Boeung Prek Lapouv management plan

January 2014 – December 2018

Part 1: Description and Evaluation

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Acronyms and abbreviations used

BL	BirdLife International Cambodia Programme
BPL	Boeung Prek Lapouv Management and Conservation Area for Sarus Crane and Other Birds
CBETG	Community-based Ecotourism Group
CCK	Chamroen Chiet Khmer
CEPF	Critical Ecosystem Partnership Fund
CFi	Community Fisheries
CI	Confidence Interval
FA	Forestry Administration
FiA	Fisheries Administration
Ha	Hectares
HH	Household
IBA	Important Bird Area
LCG	Local Conservation Group
MAFF	Ministry of Agriculture, Forestry & Fisheries
MIST	Management Information System
MP	Management Plan
NAV	Net Annual Value
NGO	Non-governmental Organisation
PRA	Participatory Rural Appraisal
Sp	Species
UTM	Universal Transverse Mercator
WWT	Wildfowl & Wetlands Trust

1. Summary

Boeung Prek Lapouv (BPL) is one of the largest remaining remnants of seasonally-inundated wet grassland in the Lower Mekong and is important for birds, plants and other wildlife, much of it still un-recorded. These wet grasslands are under threat wherever they occur and at BPL, because hydrology has been significantly altered to facilitate rice-growing, the reserve will require long-term management interventions to conserve this valuable habitat.

It is also one of forty globally Important Bird Areas (IBAs) identified in Cambodia as key sites for conservation. Moreover, it is one of three Sarus Crane Conservation Areas established by the Royal Government of Cambodia to manage as Sarus Crane (*Grus antigone*) feeding areas during their non-breeding season. During this period Sarus Cranes flock in large numbers to a small number of wetlands and at the time of their peak influx to BPL, the site, on average, supports a third of the total regional population.

BPL is also essential to the lives and livelihoods of many thousands of people because of the wetland resources it provides for them such as fish, edible plants, firewood and land for farming. For example, in an ecosystem service assessment undertaken by WWT and CCK in 2012, it was found that 68% (almost 3000) of local households collect natural resources from BPL which underlines its significance for local people. The same study reveals how widespread conversion of BPL wetlands to rice is likely to result in a reduction in ecosystem value to local people rather than an increase.

Located close to the border with Vietnam in the south of Cambodia, BPL represents the largest such grassland remnant in the region at over 8,300ha in size. In the wet season the whole area is flooded from rising waters of the Mekong and drains to the Bassac River in the east at the onset of the dry season. This natural cycle of flooding and draining is only part of the story; a man-made drainage system created for farming and transport overlying a network of small, natural watercourses means that the site now drains too efficiently, impacting on wetland biodiversity in general and Sarus crane populations in particular. This drainage system also has implications for the people who depend on BPL for their livelihoods.

Working to implement the government sub-decree awarded to BPL in 2007 and towards achieving the interim twenty year vision for BPL as expressed by stakeholders, this management plan, which applies to the period January 2014 to December 2018 sets out the following over-arching aims:

- **To increase the use of BPL by Sarus Cranes through appropriate management of hydrology and habitats**
- **To manage, maintain and enhance wetland biodiversity in BPL to support human livelihoods**

If partners and stakeholders succeed in achieving these aims then the future of BPL's people and wildlife will be more secure.

However, BPL faces major threats so the task ahead will not be easy. Conversion of wetlands to rice fields has caused a decline in wetlands in the wider BPL area between 2004 and 2011 of around 35%. Increased rice cultivation also brings with it increased irrigation and channel construction causing the wetland to dry up rapidly after the flood season. Furthermore there are concerns about the impact prevailing high use of chemicals in dry season rice farming has on fish, other aquatic biodiversity and human health. Hunting, illegal fishing and other unsustainable activities are still of great concern. A lack of clear and effective regulations, demarcation and signposting, low awareness and limited enforcement of existing laws are allowing these unsustainable practices to continue.

To address these key threats and to reverse the trend in wetland degradation, an action plan is detailed which seeks to sustain the wetland for its people and wildlife. A project approach is taken as this will aid fund-raising and clearly distinguish agencies responsible for leading implementation of activities. A summary description of the projects to be designed and implemented with the full participation of local communities is as follows:

Sustainable Agriculture – trial sustainable rice farming techniques (and other crops) that minimise the impact of agriculture on the natural environment and wetland values. This will be combined with a focussed awareness raising programme on environmental & health issues related to the application of agricultural chemicals and wetland management in general

Community fisheries – develop the newly-established community fisheries and build capacity in sustainable natural resource management

Community-based ecotourism – establish community-based ecotourism as a means to provide further benefit to local communities from the conservation of BPL and a potential source of sustainable financing for conservation efforts

Biodiversity and water management – trial water management and various habitat management measures, monitor trends of selected variables (*e.g.* water quality, water levels, extent of wetlands) as well as conservation features (*e.g.* cranes and other biodiversity)

Demarcation and land tenure – demarcate areas of the reserve that are not currently clearly marked and communicate this to local communities to help them better understand how, where and if regulations apply. Clarify land tenure so that local people feel more able to participate in delivering sustainable management of the wetland

Laws and regulations – clarifying existing regulations and assessing the need for new or amended regulatory tools to help in managing BPL, maintaining a law enforcement team in the form of the existing Local Conservation Group, and conducting daily patrols and prevent illegal activities.

Awareness and capacity building – key to achieving the aims and objectives of this plan will be the participation of wetland users and all other stakeholders in decision-making and management of the reserve. For this to be possible, a targeted programme of training and learning will be designed for each

of the projects outlined above and delivered focusing on the key theme of sustainable natural resource management.

Partners in delivery

Implementation of the management plan will need the active participation and support of various organisations and communities. Main implementers from the government will be the Ministry of Agriculture, Forestry and Fisheries through the Department of Wildlife & Biodiversity, FA; Department of Community Fisheries Development, FiA; the Provincial Departments of Agriculture active in BPL. Other government agencies that will play an important role are local administrative and law enforcement groups (at provincial, district, commune and village levels), as well as provincial line agencies (e.g. water resources & meteorology, tourism, rural development).

International NGO partners planned to be involved in implementation will be the Wildfowl & Wetland Trust (WWT), responsible for leading on biodiversity and hydrology management and who will provide technical supervision in all projects together with BirdLife International Cambodia Programme. These partners will also carry out fundraising in support of projects as necessary (*i.e.* any projects/activities not financially supported by the Royal Government of Cambodia or funded by local organisations).

The main local NGO partner will be CCK which is based near to BPL, however other partners may also be invited to implement certain activities and independent consultants will also need to be recruited to provide additional technical expertise, training and supervision for certain activities.

Key partners to implementation of the management plan will be the local communities themselves, especially the members of community fisheries and community-based ecotourism group that will be established in the first years of the plan. It is envisaged that by the end of the plan period, local communities will be able to participate in co-management of the wetland alongside government and other agencies.

It is vital for all these partners to work closely together and to avoid unilateral decisions that run contrary to the aims and objectives of this management plan, which essentially supports implementation of the BPL sub-decree. To this end, it is noted that co-operation and liaison are important themes and to assist with this an advisory panel and liaison panel will be constituted to ensure timely and co-ordinated delivery of the activities contained in the plan.

2. Legislation and Policy

The Ministry of Agriculture, Forestry and Fisheries has the legal mandate to manage BPL in collaboration with other concerned ministries and local authorities to ensure the sustainable development of natural resources for local livelihoods in this area.

2.1. Prime Ministerial Decree (Sub Decree)

On 15 October 2007 the "Boeung Prek Lapouv Management and Conservation Area for Sarus Crane and other birds" was established by Prime Ministerial Decree. For the entire 8,305 hectare area that falls within the boundaries of the conservation area, the sub decree stipulates the following objectives:

1. Protect and conserve Sarus Crane, other bird, fish and flora species, in particular those species that are globally endangered, as well as maintaining their habitats and the overall ecological integrity of the area,
2. Preserve water sources to support biodiversity and agriculture and ensure sustainability of the wetland ecosystem and the livelihoods of local communities,
3. Support other activities including scientific and technical studies; awareness; education; community development; and monitoring of environmental changes that are related to sustainable development, local, national and regional conservation.

The sub decree stipulates that within the larger conservation area, a core zone of 919 hectares is devoted to "strict protection and conservation of natural resources to maintain inundated forest, fish, food items of Sarus Crane and other bird species", although adding that "scientific research, monitoring, ecotourism services and sustainable fishing" are permitted.

2.2. Fish Sanctuary

2.3. Inundated Forest Protection Zone

2.4. Zones & Boundaries

As mentioned above there are multiple designations within the reserve:

BPL Buffer Zone –

This zone comprises seasonally inundated grassland and rice fields. The area is very important for wildlife and people. Agriculture is permitted here although conversion of existing wetland is not permitted. Within this zone, the man-made channels are important means of transport and communication for local people. Fishing is also permitted and is a significant livelihood activity for the people in and around the wetland.

BPL Core Zone –

The core zone is strictly protected as an area of near-natural wetland. It is designated as a natural resource protection zone in order to maintain the remnant inundated forest (wetland), fish resources, crane foraging habitat and habitat for the bird community in general. Also, within this zone, the designation allows for scientific research, ecotourism activities and sustainable fishing.

Fish Sanctuary – Agriculture and resource collection that damages habitat and fish stocks (e.g. firewood collection, fishing) not permitted.

Inundated Forest Protection Zone – This zone is in addition to the area of inundated forest referred to in the core zone above. Agriculture not permitted. No specific regulations for resource collection.

With limited and sometimes unclear regulations for resource extraction within the zones, all of the wetlands in the buffer zone, core zone and inundated forest protection zone fall under a similar management regime. However, law enforcement is strongest within the core zone.

The outer boundary of BPL (containing all four zones) is not demarcated on the ground, but follows the following geographic positions as shown in figure 1, below: UTM *Indian Thailand 1960 48P*: **A** (498049, 1192141); **B** (497888, 1183698); **C** (497895, 1182741); **D** (504063, 1182737); **E** (508012, 1185033); **F** (508001, 1188152); **G** (507635, 1188401); **H** (507607, 1189159); **I** (507626, 1189899); **J** (507620, 1189975); **K** (506012, 1189966); **L** (505992, 1191709). The total size of the reserve is 8,305 hectares, with the buffer zone being 7,386 hectares (89% of BPL).

The core zone is located at the approximate centre of BPL and has the following four corner points as shown in figure 1, UTM *Indian Thailand 1960 48P*: **a** (501481, 1188861); **b** (501537, 1186000); **c** (504741, 1186000); **d** (504722, 1188861). Twenty cement markers were placed on the boundary of the core zone, however of these only nine remain. The core zone is 919 hectares (11% of BPL).

The Inundated Forest Protection Zone has three coordinate points as shown in figure 1, UTM *Indian Thailand 1960 48P*: **i** (501000, 1189000); **ii** (501000, 1186000); **iii** (506000, 1186000), while the north eastern corner follows the Prek Lapouv stream where it intersects with the latitude and longitude lines drawn straight east and north from points i and iii, respectively. Although initially demarcated on the ground, these boundary markers have all disappeared.

The fish sanctuary boundary follows the following geographic points, UTM *Indian Thailand 1960 48P*: **1** (501002, 1188016); **2** (501168, 1188097); **3** (501578, 1187814); **4** (502086, 1188896); **5** (502552, 1188659), **6** (503003, 1188860); **7** (504030, 1189084); **8** (504702, 1188827); **9** (504999, 1188724); **10** (504999, 1188969); **11** (504788, 1189053); **12** (504036, 1189283); **13** (503013, 1189508); **14** (501966, 1189360); **15** (500997, 1189431). The fish sanctuary has not yet been demarcated on the ground.

