable and meat such as papaya, banana, chicken, fish and prahok (fermented fish paste) to attract turtles. This is a method widely used for turtle surveys and generally proves effective. It follows the methodology of Chey and Sun (2004) and Som *et al.* (2007).

Twelve traps were in place for 8 nights between 4th and 12th January 2013. Furthermore, 8 traps were in place for 7 nights between 23rd and 30th January 2013, with a total of 152 trap nights. All traps were set in water with a part of the trap left out of water to allow the captured turtles to breathe. We checked the traps every morning. Captured turtles were identified, measured, weighed, aged, sexed and marked by notching the carapace with a file, and the carapace and plastron were measured.



Photo showing setting a trap for turtles in a stream in the conservation site.

Surveys for tortoises were carried out doing transect walks combined with use of local trained hunting dogs as used in the previous research of (Som *et al.* 2007), and the dogs are known to be effective to detect the terrestrial tortoise species (McCormack, T. 2010). This is an excellent method for surveying a variety of habitats such as along water bodies, swamps, grasslands, and forest, and is a method used frequently to survey for turtles and tortoises. When a hunting dog encounters an animal it will give signal, e.g. by barking. Tortoises hide underneath leaves, grass, logs, rocks and termite mounds, so we searched carefully around such places. To avoid the dog owner from returning to the site after the survey to collect found animals we worked closely with

the community leader to identify a trusted person for the job. Captured tortoises were engraved with information in Khmer on date for release and a short message. Releasing turtles and tortoises is part of a religious Buddhist tradition which is believed to bring good luck. People who come across engraved turtles or tortoises will most often leave them alone as it is believed to bring bad luck and potential harm to them.

Four people walked in a line a few meters apart and searched, accompanied by three dogs. Transects were carried out in early morning and late afternoon as turtles are mostly active at these times. There was a total of 44 search hours, over 15 days.

Birds

Bird surveys were carried out over 8 days between 3rd and 11th January 2013. A combination of visual encounters, point count and sit-wait strategy in suitable locations in different habitats was applied. Surveys were carried out for 30 minutes at each location between 06:00-18:00 daily between 4th and 9th January.

In addition, mist nets were applied to enable the catch and identification of small, shy and more inconspicuous species. Mist nets were employed daily for 7 days between 06:00-18:00. Mist nets were set at suitable locations throughout the conservation sites, e.g. near roosting trees and water sources. Nets were checked frequently, and caught birds were identified, photographed and released. There was a total of 8250 m² of mist-net set.

A pair of binoculars (Bushnell 8 x 42) was used to observe birds. When a bird was spotted, information on species, numbers (for birds in flocks), and location were recorded on a datasheet and some birds were also photographed.

Bird identification was based on the knowledge of the surveyor and 'Field Guide to the Bird of South-East Asia' by Robson (2008).

Species Referencing

All mammal species are referenced to "A Guide to the Mammals of Cambodia" by Men *et al.* (2008), bird species by A Field Guide to the Bird of South-East Asia by Craig Robson 2008"; "A guide to birds of Cambodia" by Tan, S. and Poole, C. M. (2003), reptiles are based on the reptiles of Thailand by Robson (2008), and amphibian species are based on "A guide to amphibians of Cambodia" by Neang *et al.* (2008).

Results & Discussion

General Observations

Although the general area of the Grandis concession is between two protected areas, the area appears to be highly degraded and under heavy use by charcoal producers. This is a trend that is indeed true for the whole surrounding areas of deciduous forest. The southern part of Phnom Aural Wildlife Sanctuary located to the north of the Grandis concession consists of a similar low altitude deciduous forest habitat to Grandis, and also this area has experienced severe habitat degradation for charcoal production over the last ten years. The close proximity to Phnom Penh, relatively easy access and timber suitable for charcoal production has made these areas very popular. Although Phnom Aural WS is officially a protected site, enforcement efforts are relatively low.

The greater landscape of the Cardamom and Elephant Mountains are home to many species of endangered wildlife from elephants and bears to turtles, crocodiles and birds. While some species have relatively small home ranges and remain within smaller areas, some are so-called 'landscape species' which uses several habitats and roam over large areas. Examples of such landscape species are elephants, tigers and bears.