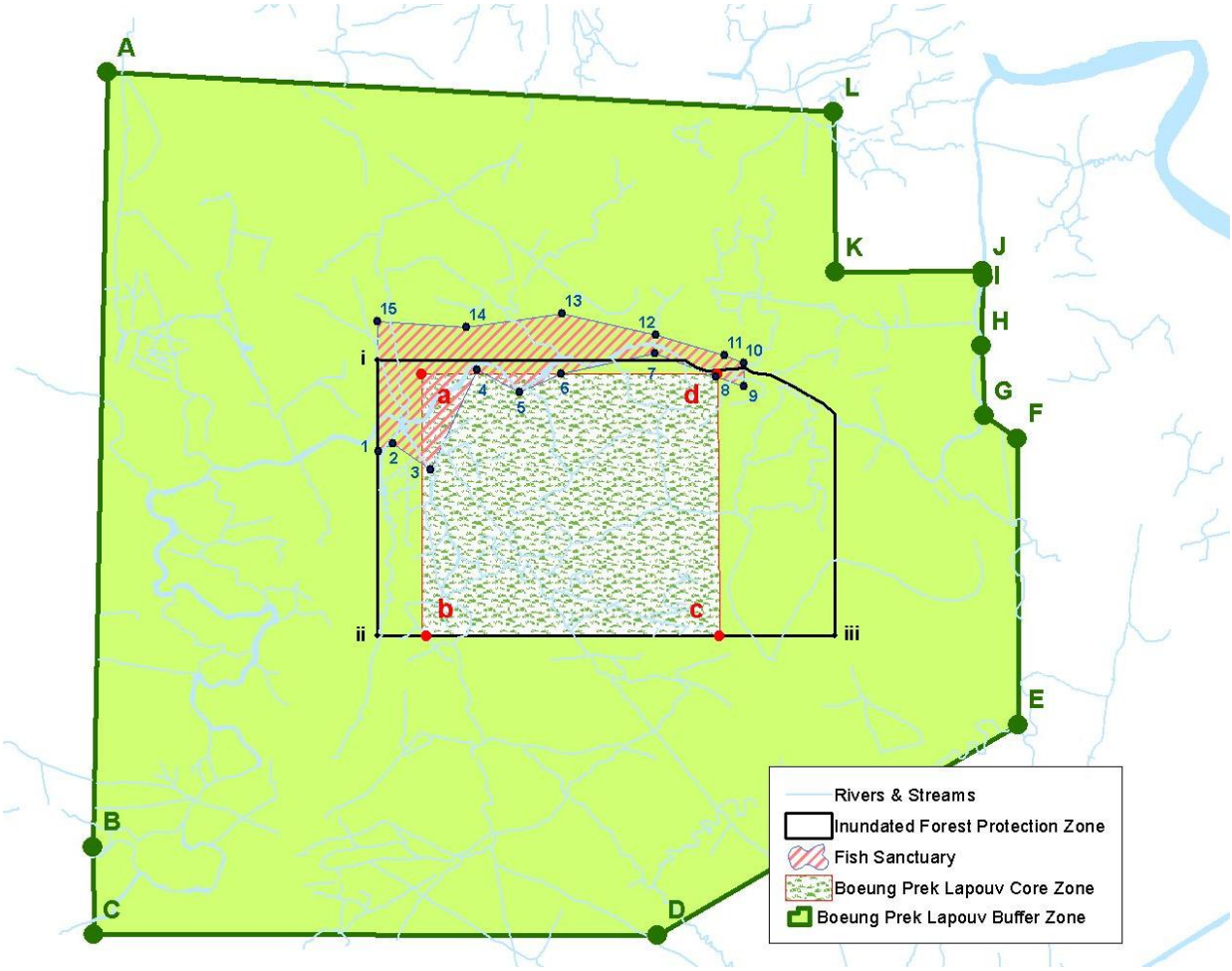


Figure 1. Map of zones within BPL (points refer to those listed in preceding section)

2.5. Other relevant legislation and policies

Ramsar convention

Cambodia signed up to the Ramsar Convention in 1999. The Ramsar Convention is an intergovernmental treaty that embodies the commitments of its member countries not only to maintain the ecological character of their Wetlands of International Importance but also to plan for the "wise use", or sustainable use, of all of the wetlands in their territories and to cooperate internationally concerning transboundary wetlands, shared wetland systems, shared species, and development projects that may affect wetlands.

3. Description of Boeung Prek Lapouv

3.1. Brief historical timeline[1]

Before 1975	BPL contained much flooded forest and area remained wet throughout dry season
1975 – 1979	People started to build small channels
1981 – 1991	People planted deep water rice
1986	Earliest recorded sightings of small groups of cranes
1991 – 1998	EU irrigation project dug the system of main canals for transport and irrigation. More and more dry season rice grown in the area. BPL becomes drier earlier in the dry season (general trend continuing up to present day).
2000-2001	Fishing lot #2 abolished and given to local communities in Kampong Krasang commune to establish CFi and manage. Inundated Forest Protection Zone (1,500 ha) created within Fishing Lot #1.
2001 – 2003	First biodiversity (bird & mammal) surveys conducted. Identified as one of Cambodia's forty Important Bird Areas (key sites for conservation). Local Conservation Group consisting of personnel from FA, FiA & local authorities established to curb illegal activities.
2007	BPL conservation area (8,305 ha) established, including core zone of 919 ha.
2010	CEPF funded 3 year project begins, led by WWT in collaboration with FA
2012	Fishing lot #1 abolished along with all other fishing lots in the country. Fish sanctuary (262 ha) created. CEPF funded CFi project started, implemented by CCK in collaboration with WWT & FiA.

[1] Consolidated results from PRA sessions with a group of people from various villages and separately, LCG members (Le Phat Quoi and Nguyen Huu Thien 2013) and PRA with local communities and local authorities (Pech Bunna *et al*. 2013).

3.2. Environmental Information

3.2.1. Climate[2]

Climate is dominated by the change of the monsoons, which generate wet and dry seasons of more or less equal length (Table 1). The wet season usually lasts from May until late September or early October. During the period there is usually heavy rainfall (> 5 mm) on one day in two over most of the Mekong Basin. Later in the wet season, tropical cyclones occur over much of the area so that August and September and even October (in the delta) are the wettest months of the year. Annual rainfall in the delta generally ranges between 1,000 and 1,500 mm, with a long-term average of 1,200 to 1,300 mm.

Table 1. Generalised climate seasons in the Mekong Basin (source: Mekong River Commission 2005)

Cool/Dry			**Hot/Dry**		**Wet**					**Cool/Dry**	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NE Monsoon			**Transition**		**SE Monsoon**					**NE Monsoon**	

The Northeast Monsoon, which sets in towards late October, initially brings lower temperatures. Rainfall during the months of the NE Monsoon is generally confined to Vietnam due to the buffering effect of the Annamite mountain range. Annual evaporation is generally between 1,500 and 1,700 mm.

3.2.1.1. Climate change

Using a global climate circulation model researchers have predicted that over land conditions will generally become drier with reduced rainfall and increased evaporation (Arora and Boer 2001 in Mekong River Commission 2005). For the Mekong this means reduced annual discharge and flood levels. Due to the reduced discharge salinity intrusion will increase in much of the Mekong delta. A major factor affecting annual flows in the Mekong will be how global warming impacts upon the glacier system on the Tibetan Plateau.

3.2.2. Location and Hydrology

BPL is an essentially flat area located in the western floodplain of the Bassac River, which is a distributary of the Mekong River. The hydrology of BPL is subject to the influence of the hydrology of the Mekong/Bassac River which is characterized by pronounced seasonal variations in flows. In the lower section of the Mekong, water levels rise in late May with the onset of the rainy season and eventually transform the large flood plain region into a sheet of sediment-rich water. Water levels peak in September or October then recede rapidly until December and then gradually until it reaches the lowest level in April and May. In this system, the Tonle Sap lake acts as a natural flood retention area that absorbs flood water in the wet season and adds to the main channel flow of the Mekong/Bassac during the dry season (Le Phat Quoi and Nguyen Huu Thien 2013).

BPL lies within the tidal regime, as most of the delta does, and the tidal effect on water levels is especially pronounced in times of lowest water inflow from upstream sources (see January and February 2013 minimum and maximums in figure 4). During the dry season, apart from tidal influx, main water sources are the Prek Lapouv, a large stream that meanders through BPL and a channel link to the Takeo

[2] Climate information is taken from Mekong River Commission 2005

River. During a provincial consultation meeting in March 2013 it was mentioned that the Department of Water Resources is planning to increase water provision from the Takeo River to irrigation channels in BPL.

However, topography (relative elevation) is still largely unknown in BPL and what impact increased flow from the Takeo River will have on the wetlands during the dry season cannot be predicted in advance. The extensive network of channels (figure 3) that have been built in and around BPL so far have led to increased drainage in the dry season and are the main cause of increasingly rapid water loss from the wetland[3] with conditions typically dry enough to walk across the wetland by mid-February. Such dry conditions are unsuitable for Sarus Cranes (see chapter 3.2.6).

No infrastructure has been built to manage water levels in BPL.

Figure 2. Location of BPL in relation to major rivers and streams (source: Google Earth 2013)

[3] Increasingly dry conditions are reported by a number of stakeholders living and working in the area.

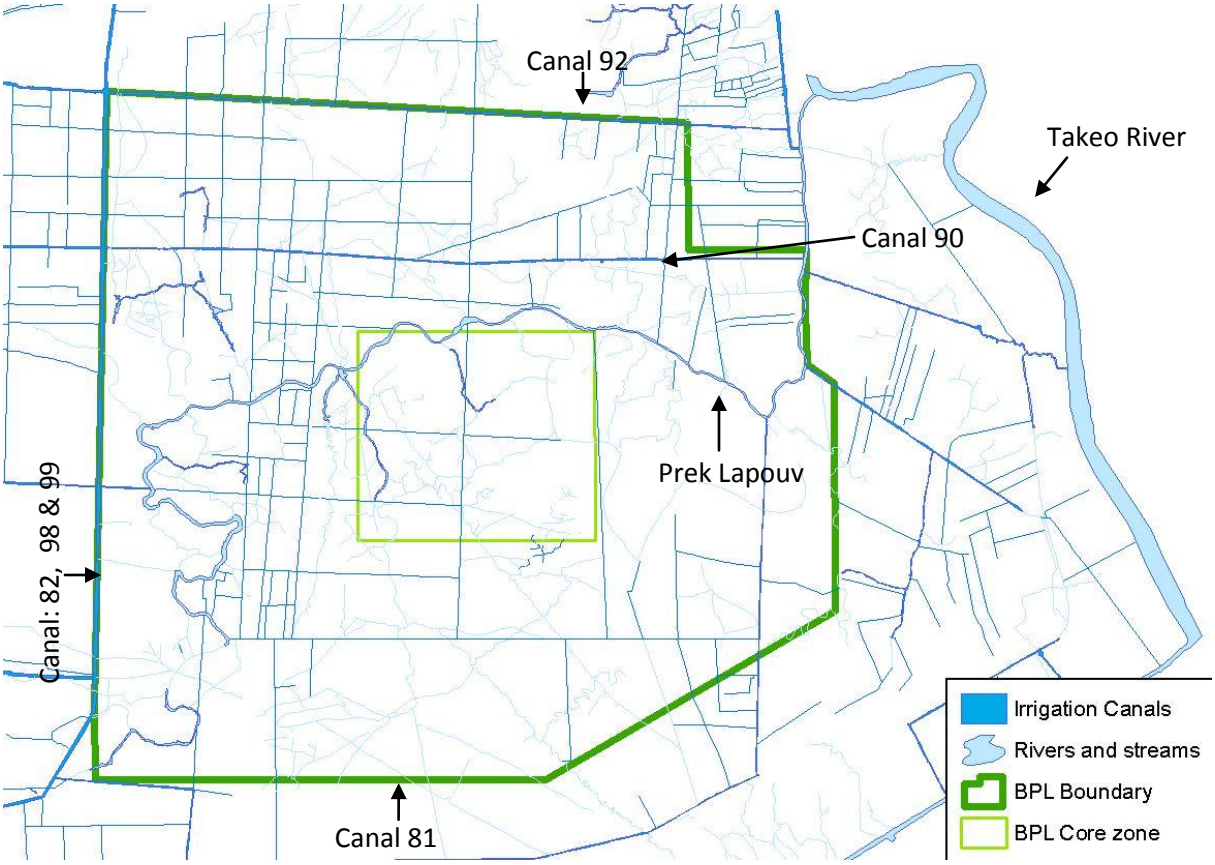


Figure 3. BPL drainage. Water flows out in the dry season to the Takeo River in the east.

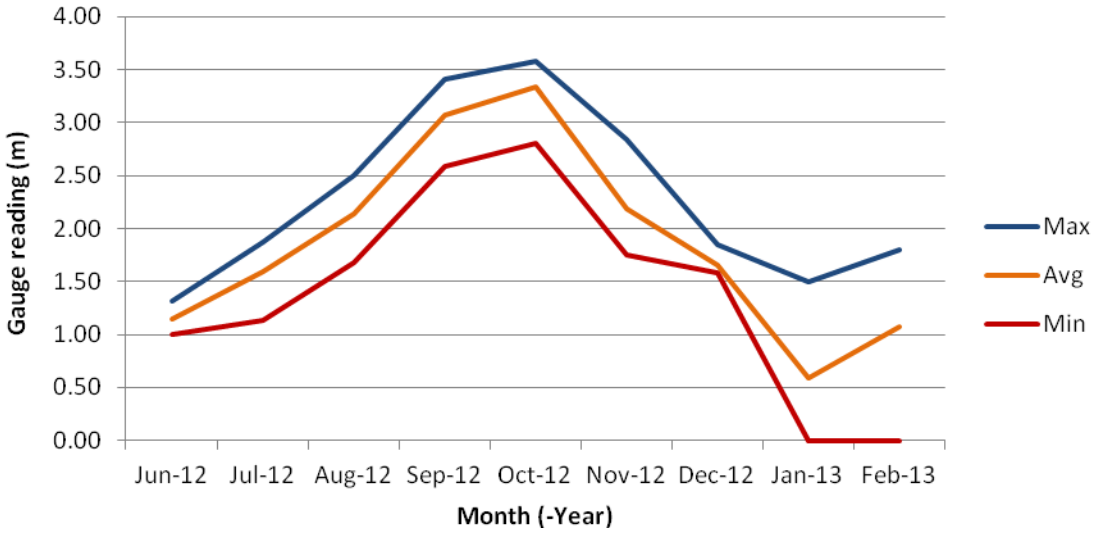


Figure 4. Maximum, average and minimum water levels in canal 90, BPL, per month from June 2012 to February 2013 (note: water level readings are not in meters above sea level due to the absence of benchmarked figures in the area; readings were taken once a day at variable times; the gauge was not placed deep enough to record minimum water levels in January and February 2013).