Although populations have severely declined in the post-Khmer Rouge era, where many individuals were killed, two main populations of elephants are still found in Cambodia, one in Monduliri province, and one in the greater Cardamom Landscape. Previously, elephants would move freely between the Cardamom and Elephant Mountains, however, with expansion of national road nr 4 between Phnom Penh and Sihanoukville and expansion of human settlements, logging and agriculture this corridor has disappeared (Maltby & Bouchier, 2011). Conflicts between humans and elephants have been recorded in these edge areas. The Grandis concession lies on the very outer edge of this corridor, and with no records reported during interviews it is unlikely that elephants are using this area.

Wildlife Identified

Mammals

Interviewees reported observing a number of wildlife species while in the forest. The full list can be found in Appendix 4. The camera traps recorded 3 species of reptile, 9 species of birds and 13 species of mammals over 754 trap nights. For a full list of species recorded by the traps, see appendix 5

The majority of these species are common species which can be found throughout Cambodian forested and agricultural country sides. Some of the species reported however, are of higher conservation concern. Below we have included a short section of each of these key species (listed on IUCN Red List as Vulnerable, Endangered or Critically Endangered).

Song of the Pileated Gibbon, *Hylobates pileatus*, was heard coming from a hillside approximately 1 km away from the ELC. The majority of the conservation area is highly degraded, and no dense forest with big trees remains. The interviewees said that there were still a few gibbons remaining at a hillside inside the evergreen conservation area, which used to be the habitat of gibbons when the forest was dense and undisturbed. This species which is listed as Vulnerable by IUCN is found in nearby protected areas of Aural Wildlife Sanctuary, Central Cardamom Protected Forest, and Kirirom National Park (Daltry and Momberg 2000; Daltry and Traetholt, 2003; Khim and Taylor-Hunt, 1995; Sreng and Setha 2002). Gibbons are highly arboreal and rarely venture onto the ground. They rely on tall standing trees for shelter and food.

Pig-tailed macaques, *macaca nemestrina*, were reported by interviewees, although no camera trap records were made. It is very likely that this species is found here as they are also reported from nearby protected areas. The pig-tailed macaque is listed as Vulnerable by IUCN, and populations are facing threats from hunting for the medicine industry (as lab animals) and are seen as pests to crops as they are found raiding crop fields in quite destructive ways. The pig-tailed macaque is mostly terrestrial, thrive well in different habitats and can tolerate degraded landscapes and agricultural areas.

Camera trap records were made of the Silvered Langur, *Trachypithecus germaini*. This species of primate is listed as Endangered on the IUCN Red List. It is terrestrial with a preference for evergreen, mixed and deciduous habitats, and appears dependent on being close to water sources. This species is highly threatened by habitat loss and hunting and populations are seeing steep declines. This should be considered one of the flagship species of the conservation zone.

Slow Loris, *nycticebus coucang*, was reported by interviewees. This is a small, nocturnal and arboreal primate, feeding on a variety of foods. It thrives in a number of habitats, including dry forests and plantations. It is listed as Vulnerable by the IUCN red list, and populations are in decline due to hunting for pets and medicine. The forests of the ELC and conservation zone are potentially good habitats for this species, however forest fires are a severe threat as it is a slow-moving species.

During the surveys, scratch marks from a bear were found at a tree in the evergreen conservation zone. The mark was most likely from a Malaysian Sun Bear, *Helarctos malayanus*, which is listed on the IUCN Red List as Vulnerable, as this is the most common species in this kind of habitat (Asiatic black bears, *Ursus thibetanus*, in general prefer higher altitude evergreen forest), and also the most widespread in Cambodia. Only a few of the interviewees reported bears from the area, and it is unlikely that it is home to a resident population due to lack of habitat and food sources. The individual was probably on the very extreme of its home range, or wandering through searching for new territories. Whereas areas such as central part of the Cardamom Mountains, Virachay NP in Ratanakiri and the plains of Mondulkiri which have large tracts of relatively undisturbed forest are seen as strongholds for the Sun Bears in Cambodia, the area

around the Grandis concession is not seen as a priority area for conservation of this species (Heng, 2009).

The Sambar Deer, *Cervus unicolor*, was reported by interviewees, but not confirmed by the camera traps. This species was up-listed on the IUCN Red List in 2008 from Least Concern (LC) to Vulnerable (VU), mainly due to habitat destruction and hunting. Previously common in forested habitats throughout Cambodia (Men, *et al.* 2008), this deer species is now becoming increasingly rare. The meat is valued, and large-scale snaring throughout forested areas has impacted on the population. This is one of the key species for prey for large carnivores such as tigers, leopards, clouded leopards and dhole (wild dogs), whose survival is closely linked to availability of prey species.

Two species of wild cattle, the Banteng, *Bos javanicus*, and gaur, *Bos gaurus*, were reported by interviewees. The Banteng is listed as Endangered by IUCN. It thrives in dry open forest, and the plains of eastern and northern Cambodia are strongholds for this species, although it is also confirmed to exist throughout the landscape of SW Cambodia. The species generally uses large areas within which they roam in small herds. The high levels of human activity and fragmentation of the habitat in and around the ELC makes this less suitable for conservation of this species' landscape here.

The Gaur, *Bos gaurus*, which is listed by IUCN as Vulnerable, in general prefers dense forested habitats, and is recorded from evergreen forests such as the Cardamom Mountains, although it will also venture into semi-evergreen and deciduous forest. The habitat in and around the ELC is not seen as a prime habitat for this species, and is unlikely to be of importance for sustaining populations. Both species of cattle are under tremendous hunting pressure and populations of both are decreasing.

Pangolins, *Manis javanica*, was reported by interviewees. This species is listed as Endangered by IUCN. It is a shy, nocturnal and semi-arboreal species, which thrives in both evergreen and dry forests, feeding exclusively on ants and termites. It is very likely that this species exists in the ELC, however probably in very small numbers. Pangolins are highly attractive on the illegal wildlife markets for traditional medicine and luxury food, and individuals can be sold for well over \$100/piece. This has driven the species to near extinction in several places throughout its range, and also in Cambodia it is now increasingly rare. It is hunted mainly using dogs and snares. Thousands of animals get caught each year from throughout SE Asia and shipped to China, which is the main market. It is a slow moving species and forest fires would severely threaten its survival. Due to the alarming trend in the trade and reported decrease of populations, this species in dire need of all possible support to ensure its survival, and all sites with presence of this species should be treated as key sites.

Turtles & Tortoises

The turtle trapping efforts resulted in the capture of two species. Interviewees reported the presence of a further four species. Previous surveys found interviews to be an extremely accurate method of ascertaining turtle and tortoise species diversity in an area. Searches in forest, grassland and swamps did not reveal any additional individuals, but shells of two species were found at camps of charcoal producers. The shell owner said that the tortoises were captured in the conservation area detected by the dogs.

One individual of the Asiatic Softshell Turtle, *Amyda cartilaginea* was caught in a trap. This species is fully dependent on continued water sources, where it spends most of its time. It lays its eggs in sandbars or soft mud on the sides of streams and rivers. This species is listed as VU by IUCN and, although fairly widespread in Cambodia and Southeast Asia, is heavily threatened by dredging, water pollution, and over-collection for food. Threats also include hunting for the illegal regional wildlife trade, primarily to Vietnam and China. Therefore, if the rivers and streams in the survey site can be properly protected from these threats, the site will be an important conservation area for this species.

Interviewees reported the presence of the Malayan Snail-Eating Turtle, *Malayemys subtrijuga* in the area. It has been recorded elsewhere in southwest Cambodia in similar habitats. This species was not recorded from the traps as it feeds almost solely on snails, but it is highly likely that it is present in the area, especially in flooded marshy areas in the rainy season, and in the streams that are connected to larger water sources outside of the conservation areas. This species is listed as VU by IUCN. It is becoming increasingly rare due to consumption for food, the collection of hatchlings for Buddhist release ceremonies, and for the international wildlife trade.