3.2.2.1. Impact of dam construction upstream[4]

A potential future issue related to hydrology is the effect dam construction upstream, on the Mekong and its tributaries will have on BPL. Within the Lower Mekong Basin (LMB) most of the larger Mekong River tributaries have cascades of dams in place or planned with some 71 projects expected to be operational by 2030. A further eleven dams are being considered on the Mekong mainstream within the Lower Mekong Basin (LMB) and a twelfth is already being developed (despite a lack of official consensus between LMB countries). Some of the predicted changes following construction of all proposed mainstream dams are:

- The transition period between seasons will be reduced, *i.e.* onset of flooding will occur rapidly (gradual transitions play an important role in triggering biological processes such as fish migration, plant growth, etc.)
- There will be a greater fluctuation in daily or even hourly water levels with a potential of between 3-6 m water level changes up to 40-50 km downstream of individual dams (BPL is further away from the nearest proposed dam than this)
- Combined impact of mainstream and tributary dams is expected to result in a 75% decrease in sediment load
- Based on loss of habitat alone, the mainstream projects would induce a 12-27% reduction in the primary productivity of the aquatic systems (i.e. plant productivity) in the Mekong, with implications for the overall productivity of the river. The loss in sediment will reduce this to a small fraction of current productivity.
- The fragmentation of the river system would isolate aquatic populations into pockets leading to a loss of species. The total loss in fish resources would be 26–42% compared to the 2000 baseline.

3.2.3. Water quality[5]

Water in BPL mainly originates from the Prek Lapouv stream, Takeo and Bassac rivers. Water quality analysis was conducted in late February 2013 with samples taken from various canals, rivers and streams. Water was only slightly acidic to neutral with a pH of 5 – 7, however, in areas with acid sulphate soils (see next section) the pH was as low as 3. In the flood period pH has been reported as neutral at 6 – 7 (Tran Triet 2003).

Dissolved Oxygen (DO) levels in February were low at 3.1 – 5.1 mg/l in canals and streams. This is in contrast to high DO levels measured in November (peak flood period) at 5.1 – 7.1 mg/l (Tran Triet 2003).

Salt content was very low at 0.01% for all measurements made in connected waterways.

3.2.4. Soils[5]

Although soils are young with limited profile development, the dense canal network facilitates drainage and causes weathering of soils in the dry season, especially of soils lying at relatively high elevation. Most soils types belong to the group of developing alluvial soils (**Inceptisols**). Soil profiles contained a B

[4] Information in this chapter follows that in ICEM 2010

[5] Summary of data collected in February 2013 as part of an eco-hydrological assessment (Le Phat Quoi and Nguyen Huu Thien 2013)

sub-horizon where the weathering of materials had taken place. Formation and accumulation of iron compounds such as Goethite (FeO(OH)) and Hematite (Fe_2O_3) was observed in the B sub-horizon as a result of fluctuation between wet and dry condition. Soil texture is between clay and silt clay.

However, in many, especially low lying areas, soils contained either a sulfuric horizon or sulfidic materials at less than 125 cm from the surface and can be considered as potential or actual **acid sulphate soils**. Such soils are least suitable for cultivation and need special management consideration, *e.g.* they should be kept permanently moist to avoid release of large amounts of acid in to the environment. More work may need to be done on mapping the distribution of soils in BPL.

3.2.5. Flora[6]

A rapid assessment of flora in BPL conducted in February 2013 identified 65 species (Appendix 1). The largest family of plants were grasses (Poaceae) with 21 species identified, followed by sedges (Cyperaceae) with 13 species. Water chestnut (*Eleocharis dulcis*) and Water lily (*Nymphaea* sp.) are considered to be important food items for Sarus Cranes. Water chestnut grows on acid sulphate soils while Water lily is found along waterways and depressions in fields, with the latter being areas where Sarus Cranes can access the plants and feed on the soft stems.

Three different habitat types can be considered to occur in BPL. These are seasonally inundated grasslands, scrub (often referred to as inundated forest in Cambodia) and aquatic habitats.

3.2.5.1. Plant communities[6]

The plant communities that have been described so far under each habitat are:

Seasonally inundated grasslands

- *Echinochloa stagnina* - *Leersia hexandra*; This plant community is distributed predominantly at middle to upper elevational ranges, especially along slopes of canals and small mounds. Other species associated with this community are *Phyllanthus reticulates, Morinda citrifolia, Saccharum spontaneum,* and liana species such as *Ipomoea nil*, *Merremia umbellate*.
- *Ischaemum* sp - *Leersia hexandra*; This plant community has quite a broad distribution in the middle elevational range. Besides the two species of *Ischaemum* grass and *Leersia hexandra* that are most abundant, there are other species interspersed, such as *Echinochloa stagnina*, *Chloris barbata, Eleusine indica*.
- *Eleocharis dulcis*; Clusters of *Eleocharis dulcis* are sometimes found within *Ischaemum* sp. - *Leersia hexandra* grasslands in slight depressions. The area of each cluster is not large, however there are many clusters that together with the above plant community form an overall grassland mosaic, predominantly in the southern half of BPL. Some other species occur in association with these *E. dulcis* clusters, such as *Nymphaea* sp. and *Persicaria hydropiper.* In the dry season bare land was occupied by *Cynodon dactylon* clusters.
- *Eleocharis dulcis – Ischaemum sp*. There is a large area in the most southern and south-western parts of BPL. Although two species co-dominate, some other species such as *Eleusine indica,*

[6] Summary of data collected in February 2013 as part of an eco-hydrological assessment (Le Phat Quoi and Nguyen Huu Thien 2013)

Leersia hexandra, Chloris barbata, Cynodon dactylon are also found in association with this community.

- *Saccharum spontaneum - Phragmites vallatoria*; a community distributed along the raised bank of canals. The banks of the canal network built before establishment of BPL are covered by *Saccharum spontaneum* and *Phragmites vallatoria*. *Mimosa pigra* has also intermingled in this community and its population is quite large in some areas.

Aquatic habitat

- Cyperus plant community; is widely distributed in low lying areas along the canals and in small ponds. Dominant species are *Cyperus malaccensis, Scirpus grossus*, *Scirpus mucronatus.* Waterlogged soils are required for this community to develop.
- *Nelumbo nucifera* (Lotus) – *Nymphaea* sp. (Water lily); distributed only in the area of open water and deeper depressions. Lotus was found in some open water areas along natural channels and irrigation canals, but was absent in depression areas among grasslands. However, Water lily was found commonly in small depressions within the grassland. Other aquatic species were also identified as *Nymphoides indica*, *Ceratophyllum demersum*. Water hyacinth (*Eichhornia crassipes*) was also commonly found in the waterways.

Scrub

- Scrub complex; distributed in higher areas along the banks of canals and higher terrain. Plant community comprising mainly of *Morinda sp.* and *Phyllanthus reticulatus*. The grass beneath the scrub canopy comprises *Ruellia tuberosa*, *Cyperus difformis*, *Pluchea indica*, *Cynodon dactylon*, *Heliotropium indicum*, and liana species as *Ipomoea nil, Merremia umbellate*. *Mimosa pigra* was also found scattered in the shrub community.
- Mimosa (*Mimosa pigra*) sometimes forms mono-dominant stands on high-mid elevations where the soil has been disturbed, such as on embankments.

3.2.5.2. Invasive non-native flora[7]

The invasive non-native species Giant Mimosa (*Mimosa pigra*) is a major threat and has already been the subject of a control programme.

Management to date has been to cut back all Giant Mimosa plants in selected plots just ahead of the flood season and follow up with a second round of control directly after flood waters recede. In 2011 and 2012 effectiveness of this method was studied by monitoring plant mortality and emergence of new plants. Plant mortality due to the cut & flood method was estimated at 88% in 2011 and 82% in 2012. This shows that this method is very effective in killing Giant Mimosa plants. However, this does not prevent new plant growth and in 2011, a year in which post-flood treatment was delayed until late February it was found that there were high numbers of new plants emerging in treated areas. Considering this new growth, the reduction in number of living Giant Mimosa plants in treated areas was only 53% in 2011. In 2012 it was 77%, but the post-flood treatment was carried out much earlier, in mid-December, and less new growth had occurred by that time. Annual retreatment of same areas and

[7] This chapter is a summary of that reported in Seng Kim Hout and van Zalinge 2013

long term monitoring is needed to combat new growth and assess if the rate of new growth will be reduced over time.

Another confirmed non-native invasive species is the Water Hyacinth (*Eichhornia crassipes*). It may cause ecological impact by replacing native aquatic species, increasing evaporation and sedimentation and reducing oxygen levels in already small and shallow waterways. Its prolific growth annually blocks boat traffic along stretches of canals, streams and rivers in BPL. Water Hyacinth can be used to make compost and when dried the long stems can also be used as raw material for making furniture, mats and hammocks.

3.2.6. Fauna

Information on fauna is limited to birds. No work has as yet been conducted on assessing and monitoring the status of fish, reptiles, amphibians, mammals, aquatic and terrestrial invertebrates or soil organisms.

To date 110 bird species (Appendix 2) have been recorded although the real number is likely to be substantially higher as there are limitations in capacity of staff to identify all species and the main focus of monitoring has justifiably been on threatened species, especially the Sarus Crane, in the initial years of conservation work. There are five threatened species that are known to occur in BPL:

1. **Bengal Florican** (*Houbaropsis bengalensis*), a Critically Endangered[8] bustard. There have been sightings of singles (once two birds) between January to June (due to high water levels the occurrence of this species is restricted to the dry season). Records are few (six sightings from June 2003 - March2013) and sporadic (the species was recorded in only four of the eleven years, last record from 2010). However, it is a highly cryptic species and is usually seen when flushed (as currently most monitoring in BPL is done by boat the chance of encountering a florican is low). Nevertheless, based on the lack of suitable habitat (although as BPL has become drier the grasslands have become very tall and dense in parts), their large home ranges, and number of sightings, it is expected that there are fewer than ten individuals in BPL and any other records from the delta have been from over a decade ago. The main area for conservation of the species is the floodplain grasslands of the Tonle Sap Lake in Kampong Thom province.

2. **Black-faced Spoonbill** (*Platalea minor*), an Endangered winter migrant. In the winter of 2010/11 four birds were found after researchers tracking a bird with a GPS transmitter notified the project of its presence in BPL. Subsequently the same group plus one additional bird were found a month later in the floodplain along the Takeo River around twenty kilometres north of BPL (van Zalinge *et al*. in press). In the following winter two birds were again encountered. Although no spoonbills were confirmed in 2013 it is likely that they are fairly regular visitors in low numbers. Their presence will be strongly influenced by water levels as they forage in shallow waters.

[8] All threat categories follow those of the IUCN Red List presented in BirdLife 2013.

3. **Greater Adjutant** (*Leptoptilos dubius*), an Endangered stork, resident in Cambodia but only a wet season visitor to BPL. Between 2005 and 2009 groups of 4-19 Greater Adjutants were recorded annually from June -August, but since then there have been no more sightings. The reason for their recent absence is unknown although it is suspected that it may be related to conversion of wetlands to rice fields together with associated increase in disturbance.

4. **Lesser Adjutant** (*Leptoptilos javanicus*), Vulnerable. Mostly occurring in BPL in the wet season with counts of 2-34 from June - August in all years since 2005, but also with occasional presence in low numbers (1-7) in the dry season from November till February.

5. **Sarus Crane** (*Grus antigone*), Vulnerable. BPL is one of the key feeding sites for cranes in the non-breeding season, which overlaps with the Cambodian dry season. BPL is especially used from December to February each year with a maximum count of 304 cranes counted in January 2011 (see figure 5 below). The average annual maximum count for between 2008 and 2012 is 247 cranes. The average maximum for the entire Mekong delta (based on annual regional count) within the same period is 443 cranes and the average maximum count of the regional population is 803 cranes (Tran Triet and van Zalinge 2012, van Zalinge *et al*. 2011). Thus BPL periodically can hold, on average, 56% of the Mekong delta population and 31% of the total regional population (Cambodia and Vietnam) counted annually (Cambodia and Vietnam) during the non-breeding season.