Interviewees also recorded the Yellow-Headed Temple Turtle, *Heosemys annandalii*, from the area. This species has been recorded in similar habitats in southwest Cambodia, so it is highly likely the species occurs here. It is classified by IUCN as Endangered, and is one of the most threatened turtles in Southeast Asia due to its large size and value both for local consumption and for international trade. Large numbers have been collected in Thailand and Vietnam, and Cambodia is now a stronghold for the long-term conservation of this species in the wild. This site would therefore provide an important conservation area for the species, which lives in slow-moving rivers and streams, and in marshes and ponds.

Interviewees reported the Southeast Asian Box Turtle, *Cuora amboinensis*, from the site, which is highly likely as the habitat is ideal for this species (Chey, K. *et al.* 2013; Som *et al.* 2007; Bryan L. Stuart *et al.* 2001). This species is listed as Vulnerable by IUCN, and is facing high threat levels from hunting, resulting in populations decreasing severely throughout its range. Again, this site could be an important conservation area for this species.

Interviewees also reported the Asian Giant Pond Turtle, *Heosemys grandis*, from the area. This species is listed as Vulnerable by IUCN and is facing same hunting pressures as the Yellow-headed Temple Turtle, although it is more common. It is, however, under a great deal of hunting pressure across its entire range, so it could be a very important species for conservation in this area, and **perhaps a flagship species for publicity due to its Latin species name (*grandis*)**.

Also, the Black Marsh Turtle, *Siebenrockiella crassicollis*, was reported by interviewees. It is very likely that this species is found here as the habitat is right and it has been recorded in similar habitats in other parts of SW Cambodia. This species is listed as VU by IUCN and is facing same threats as species mentioned above.

One specimen of Leaf Turtle from the genus *Cyclemys* were caught in traps. This species was thought to be widespread and common, but recent studies found that the genus actually contains seven species, including one species – the Cardamoms Leaf Turtle – that is endemic to the Cardamom Mountains range. This is the species that was caught during the survey. It is currently classified as Least Concern based on its previous species descriptions, but given its highly restricted range now, the Cardamoms Leaf Turtle will almost certainly be listed by IUCN as Vulnerable.

Two shells of the Elongated tortoise, *Indotestudo elongata*, were found at camps of charcoal producers, who hunt them with dogs and eat them. The area contains very good habitats for this species, which prefers dry open forested and grassy habitats (Chey, *et al.* 2013; Som *et al.* 2007; Bryan L. Stuart *et al.* 2001). This species is listed as Endangered by IUCN. Interviewees and charcoal producers in the forest confirmed that this species was much more common in the area just three years ago. That said, if there are strong conservation efforts now, focusing on fire prevention and banning dogs from the conservation zone, the population can recover and the site will be an important conservation area for this rare species.

The area is therefore home to a large number of threatened turtle species, so there is excellent potential to secure these species here. The low capture level of turtles and tortoises indicates that population numbers are now fairly low, probably due to high levels of hunting and forest fires in the past. That said, many of the turtle species recorded only in interviews hide in the mud in a state of partial hibernation during the dry season when water becomes scarce, so it is very likely that several of the above mentioned species were present but hibernating at the time of the survey, which makes it very difficult to

Measurements of Shells Found

Shell 1: Carapace length: 21cm, Carapace width 14.9cm, Plastron length: 17.8cm, Age: 9 years, Sex female.

Shell 2: Carapace length 19.6cm, carapace width 14cm, no plastron and 13 years. Sex is unknown because there is no plastron to identify.

locate them. The area therefore has great potential to become an important conservation area for turtles and tortoises.

Birds

A total of 92 bird species representing 39 families were recorded during the survey. This is an unexpected and surprising high number for this small area and short survey, when comparatively only 60 bird species were recorded for a similar effort in the much larger area of the Cardamom Mountains (Sophea, C. 2011). This result indicates the importance of the study site with the remaining few roosting trees, scrub, grasslands and ponds where birds aggregate and search for food and shelter. However, all recorded bird species are common and typically found in modified habitats. All species are listed as Least Concern (LC) by IUCN (IUCN 2012). However, six species of *Falconidae* (*Polihierax insignis*, *Aviceda jerdoni*, *Pernis ptilorhynchus*, *Haliastur indus*, *Spilornis cheela* and *Accipiter badius*), three species of *Psittacidae* (*Loriculus vernalis*, *Psittacula eupatria* and *Psittacula finschii*), three species of *Tytonidae* & *Strigidae* (*Tyto alba*, *Otus lettia* and *Glaucidium brodiei*) and one species of *Bucerotidae* (*Anthracoceros albirostris*) are listed in the Appendix II of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (CITES 2012), which is restricting international trade.