Cranes depart BPL when the site becomes very dry around late February or March, but will sometimes return in low numbers at the onset of the rainy season (see figure 6 and table 2). All of the data show that numbers and duration of their presence at BPL is highly variable between years as conditions become unsuitable towards the middle of the dry season. It is believed that the critical factor behind the crane's departure around late February is because soils become too dry and hard for the cranes to probe for food. The return of small groups after the rainy season has started, when soils are moist but the wetlands not yet flooded, supports this theory. Retaining soil moisture at suitable levels is likely to be a crucial factor in managing BPL for Sarus Cranes.

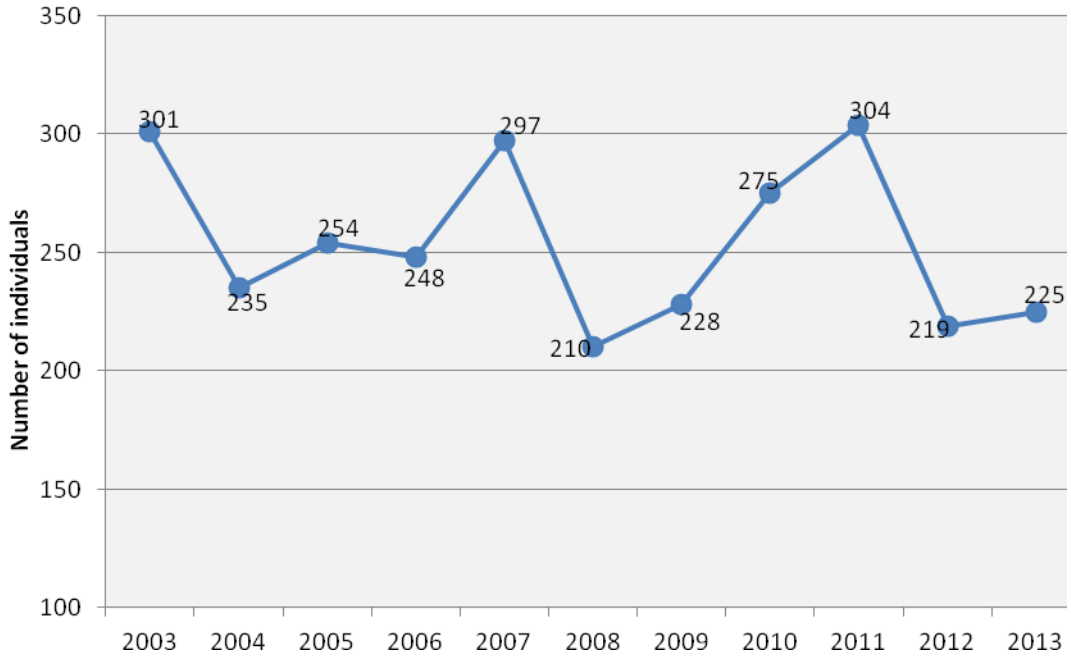


Figure 5. Maximum number of cranes counted at BPL in each year

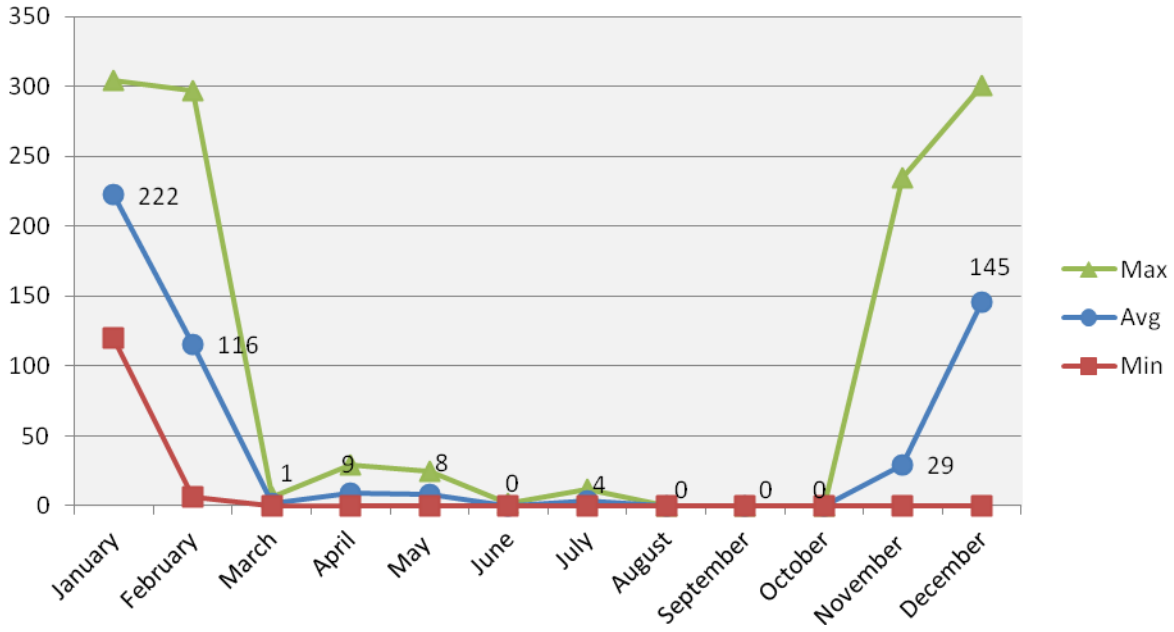
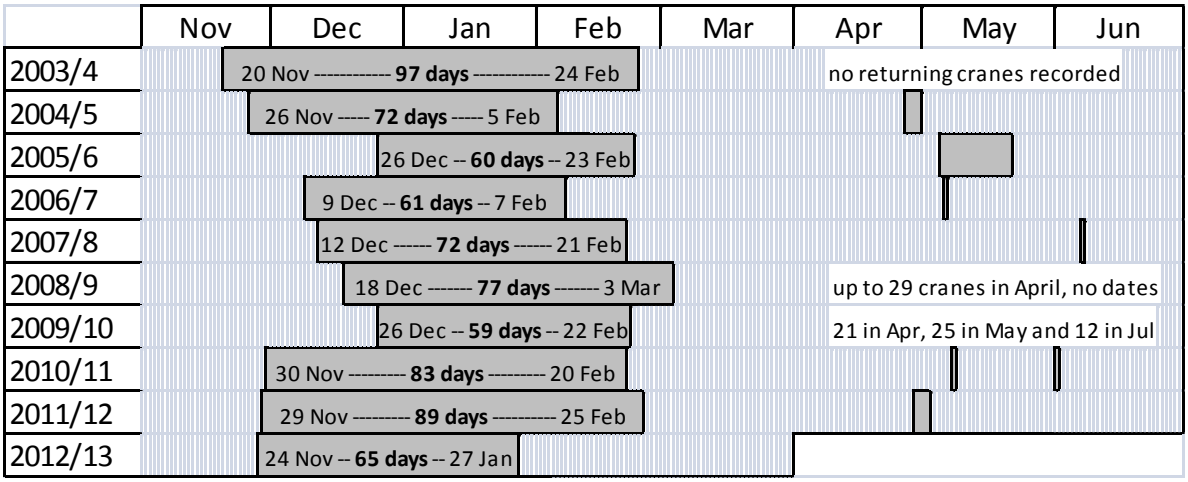


Figure 6. Monthly pattern of crane presence at BPL (based on maximum monthly counts July 2003 – March 2013).

Note in figure 6 that the minimum (of monthly maximum counts) has been zero or close to zero for all months within the considered period (Jul'03-Mar'13) except January. Generally, December-February is the main period, but numbers can be high in November as well.

Table 2. Period of crane presence at BPL for 2003/4 to 2012/13 during the non-breeding season



The average duration for the main block of crane presence over the above time period is 74 days. There is substantial variation between years. In 2013 cranes had already departed by end January as conditions were very dry. Cranes may return for short periods later in the non-breeding season (generally considered to be November to June) after there has been some rain.

3.3. People – the stakeholders at BPL

3.3.1. Communes

BPL (8,305 ha) is located entirely within Takeo province, close to the border with Vietnam, and is shared by Borei Chulsa (61%) and Koh Andet (39%) districts (see figure 7). BPL straddles six communes. Within Borei Chulsa these are: Kampong Krasang (37% of total area) and Chey Chouk (24%). Within Koh Andet: Prey Khla (21%), Krapum Chhuk (10%), Romenh (5%) and Prey Yuthka (3%).

3.3.2. Villages

Villages that use BPL the most were identified through an ecosystem service assessment conducted in February 2012 that included 428 household interviews (10% sample size) in 19 villages (van Zalinge *et al*. 2013), and a Rapid Rural Appraisal (RRA) with local government administrators as part of preparatory work for establishing community fisheries in BPL on the 27th of February 2013 (Pech Bunna 2013). Table 3 below shows the villages covered in these two activities and their relative use of BPL while figure 7 shows their location.

Table 3. Relative use of BPL by village (based on ecosystem service assessment and RRA meeting)

Village name	Number of Households	Ecosystem Service Assessment		Relative use as determined in RRA
		% HHs collect nat. resources	% HHs farming in BPL	
Sangke Chuor	58	100%	0%	Medium
Banteay Slaek	38	100%	100%	Medium

Village name	Number of Households	Ecosystem Service Assessment		Relative use as determined in RRA
		% HHs collect nat. resources	% HHs farming in BPL	
Dei Leuk	27	100%	0%	Medium
Kouk Panhcha	19	100%	0%	Medium
Banteay Thleay	418	96%	31%	Medium
Chroy Pon	102	90%	20%	Low
Sangkum Meanchey	261	82%	29%	Medium
Kdol Chrum	252	80%	28%	Medium
Chambak Em	469	73%	14%	High
Keo Kampleung	306	71%	53%	High
Tara Kum	226	70%	17%	Medium
Daem Kroch	207	67%	75%	Medium
Chey Chouk	88	67%	78%	Medium
Tuol Kandal	305	66%	0%	Low
Rominh Khang Cheung	510	58%	0%	Not included
Rominh Khang Tboung	298	48%	0%	Not included
Prolay Meas	262	46%	12%	Not included
Kampong Krasang	83	33%	33%	Low
Daem Chan	228	30%	4%	Not included
Thma Bei Dom	159	Not included		Low
Daem Doung	No data	Not included		Medium
Samraong	No data	Not included		High
Vietnamese villages	No data	Not included		High

The RRA and ESA results shown in table 3 differ slightly, but are indicators of a village's use of BPL. The RRA is closer to a reflection of total amount of fish extracted by that village than percentage of households involved in resource collection. The RRA also highlighted intensive use by villages not considered in the ESA (*e.g.* Samraong) and the fact that currently BPL is not only used by local communities in Cambodia, but also intensively used by people from across the border in Vietnam, for natural resource collection and farming.

Based on the information from the nineteen villages surveyed under the ecosystem service assessment the total number of households collecting natural resources from BPL is close to three thousand. However, this does not include villages like Samraong, Daem Doung, Thma Bei Dom and people from Vietnam.

There are three villages located within the boundaries of the reserve: Sangkum Meanchey (261 households) in Kampong Krasang commune; and Banteay Sloek (38 households) and Dei Leuk (27 households), in Chey Chouk commune.

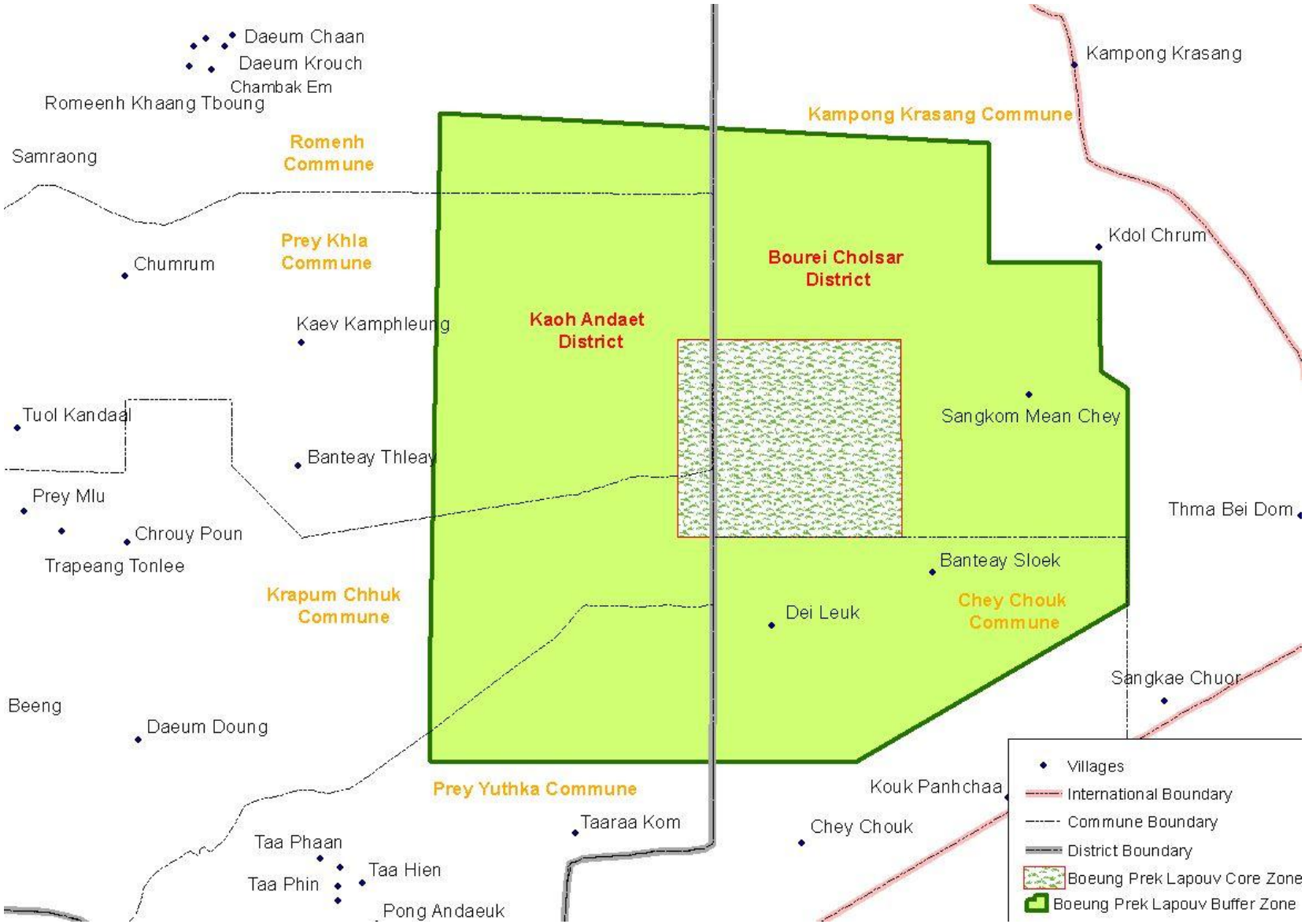


Figure 7. Map of villages in the BPL area

3.3.3. Other stakeholders

As mentioned above a large number of Vietnamese people cross the border in to BPL to farm rice, fish and collect other wetland produce. This has large repercussions on the current state of BPL and its future. Use of BPL by people from Vietnam is an issue frequently raised in stakeholder discussions on resource use by local people (*e.g.* RRA, PRA and ESA studies); with people saying that the use of BPL (especially fisheries) by this group is unsustainable. Anecdotal evidence suggests that instead of farming the land themselves, a local household can earn approximately $200-$250 per year for five hectares of farmland if they rent the land to a Vietnamese farmer[6]. This also results in additional pressure to convert wetlands to take advantage of this demand.

3.3.4. Land use in BPL

3.3.4.1. Land tenure

A large proportion of land in BPL is located within Borei Chulsa district mostly in the two communes of Chey Chouk and Kampong Krasaing. The remaining part is in Koh Andet district which comprises four communes such as Prey Khla, Rominh, Kropum Chouk and Prey Yuthka. According to interviews with commune chiefs, most lands in BPL are owned by local people but without any land titling certificates, except for Chey Chouk commune where some people have land tenure certificates issued by Takeo Provincial Department of Cadastral. (Seng Kim Hout 2004).

According to existing land law, the 2001 pattern of land use on agricultural or otherwise settled land is the decisive factor regarding private property and settling land claims. Land either abandoned or otherwise, not under cultivation or settlement in 2001 is legally state property. Under the land law, some of the land currently farmed in BPL would be private property and some would belong to the state. However, it is not known which land was being farmed in 2001. Furthermore, for the purposes of current government policy to have all rural land titled, it has been decided that all land under cultivation at the time of land titling will be considered up to a maximum of five hectares per household. This increases the risk of land grabbing in the interim period and it is therefore important to conduct land titling in BPL as soon as possible.

3.3.4.2. Land use and land use change

There are two main forms of landuse in BPL: floodplain wetland (used for collecting a wide variety of natural resources and for biodiversity conservation) and rice cultivation. In 2004, in an area of 10,787 ha that encompassed the current boundaries of BPL, there was 7,059 ha of floodplain wetland (65% of total area) and 3,728 ha of ricefields (Seng Kim Hout 2004). In 2011 the size of all floodplain wetlands in BPL was 4,568 ha (55% of BPL and 42% of the 2004 study area). If it is assumed that areas outside BPL will have been converted to rice (as suggested by satellite imagery) this represents a decline in wetland area of approximately 35%.

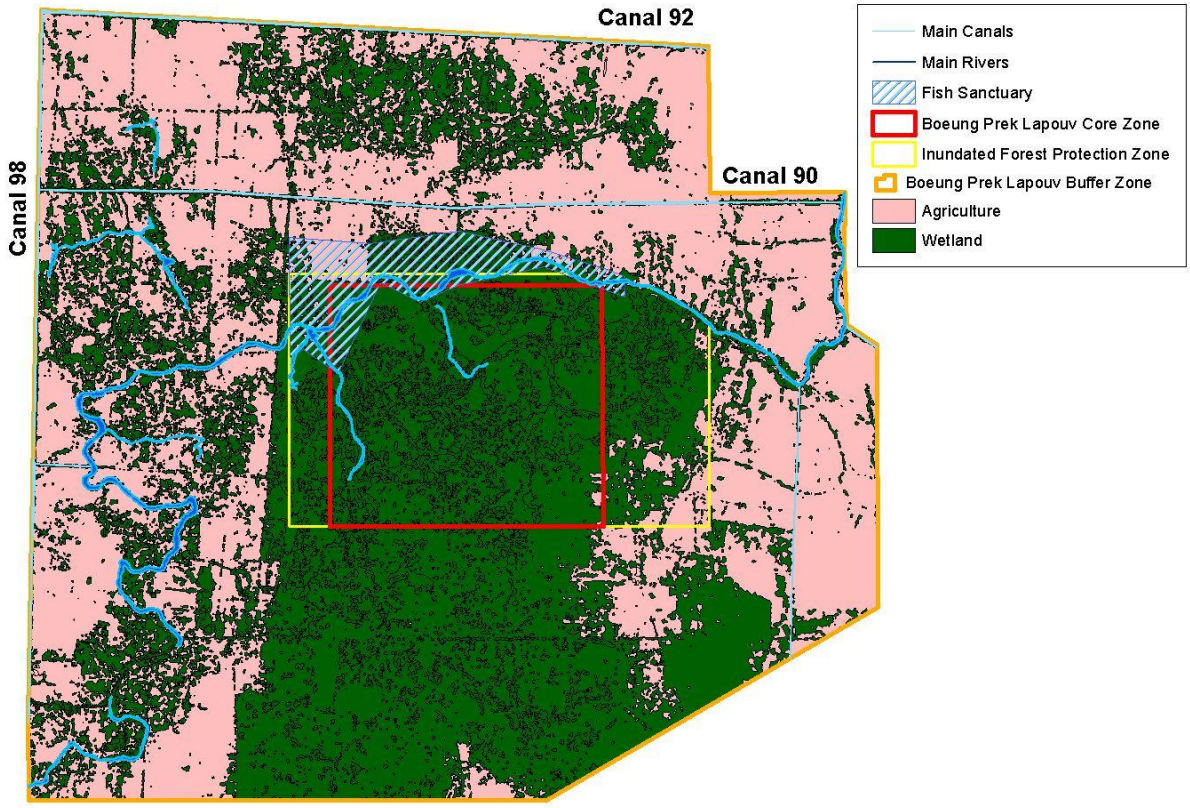


Figure 8. Map of agricultural and wetland areas in January 2011

As can be seen in figure 8 wetland conversion for agriculture has spread in to the inundated forest protection zone and part of the area designated as a fish sanctuary was already converted to ricefields by January 2011. Even the core zone is not free from attempts to convert land and in late 2010 people expanded their farming activities in to the core zone. This was disallowed by authorities, but nevertheless people keep attempting to use the land. This indicates the current pressure there is to convert land throughout the protected area.

3.3.5. Ecosystem services (food and fuel provisioning) assessment at BPL[9]

3.3.5.1. Methodology used in the assessment

A rapid assessment with local stakeholders of ecosystem services provided by BPL and factors impacting the provision of services was conducted in January 2012. The rapid assessment identified food and fuel provisioning services as the main ecosystem service utilised by people. A detailed assessment of these services provided by BPL was then conducted in February 2012 with 428 households interviewed (10% sample size) from 19 villages in and around BPL to allow calculation of the net annual value derived from harvesting "wild goods" (fish and other wetland based products) as well as the net annual value of rice

[9] This chapter presents results from an ecosystem service assessment conducted by WWT and CCK (van Zalinge *et al.* 2013)

cultivation. Detailed information was collected on amount of the various products harvested in a year, average price obtained and total cost incurred in the process of harvesting. Net annual value (income minus cost) was then calculated for each specific product harvested.

3.3.5.2. BPL values for food and fuel provisioning services

Figure 9, below, shows that wild goods make up 74% ($1,601,799) of a total net annual value (NAV) for all food provisioning services derived from BPL calculated at $2,168,019. Fish alone represents half the value of all wild goods together at $1,096,107 per year. This calculation is based solely on surveyed villages (table 3). It does not include value derived by people of Vietnamese origin or other villages surrounding BPL that may derive food provisioning services from BPL. Also, during the time of survey the fishing lot had only recently been suspended and local communities were at that time not yet permitted access to the fishing lot in the dry season. So, the total fish harvested by local people during time of survey is likely to have been less than it will be in future, especially under more sustainable management.

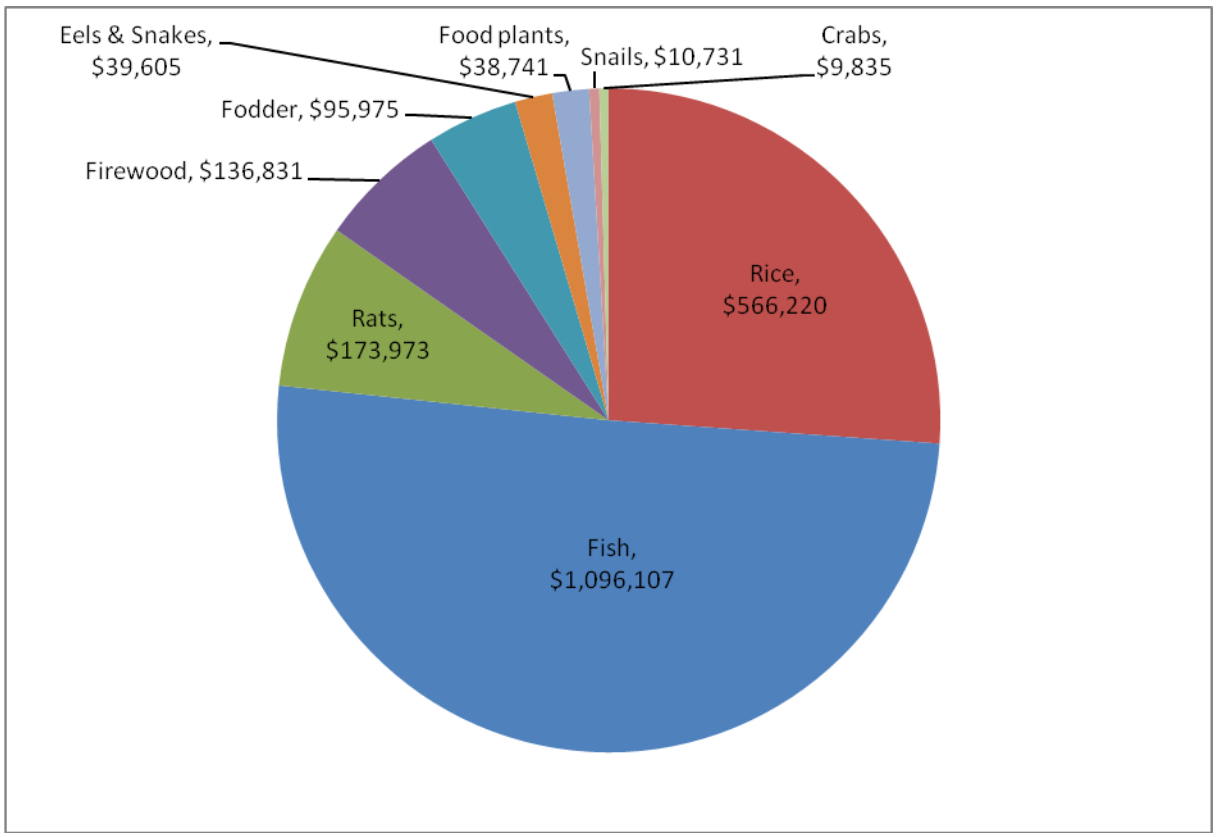


Figure 9. Total net annual values of different products harvested from BPL . Rice is the only cultivated good, the rest are wild goods collected from non-cultivated areas (*i.e.* wetland areas in BPL).