In Cambodia the recorded species are locally common and can be found almost everywhere in degraded landscapes around rice fields and human habitat. A few eagles and falcons were spotted flying during the day but, but were mainly recorded at night in roosting trees. This indicates that some species forage outside of the survey area and come back to sleep at the roosts. Interestingly, six species: *Francolinus pintadeanus*, *Aegithina tiphia*, *Ficedula albicilla*, *Pycnonotus aurigaster*, *Hirundo rustica* and *Prinia hodgsonii*, which are both fruit and insect eaters had a dominating presence based on numbers of individual (>100). These are common and abundant bird species which stay in flocks and forage for food in bush, scrub and around streams. This is a concern for this area, as these habitats are facing high impact from the charcoal production happening here. The majority of the birds recorded are insectivores and not depending much on fruits, which can be explained by the fact that not many fruiting trees are present in the area.

Interviewees reported a few species of birds which was not recorded during the survey. Those of importance include the Green Peafowl, *Pavo muticus*, which is listed as Endangered by IUCN. Threats to this species is habitat conversion and fragmentation, and hunting for feathers, meat and eggs. The species thrives in dry open deciduous forest as well as mixed evergreen and semi-evergreen forests, but prefer areas close to water sources. Strongholds for this species in Cambodia are the eastern and northern plains, which has similar habitat to that of Grandis ELC. The habitat within the ELC and surroundings is important for the populations in SW Cambodia.

Interviewees also reported the Lesser adjutant, *Leptoptilos javanicus*, which is listed as Vulnerable by IUCN. This species is a large water bird, which depends on wetlands for food, and is most likely a rare visitor in the concession, which would not be an important site for this species.

All birds rely on the sparse water sources in this dry area. If the charcoal production continues and the remaining trees are logged this may result in streams and ponds drying up during the dry season which would negatively impact resident birds and other wildlife species. However, most of the hunting is not targeting birds, and the area appears to be supporting the existence of a variety of species. With good management it could be an effective refuge for many species in the landscape.

Suggested mitigation measures for birds

1. It is important to keep good patches of forest as the birds are depending on this for shelter and food. Larger older trees are preferred by many species for roosting, and with bigger trees being logged for charcoal or other products, this reduces the quality of the habitat for the birds. Also the high level of activity by tractors that carry out logs for the charcoal produces causes a lot of disturbance, which scare away the birds.
2. It is extremely important that the water sources in this dry landscape are kept intact. If the water disappears, the birds will abandon the site in search of water. Even with temporary disturbance to a site, resident birds may evacuate, but will return later if there is still water available.

Other

Opportunistic sampling resulted in a series of reptiles and amphibians, see Appendix 6, however, nothing of high conservation value was recorded.

Threats

The majority of households in villages surrounding Grandis Timber are involved in producing charcoal. The village chiefs from the two surveyed villages estimated that about 90% of the households have charcoal kilns in the forest or at home and, and that the remaining households are involved in the charcoal trade as middlemen and retailers. The majority of kiln owners have a two or more kilns. The owners of kilns regularly venture into the surrounding forest to collect wood for charcoal production.

All interviewees were charcoal producers. Most of the interviewees make three to four trips per week to collect wood. Some charcoal makers have one or more of their kilns in the forest.

Interviewees reported that ‘outsiders’ from Kampong Speu town, Phnom Srouch District, and other provinces often come to the area to produce charcoal, as wood resources for charcoal production have been depleted at other sites. Outsiders also hunt for wildlife for food and collect luxury wood for selling. Interviewees reported that the price of charcoal is increasing significantly in recent years due to the increase in demand of charcoal by households, restaurants and export to Vietnam. Charcoal producers can earn up to US\$1,000 per month for a family producing charcoal in the forest with three to four kilns. This is a lucrative business and is resulting in even luxury woods being used for charcoal production.