3.3.5.3. Forecast for food and fuel provisioning services in ten years time in BPL (given current trends)

The rapid assessment carried out at the beginning of the study included an assessment of threats and and attempted to predict the state of BPL in ten years time if current trends continue. Based on these results, a second study area (the alternative state referred to earlier) was chosen in the same floodplain as BPL is in (figure 11), but where rice fields occupied seventy percent of the area as opposed to less than half as is currently the case in BPL. The same household questionnaire survey was repeated for this alternative state to determine the NAV of all food provisioning services at this location.

Comparing per hectare values of cultivated and non-cultivated goods derived from the two areas shows that while per hectare values of cultivated land in BPL and the alternative state are similar, the per hectare value of remaining wetland areas in the alternate state is significantly lower (figure 10, below). Households attempting to collect goods (e.g. fish) from the alternative state may even be doing so at a negative NAV, i.e. the amount of product they harvest is so low that it does not make economic sense to continue collecting natural resources from the wetland in the alternative state, yet as these are important sources of nutrition they continue to do so.

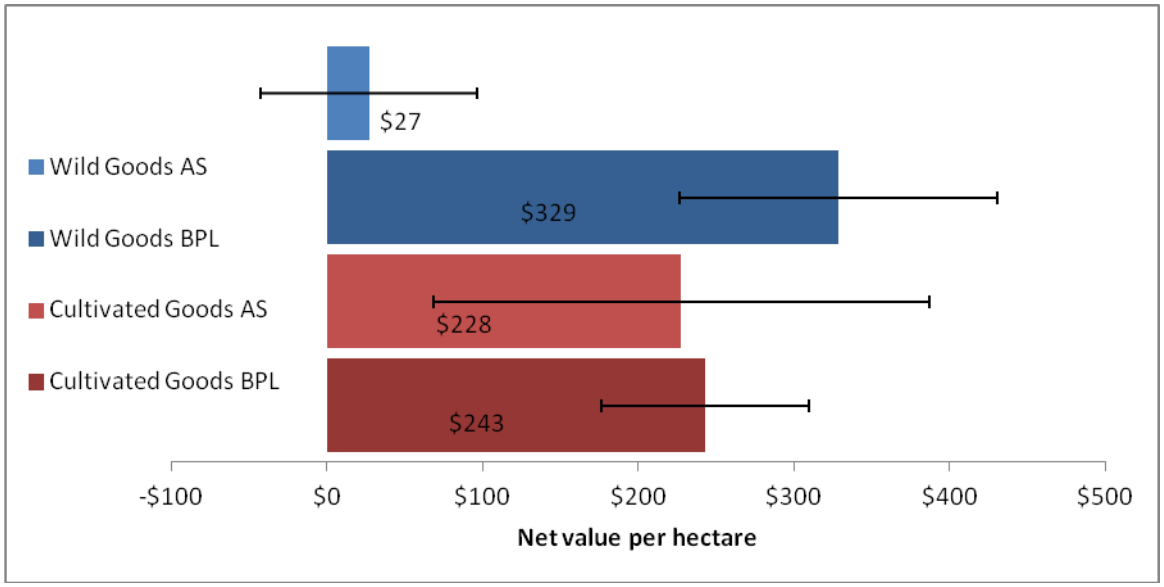


Figure 10. comparison of wetland and farmland average net annual values per hectare for BPL and the alternative state

The figure clearly shows that the wetlands in BPL are a very important source of food and fuel to local households and if BPL is allowed to become like the alternative state, wetlands will degrade and eventually lose their value, impoverishing local households that are dependent on the area.

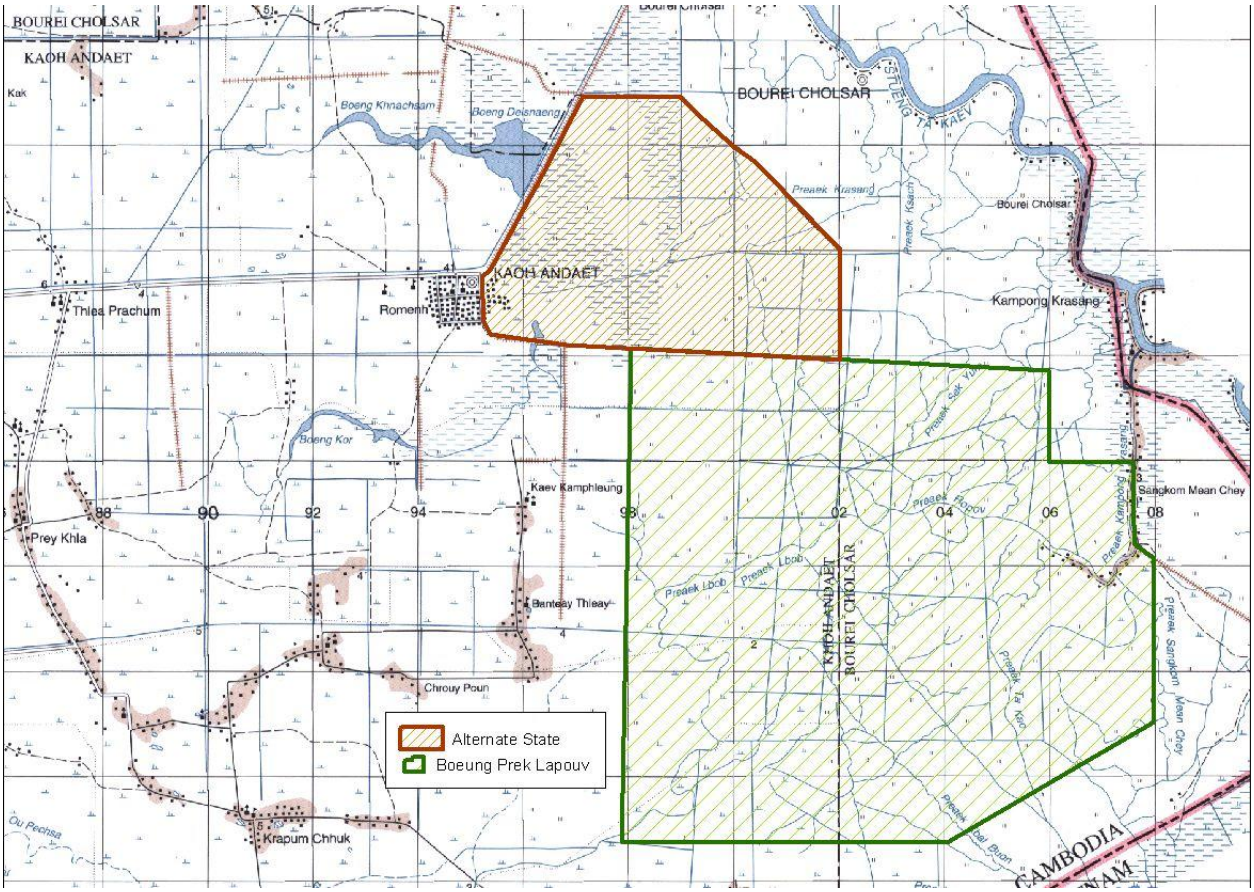


Figure 11. Location of alternative state used to compare food and fuel provisioning service values with those of BPL

3.3.5.4. Sustainability

No thorough assessment of the sustainability of resource harvesting has as yet been conducted. However, it is intended that, as part of future development of the Community Fishery (chapter 3.3.6.), an assessment will be made of the sustainability of the current fish harvest and an annual sustainable yield recommended. In the PRA (Pech Bunna *et al.* 2013) and rapid appraisal component of the ecosystem services study (van Zalinge *et al*. 2013) stakeholders spoke of declining fish stocks and concerns about the degradation of BPL fisheries due to unsustainable harvesting practices.

3.3.5.5. Other ecosystem services

Although the above mentioned ecosystem services were identified as the most significant ones in terms of supporting local livelihoods, other services not measured include climate regulation services, carbon storage, water storage and water provisioning.

3.3.6. Community fisheries

Under a project agreement between CCK and the Community Fisheries Development Department of the Fisheries Administration community fisheries (CFis)are being established in Boeung Prek Lapouv (with funding from CEPF up to October 2013). Two community fisheries are being established in BPL, divided

between the two districts: Koh Andet and Borei Chulsa. The proposed CFi in Borei Chulsa (named Kampong Krasang CFi in figure 12) also includes an area north of BPL. The rationale for establishment of the CFis stems from the recent cancellation of economic fishing concessions in Cambodia including within BPL. This presented an opportunity to establish a local structure for managing the wild fishery more sustainably and equitably in line with government advice and regulations.

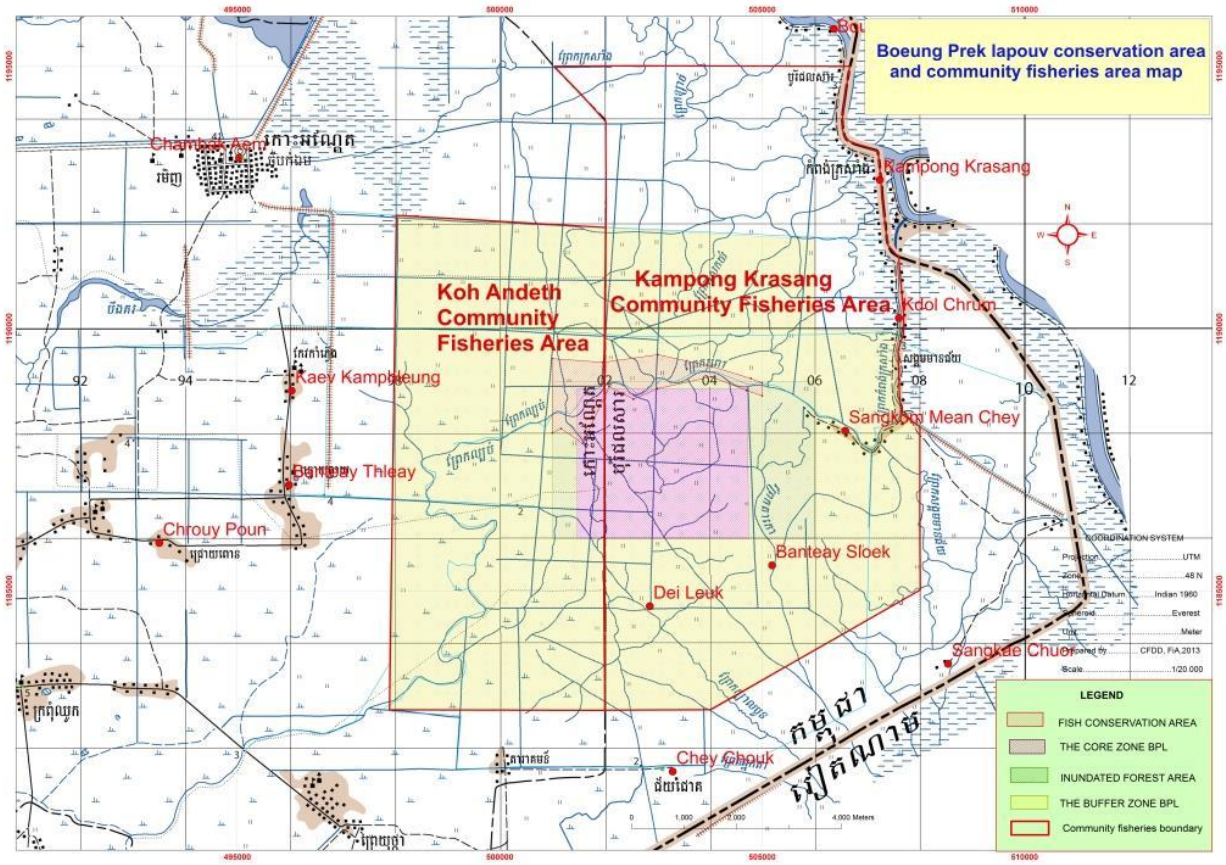


Figure 12. Proposed community fisheries areas overlapping with BPL (note the Kampong Krasang CFi extends north of the reserve). Source: Pech Bunna *et al.* 2013.

The following villages will be included in the two CFi's (Pech Bunna *et al*. 2013):

1. For the proposed Kampong Krasang CFi: Borei Chulsa, Kampong Krasang, Kdol Chrum, Sangkae Chour, Sangkum Meanchey, Kouk Pancha, Chey Chouk, Tarakum, Dei Leuk and Banteay Sleuk
2. For the proposed Koh Andet CFi: Kaev Kamphleung, Banteay Thleay, Chambak Em, Samrong, Daem Kroch, Chrouy Pon and Trapeang Tonle

It is hoped that the process of legally designating these two CFis will be completed before the start of this plan period. However, if not, this will be achieved in the early stages of the plan.

3.3.7. Ecotourism

A feasibility study conducted in 2004 (Bauld 2005) concluded there was potential for community-based ecotourism at BPL. A combination of birdwatching, boat trips, homestays and community-based

activities could be introduced at BPL, however no ecotourism project has been initiated to date. BPL is only a few hours from Phnom Penh and travelling times are likely to be greatly reduced as roads are gradually improved. A visit to BPL can already be made as a day trip from Phnom Penh.

4. Evaluation

4.1. Conservation Features

As BPL supports the livelihoods of many people (three thousand households as a very conservative estimate), managing the reserve so that people continue to benefit from it is critical. Without doing so, management interventions to conserve species and habitats are likely to fail.

The over-arching ethos of this management plan is therefore to work in a participatory manner with local people, the government and all other stakeholders to plan for and establish sustainable natural resource management practices that secure the future of the wetland for its people and wildlife.

For BPL, the main conservation features are considered to be:

1. **Sarus Crane populations in non-breeding season**: this is a key priority for management as BPL is one of the main feeding sites for this species in the country and maintaining the site's importance for Sarus Crane was the primary motivation behind establishing BPL as a protected area.
2. **Water bird assemblage:** the site supports many species of waterbirds including small numbers of at least four other threatened species. Data on species and populations are lacking but it is clear that BPL is important for this community.
3. **Wider wetland biodiversity**: it is very likely that BPL is important for many other as yet un-recorded wetland species apart from birds but data on this are lacking. Moreover, the livelihoods of many thousands of people are critically underpinned by BPL and the benefits they derive from it *e.g.* harvesting of wild goods such as fish and plants. Protecting and enhancing the provision of these wetland benefits will mean that BPL will continue to have relevance and meaning for local people's lives and this in turn, will greatly assist in the conservation of cranes and wider wetland biodiversity.

4.2. Factors

A factor is anything that has the potential to influence or change any of the above main conservation features, or the way in which the feature is managed (Alexander 2010). Table 4 below shows the factors that were identified through a series of stakeholder consultations. Management interventions will largely target these factors in order to produce favourable conservation outcomes.

Table 4. List of key factors affecting conservation features at BPL

Type of factors	Factor	Description of influence of factor on features	Process of identification of factor	Impact (scores given[6, 7, 8])
Internal anthro-pogenic factors	Illegal fishing	Decline in fish population over time will lead to impacts on local people and bird community	1. Rapid Appraisal[10] 2. Community[11] 3. Provincial[12] 4. PRA[13]	1. 7.5/9 (high) 2. 2/2 groups 3. Top 5
	Over-harvesting	Decline in natural resources over time will impact on livelihoods of local people	1. Rapid Appraisal 4. PRA	Not scored
	Wetland conversion (for agriculture)	Decline in wetland extent, ability to support cranes, biodiversity and changes provision of ecosystem services	1. Rapid Appraisal 2. Community 3. Provincial 4. PRA	1. 6/9 2. 2/2 groups 3. Top 5
	Water pollution	Increasing use of chemicals in agriculture causes decline in biodiversity and other ecosystem services	1. Rapid Appraisal 2. Community 3. Provincial	1. 6.5/9 2. 2/2 groups 3. Top 5
	Lack of water in dry season	Manmade drainage channels plus crop irrigation results in very low water levels leading to decline in crane use of BPL, biodiversity and ecosystem goods and services	1. Rapid Appraisal 2. Community 3. Provincial 4. PRA	1. 9/9 2. 1/2 groups 3. Top 5
	Hunting	Direct reduction in wildlife populations	1. Rapid Appraisal 2. Community 4. PRA	1. 3.5/9 2. 2/2 groups
Internal natural factors	Invasive non-native species (esp. *Mimosa pigra*)	Reduces biodiversity and alters provision of ecosystem services	1. Rapid Appraisal 3. Provincial	1. 5/9 3. Top 5
	Vegetation change	Use of BPL by cranes, wider biodiversity can be affected	Expert opinion	

[10] A rapid appraisal of threats was undertaken in the January 2012 ecosystem service assessment and the average score is taken from two groups, government and civil. Nine is the highest possible score and zero the lowest.
[11] A community management plan consultation session was held in March 2013. Two equal sized groups were consulted.
[12] A provincial management plan consultation session was held with government staff in March 2013. During the meeting there was a plenary discussion of all threats followed by a listing of the top five.
[13] PRA was conducted by staff from FiA's Department of Community Fisheries Development in March 2013 (Pech Bunna *et al*. 2013)

4.3. Management issues identified by stakeholders

During the same stakeholder consultations a number of management issues were mentioned that need to be considered whilst delivering this plan.

Table 5. List of management issues identified by stakeholders

Issue	Description	Source
Cross-border movements of people	Large numbers of people come from Vietnam to farm and collect natural resources, leading to illegal land encroachment and unsustainable use of BPL	Rapid Appraisal, Community, Provincial, PRA
Wetland in buffer zone is inadequately protected by existing regulations	Weak protection and confusion about legal status of wetlands in buffer zone leads to wetland conversion and degradation	PRA
Poor awareness of wetland boundaries	Ineffective wetland demarcation increases risk of wetland conversion and breaking of regulations	Provincial, PRA
Lack of land entitlement for local people	Lack of land rights reduces possibilities for sustainable management activities to be instigated	Provincial
Lack of community participation in reserve management	Limited involvement of communities in decision-making and management processes at BPL reduces likelihood of instigating successful sustainable management activities	Provincial, PRA
Need to improve communication links between government agencies	Limited communication between government agencies working in BPL has the potential to result in policies and plans being initiated that are contrary to the long-term sustainable management of reserve	Provincial, PRA
Limited control over levels of resource harvesting	Open, unlimited access of wetland is considered unsustainable, impacting on biodiversity, equitable distribution of ecosystem services and long-term ability of BPL to support livelihoods	PRA
Illegal harvesting	On occasions, people resort to illegal hunting and gathering often because they lack other means to support themselves. This results in reduction in populations of protected species, other species	Provincial, PRA
Inability to manipulate water levels	Lack of infrastructure to manage water levels appropriately leading to highly variable hydrological conditions that can be unsuitable for cranes, other biodiversity	Provincial, PRA
Limited human and financial resources to undertake management activities	Insufficient resources to undertake all necessary activities jeopardises ability to achieve aims and objectives of the management plan	Provincial, PRA

4.4. Interim twenty-year vision

During the workshops attended by local community members and government officials, exercises were undertaken to try to establish a common vision for BPL which stakeholders could agree upon and then work together to achieve. Whilst this plan is only for the first five years of that period, it represents the first step on the way to realising that vision. As a result of the suggestions, comments and views expressed in the workshop exercises, the following statement is proposed as an interim 20 year vision for BPL:

"A healthy wetland rich in biodiversity including many Sarus Crane, managed sustainably by local communities to support their livelihoods as well as wildlife"

Whilst this interim statement is useful in providing an end-point to aim for, it is intended that partners and stakeholders should agree a more detailed vision statement in the early part of this management planning period. However, the vision as it is provides a focus for management and it is with this in mind that the following management aims and objectives are presented.

4.5. Management plan aims and objectives

Key aims:

- **To increase the use of BPL by Sarus Cranes by appropriate management of hydrology and habitats**
- **To manage, maintain and enhance wetland biodiversity in BPL to support human livelihoods**

Meeting these key aims will underpin the delivery of the government sub-decree of 2007.

Objective 1:
Sarus Cranes will have increased their use of BPL by 2018 because appropriate grassland and hydrological management regimes have been identified and implemented

Rationale: BPL was designated because of its importance as a feeding site for Sarus Cranes in the non-breeding season. Number of cranes is of course important, but so too is their distribution across BPL and duration of their use of BPL which depends on the amount and quality of grassland and wetland habitats. This means that managing such habitats (especially *eleocharis* grasslands and aquatic habitats for *nymphea)* and monitoring the effect of this will be fundamental to success. Sarus Cranes are also affected by external factors so, in judging success, it will be important to consider the numbers of cranes using the site in the context of regional population dynamics.

Performance indicators:
i) Soil penetrability in key *eleocharis* grassland areas is suitable for feeding cranes until the end of March for the final two years of the plan (2017-2018)
iii) The extent of *eleocharis* grasslands has increased by 10% by 2018
iv) The extent of aquatic habitats supporting *nymphea* has increased by 10% by 2018

v) The total number of cranes that uses BPL (based on annual maximum counts) will on average have increased by at least 10% and the increase in numbers will be greater than any change (positive or negative) in the Sarus Crane population (based on results of annual regional counts conducted in late March/early April) for the years 2014-2018 in comparison to the average for 2004-2013.
vi) Any year-on-year declines based on the indicator above will not be more than 20% between consecutive years after 2016
vii) Average number of days per year that cranes are present at BPL will have increased by at least 10% for the years 2014-2018 in comparison to the average for 2004-2013

Objective 2:
Wetland resources that support human livelihoods are maintained and enhanced in the reserve as a result of more sustainable management for the benefit of people and wildlife.

Rationale: The successful conservation of BPL and its biological richness depends to a large extent on the ability of the reserve to provide ecosystem goods and services for local people. If livelihood activities are unsustainable then overall ecosystem health will decline with an associated reduction in benefits to local people. Managing existing activities and developing alternative ones to put in place more sustainable approaches will require the full participation of local people and, in the long-term, for them to be involved in the co-management of these activities alongside the government.

Performance indicators*:
i) Local communities actively co-managing CFi, CBET and sustainable farming initiatives by 2018
ii) Overall monetary value of food provisioning ecosystem services (wild harvested goods such as fish and plants) increased by 5% by 2018 (compared with 2012 values and taking into account price inflation)
iii) Populations of key indicator species (see objective 3) are maintained or enhanced by end of plan compared with 2016
iv) Percentage of local population expressing the desire to conserve BPL as a natural wetland increased by 25% between start and end of management plan period
v) Current extent of wetland habitat maintained

*these performance indicators will be reviewed throughout the duration of the plan as and when new data become available, particularly with regards to fishery yields and biodiversity .

Objective 3:

Wider biodiversity (including the waterbird assemblage) at BPL will be better understood and indicator species identified to permit long-term monitoring of ecosystem health

Rationale: current knowledge of the state of biodiversity at BPL (except for Sarus cranes) is poor. However, understanding the status of wider biodiversity at the site is important for many reasons, but it is especially important as an indicator of a healthy, functioning wetland (which in turn indicates that it is able to support human livelihoods). Identifying species or communities of species that can give an early

warning of threats to wetland biodiversity and allow timely interventions is therefore key to biodiversity conservation.

Performance indicators:

i) Baseline surveys conducted for fish, birds, mammals, invertebrates and plants by 2017
ii) Suitable “early-warning” indicator species or communities selected by 2016
iii) Annual monitoring plan produced and being implemented
iv) Report detailing status of biodiversity at BPL produced by 2018

Boeung Prek Lapouv management plan

Jan 2014 – December 2018:

Part 2: Action Plan and Projects

5. Co-deliverers

A partnership between the FA, various government agencies, NGOs and community groups is necessary to achieve the aims of the management plan. Current and future partners are listed below along with their roles, although other partners may be involved during the course of implementing the management plan.

Government partners

Forestry Administration (FA): responsible for overall management of BPL. Within FA the Department of Wildlife & Biodiversity oversees daily management activities in BPL working with the Takeo Forestry Administration Division in handling any legal issues that need resolution. and responsible for enforcing the Forestry Law and Wildlife Law.

Fisheries Administration (FiA): responsible for the management of all fishing activities and protection of fish habitat. Responsible for enforcing the Fisheries Law. Also responsible for establishing and supporting community fisheries. Main branches of FiA involved in BPL are the Takeo Fisheries Administration Cantonment comprising Sangkat Sek Yum and Sangkat Koh Andet, as well as the Community Fisheries Development Department.

Takeo provincial line agencies such as Department of Water Resources & Meteorology, Department of Agriculture, Department of Land Management, Department of Rural Development and Department of Tourism will also be partners in implementing the management plan.

Takeo administrative authorities, such as provincial, district, commune and village authorities will also be regularly involved during the implementation of the plan and will be invited to attend meetings, including those of the inter-agency advisory panel.

Collaborative law enforcement agencies such as commune level policemen and border army personnel with bases near to BPL will regularly be involved as part of the re-formed LCG (first formed in 2003) for the reserve which will deliver most law enforcement activities including regular patrols. This group consists of forestry, fisheries and other law enforcement personnel.

Non-governmental partners

The local communities in and around BPL represent an important stake-holding group and will be integral in co-delivering most if not all planned activities. As such, facilitating their early participation in planning and designing activities will be crucial to the success of the plan.

Wildfowl & Wetlands Trust (WWT): UK based conservation organisation specialised in wetland management and species recovery programmes. Started work in BPL in October 2010 and principle authors of this management plan. WWT will lead delivery of biodiversity and capacity-building activities (this latter one with CCK) as well as provide expert advice on wetland management if financial resources are secured to fund the plan.

BirdLife International Cambodia Programme (BL): UK based conservation organisation specialised in birds. Started work in BPL in 2003. Maintains a regional office in Hanoi and Cambodia programme office in Phnom Penh.