The impact of charcoal production in this area is immense. Many kilns were observed in the forest, and tractors regularly travel through to transport the logs back for kilns at the villages. During our first day of survey we counted more than 20 tractors loaded with logs passing our camp inside the conservation zone. The logging occurred in both main conservation zones, as well as other parts of the Grandis concession and in surrounding state land. Charcoal production and presence of kilns is seen as a forestry offence and is generally enforced by rangers using article 98 of the Forestry Law. Interviewees mentioned that occasionally kilns inside the forest were broken down by the rangers of FA and Wildlife Alliance. However, enforcement on charcoal production is generally low.



Photo showing many kilns in the conservation area and tractor is generally used to transport the logs for their kilns.

The forest in the conservation areas has already been selectively logged for charcoal production and luxury timber, and only small and low-quality-wood trees remain. Low level charcoal production in this area has been carried out for decades, but recently this has escalated as resources are decreasing and demand and prices increasing. Also, land prices have increased which has resulted in the land surrounding the villages being cleared for farming, which has pushed the charcoal production further away from the villages, into state land as well as protected areas. From our observations during the survey it appeared that only small parts of the forest on the hill sides remain in good shape, however parts of these have also been selectively logged. Interviewees estimated that without intervention, the remaining forests would disappear within one or two years. Most interviewees stated that with recent high activity levels, there will be no more good-quality-charcoal trees left for next season, and some charcoal producers have already moved to cut the logs further outside the Grandis conservation areas.



Photos showing the shell of an Elongated Tortoise found at the campsite of charcoal producers, and a snare found inside the conservation area.

When charcoal producers camp in the forest to operate the kilns, they hunt wildlife for food. The interviewees reported that the targeted wildlife mostly is turtles, tortoises, small mammals (such as bamboo rats), muntjak deer, porcupines, civets, wild pig and birds.

To hunt for wildlife they use snares, slingshots and hunting dogs. Furthermore, some use playback of bird calls to attract some bird species into nets, and use electro-fishing in streams and ponds for catching fish and turtles. During the dry season they often burn the dry forest, scrub and grasslands, as it is easy to hunt and collect wildlife when the landscape is burnt.

Large parts of the forest inside the ELC (as well as outside) is burned, including small shrubs, dead trees and dry grasses, leaving just small patches of green forest areas in seas of charred and rocky landscapes. During the surveys, it was estimated that some 80% of the forest either had recently been burned or was in process of burning. While some wildlife may escape the burning, some species like tortoises and other slow-moving species (Loris, Pangolin, etc) might not

survive. Furthermore, the burning decreases the amount of food available for herbivores, amount of hiding and nesting sites and increase general temperature as there is no shade. These combined effects can have a large negative impact on the resident wildlife, which will either die or move away.



Photo showing previous forest habitat after logging and burning inside the conservation zone.

Summary of Findings

The habitat of the ELC conservation zones and surrounding areas of a matrix of dry deciduous forest, mixed with semi-evergreen and evergreen forest is very good habitat for a number of key species for conservation in Cambodia. However, the high level of disturbance is severely decreasing quantity and quality of these habitats.

The wildlife survey identified overall a relatively large number of globally threatened species, for which this site, with appropriate management, could be important. Although the bird survey recorded many species, only a small number of these were of conservation concern. The mammal survey turned out a relatively small number of medium, and large mammals, however several of these are of global conservation concern. The turtle survey identified several species of global conservation concern. The key species from these surveys are those of high conservation concern (Endangered on IUCN Red List) for which this habitat and site is of importance. These species are: Silvered langur, *Trachypithecus germaini*; Pangolins, *Manis javanica*; Yellow-headed temple turtle, *Heosemys annandalii*; Elongated tortoise, *Indotestudo elongate* and Green peafowl, *Pavo muticus*. For these, securing populations at this site would greatly benefit the conservation of these species in Cambodia. The site also support a number of species listed as Vulnerable, and with the right management could maintain the ecological functions and the integrity of the forest.

The conservation zones are quite small, and as a 'stand-alone' would not support the presence of a range of large species or landscape species, so connectivity to the larger landscape is important. There was a lack of predators in the areas, with no records of large cats (1 report of a leopard but

this is unlikely with the present level of disturbance) or dhole. This is likely due to a combination of low abundance of prey species, high levels of disturbance and human presence, and fragmentation of habitats. If conservation zones receive the right management and protection, and if connectivity to larger landscape in SW Cambodia is secured, it is likely that predators will return to the site, contributing to a natural, functioning ecosystem.

Below is listed a number of recommendations for appropriate management and actions in order to secure the conservation sites for the biodiversity.

Recommendations

Protection and regeneration of habitat in conservation zones:

One of the main threats to the forest and wildlife of the conservation zones is the rampant logging for charcoal production, which is estimated to severely reduce forests over the next one to two years. Maintaining forest cover within the conservation zones is of utmost importance for the survival of the resident wildlife. Several of the recorded species are arboreal, and all rely on forests for shelter and food. Ideally, all logging must be stopped immediately. Furthermore, restoration of fragmented or clear-cut areas is recommended to ensure connectivity of forest and increase quality and quantity of habitat.

Forest fires in the area are a major threat both to the habitat and the wildlife. Several species will not be able to escape fire events, and the habitat that the species rely on is severely damaged by the fires. It is highly recommended that no fires happen. Alternative livelihood approaches will likely be necessary with surrounding communities to offset any lost income from logging and charcoal production.

Ensure connectivity of habitat:

The combined area of the conservation zones is relatively small, and therefore it is very important to ensure connectivity of the forest cover within these. The eastern conservation zone of just 109 ha is too small to support significant wildlife, unless connected to the other conservation zones through a corridor. The state lands surrounding the ELC are subject to severe degradation, and connectivity to the large forested landscape of SW Cambodia may be compromised, which leaves the ELC conservation zones as a 'stand-alone' habitat in a matrix of degraded lands. Therefore, it is important that the zones themselves are connected and not fragmented.

Protection of riverine and wetland habitats:

The landscape in which the ELC is located is naturally dry, and consists of mainly dry deciduous forest with few water sources. During the dry season the water sources reduce to a minimum. All resident wildlife rely on these sparse water sources for their survival and maintenance of these is critical. Forest clearing, fragmentation, and fires all threaten the existence of the water sources. It is of outmost importance that forest cover along the rivers is maintained as well as the more wet areas of the evergreen zone. Again, a contiguous block of forest is the best way of ensuring protection of water sources. One potential issue is the river that is demarcating the boundary of the ELC west conservation zone, as the other side of this is state land and not under the mandate of Grandis Timber. Although degradation is currently taking place on both sides of this boundary, continued degradation on state land could undermine Grandis' conservation efforts by compromising the maintenance of the entire system.

Another potential threat to the water sources is future use of fertilizers and pesticides used in the concession, which may end up in the streams and wetlands and make them unsuitable for use by the wildlife.

No hunting:

Hunting is a main threat to the key species recorded from the site. Most likely, populations of most species is already at a critical minimum, and to ensure continued presence of these it is key that hunting pressure is eliminated.

We also recommend that access to conservation sites (and whole ELC ideally) by domestic dogs is banned. Dogs easily track down wildlife, and even if the owners did not intend to go hunting for wildlife, they will rarely turn down the opportunity to go home with a tasty meal or an animal that can be traded for hard currency.

During the dry season when the streams dwindle to fragment pools it is easy for local people to use electrofishing for catching fish and turtle. This method is very destructive and can effectively wipe out all wildlife from the water source in a very short time. It is highly likely that this is happening to all water sources within the ELC and is causing the very low levels of turtles there.

Suggested action steps to ensure best management practices:

- Demarcation of conservation zones
- Patrols to ensure no logging, hunting or charcoal production activities in conservation zones. Include ban of domestic dogs in conservation zone
- Awareness raising about the conservation zones and limitations of use of natural resources to local communities*
- Reforestation of fragmented areas
- Responsible use of fertilizers and pesticides in concession
- Ensure good forest cover along water sources both within and outside of conservation zones
- Alternative livelihood program with surrounding communities

*When talking to interviewees and charcoal producers we met during the survey, it became clear that people were not aware of the Grandis conservation areas, and they thought they could produce charcoal in the area with only occasional crack downs by Wildlife Alliance rangers every few years.

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