Chamroen Chiet Khmer (CCK): Cambodian NGO based in Koh Andet district. Focus is on rural development, including natural resource management. Collaborating with BL and later WWT on project activities in BPL since 2009.

Community Fisheries (CFi's): Two community fisheries with representation of key villages in and around BPL will be formed during the management plan and become important partners in conserving BPL.

Community-based Ecotourism Group (CBETG): A CBETG is proposed to be formed during the management plan period with representation of people from various villages.

Other partners not yet confirmed will be an agricultural NGO, universities and external facilitators to assist with the participatory planning processes required to foster widespread support for the plan

5.1. Summary of human resource requirements

Delivery of the plans and projects detailed within the plan will require both human and financial resources. It is envisaged that many of the activities will be co-delivered by partner organisations together with wetland user communities (as described above). However, there will need to be a core team of staff employed throughout the duration of the plan to co-ordinate and steer management efforts and to ensure that all stakeholders are aware of their responsibilities and how they can participate effectively in delivering success.

As a minimum, delivering the plan will require an officer seconded from the Forestry Administration together with two more staff employed by a lead NGO, probably WWT (one based with FA officer in Phnom Penh and another based full-time at BPL). This team should not only perform a co-ordination role and steer delivery but also provide necessary technical inputs in particular with regards to sustainable wetland management. Sometimes, it will be necessary to employ external consultants for brief periods to perform discrete tasks, especially to facilitate participatory planning events. These instances are identified in the activities plan. Also, there is a requirement to continue with law enforcement activities performed up to now by the Local Conservation Group. Although this group is likely to be reformed somewhat, it is an essential part of plan delivery.

The role that wetland users will play is an important one too. The wetland supports the livelihoods of many thousands of people and so their knowledge and needs are crucial in making management interventions work. Building their capacity to participate in delivering sustainable wetland management is fundamental to success and this is acknowledged in the planned activities. The plan makes clear that for the future the only sustainable situation is likely to be one where wetland users are co-managing the reserve (especially through the CBET and CFis) with FA and others.

Therefore, before any of the following management tasks can be undertaken, project team members will need to be recruited and trained as the first step in delivering the plan.

Advisory and liaison panels

An inter-agency advisory panel will be established to provide a forum for government departments and BPL representatives to exchange ideas, update on policy and strategy developments affecting the reserve as well as to give legal and technical advice to a second panel, the BPL liaison panel.

The inter-agency advisory panel will include FA, other government departments and provincial line agencies within Takeo, administrative authorities from Takeo, BL, WWT, CCK and selected representatives from BPL projects

The BPL liaison panel will consist of wetland users, project representatives (*e.g.* from CBET and CFi), BL, WWT, CCK and the FA. Here, panel members will update colleagues on project progress, identify issues, propose solutions and otherwise liaise about management plan activities. Where required, this panel may ask for support and advice from the advisory panel.

Both panels will be constituted within the first 3 months of the plan commencing and will meet quarterly and circulate minutes of meetings to each other. FA will provide the link between the two panels together with WWT and BL.

Financial requirements

In order to deliver the aims of the plan, adequate funding will need to be secured; without money, very little can be achieved. Co-deliverers and partners should endeavour to identify opportunities for funding the plan and wherever possible seek to commit funds from their own resources. The principle authors of this plan, WWT, commits to raising funds to enable the plan delivery to commence on time and it looks to other partners to do the same.

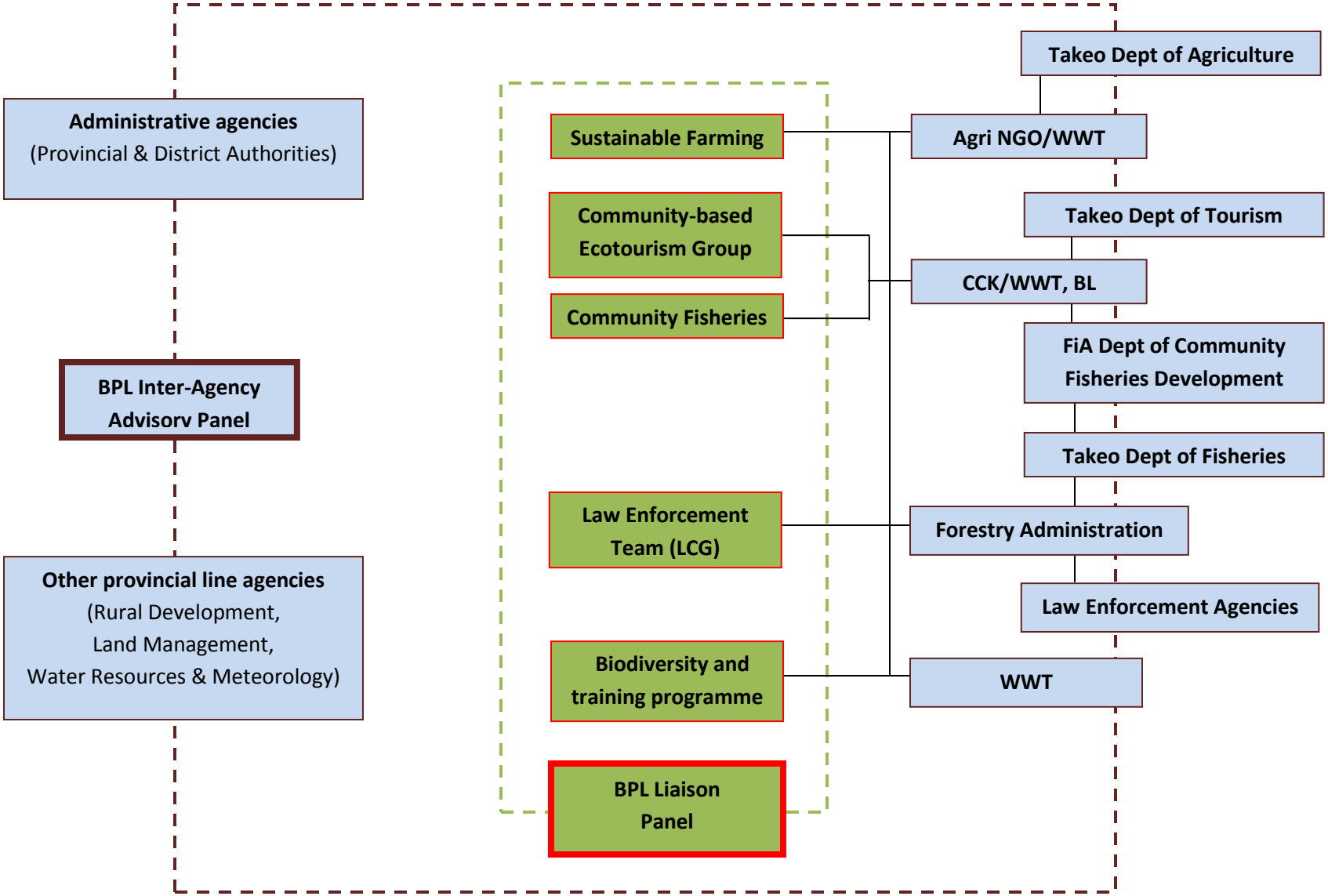


Figure 13. Proposed organisational linkages between partners (solid lines) and other agencies. Dashed lines indicate a grouping level (BPL liaison panel, BPL inter-agency advisory panel).

6. Action Plan

In order to achieve the objectives of the plan, a number of activities have been formulated that, if undertaken as described below will ensure success. These activities are grouped under projects, facilitating fundraising and clarifying stakeholder involved in implementation of the plan. Where co-deliverers are identified, these will include the partner likely to lead on co-ordination of the activity as well as being the organisation with the main responsibility for delivery. The total budget needed to implement all activities is approximately US$500,000

6.1. Sustainable Agriculture Project

Project plan

Purpose: To demonstrate to farmers how to produce rice (and/or other products) with minimal inputs whilst protecting soil and water quality, human health and enhancing biodiversity

Table 6- Activities to be implemented under the sustainable agriculture project

Activity	Y1	Y2	Y3	Y4	Y5	Co-deliverers	Means of verification
1. Design trial low-input/high biodiversity rice production with local farmers and implement in trial buffer zone plots	*	*				Agriculture NGO, Takeo Agriculture Dept. (TAD), WWT, FA	Quarterly progress reports
2. Report on trial and make recommendations for wider application of sustainable farming system		*				Agriculture NGO, TAD, WWT, FA	Final report
3. Rollout sustainable farming system to further demonstration plots as appropriate			*	*	*	Agriculture NGO, TAD, WWT, FA	Quarterly progress reports
4. Design and deliver awareness-raising programme (including safe and targeted use of chemicals, protecting wetland resources, enhancing biodiversity)	*	*	*	*	*	Agriculture NGO, TAD, WWT, FA	Final report
5. Project rep(s) to attend and provide reports at quarterly BPL liaison panel meetings	*	*	*	*	*		Meeting minutes

Table 6.1- Approximate budget for sustainable agriculture activities listed above that require separate funding

Activity	Cost/yr ($)	Total ($)
1. Design and trial sustainable farming	10,000	20,000
3. Rollout sustainable farming system	10,000	30,000
4. Design and deliver awareness raising programme	1,000	5,000
	Total ($)	55,000

6.2. Community Fisheries and natural resource management Project

Project plan

Purpose: To develop the newly-established community fisheries in BPL as models of sustainable NRM so that they protect and enhance the wild fishery at BPL and support livelihoods of CFi members. CFi's will also be used to demonstrate sustainable fishery management to other audiences. Given that the new CFi's are more or less equivalent in size and location to the BPL reserve, it makes sense also to work with its members to develop a wider capacity for the sustainable management of the wetland as a whole so that co-management of the wetland can become a reality.

Table 7. Activities to be implemented under the community fisheries project

Activity	Y1	Y2	Y3	Y4	Y5	Co-deliverers	Means of verification
1. Complete the legal establishment (if not yet completed) of two community fisheries (CFi's), one in Koh Andet district and one in Kampong Krasang district	*					FiA, CCK to lead, with collaboration of FA, WWT	Two CFi's officially approved by MAFF
2. Undertake assessment of fishery health within new CFis and make proposals for interim annual sustainable harvests (fish)	*	*				FiA, CFI, Consultant, Universities, WWT, FA	Final report
3. Agree interim annual sustainable harvest		*				CFi's, FiA, WWT, CCK, FA	Signed agreement
4. Produce CFi management plans	*	*				CFi, FiA, WWT	Plans produced
5. Identify priority natural resources collected from BPL and undertake sustainability assessment of current yields & practices	*	*	*			Wetland users, CFis, Consultant, Universities, WWT, FA	Final report
6. With stakeholders, propose and agree a framework for annual sustainable harvests of priority natural resources and then implement and monitor				*	*	FA, FiA, WWT CFi. other wetland users and CCK, WWT, TAD,	Framework agreement signed by all stakeholders, annual returns provided by members
7. Design and deliver capacity-building programme for CFi (to include training for monitoring of resource use, wetland management etc)	*	*	*	*	*	CCK, WWT, CFi, FA	Training programme delivered, numbers of attendees, production of reports
8. Develop mechanisms for funding future CFi activities contained within CFi mgmt plans.	*	*				CCK, FiA, CFi, FA	CFi quarterly reports
9. Ensure BPL regulations are included in the CFi regulations and	*					CCK, FiA to lead in collaboration	CFi regulations

Activity	Y1	Y2	Y3	Y4	Y5	Co-deliverers	Means of verification
management plans						with FA, WWT/BL	
10. Project rep(s) to attend and provide reports at quarterly BPL liaison panel meetings	*	*	*	*	*		Meeting minutes
11. Establish a CFi office and information points	*	*				CCK, WWT/BL, FiA, CFi's	Field check & maps

Table 7.1-Approximate budget for community fisheries activities listed above that require separate funding

Activity	Cost/yr ($)	Total ($)
1. Complete establishment of two community fisheries (CFi's) covering BPL	10,000	10,000
2. Fisheries assessment study	10,000	20,000
5. Assess sustainability of collection of natural resources	10,000	30,000
6. Propose and agree sustainable harvest framework	1,000	1,000
7. Deliver capacity-building programme	1,000	5,000
11. Establish CFi offices/meeting/ information points	5,000	10,000
	Total ($)	76,000

6.3. Community-based Ecotourism Project

Project plan

Purpose: To establish community-based ecotourism in BPL to provide a sustainable income source and employment opportunity and increase capacity of local communities to conserve BPL. This initiative will be based on a participatory planning process that includes all stakeholders to develop widespread support for and long-term commitment to sustainable eco-tourism in the reserve.

Table 8- Activities to be implemented under the community-based ecotourism project

Activity	Y1	Y2	Y3	Y4	Y5	Co-deliverers	Means of verification
1. Undertake market analysis of potential for CBET at BPL to assess if this is a viable proposition. Make recommendations for action	*					FA, Takeo Tourism Dept, CBET consultant, WWT, CCK	Report
2. Develop and agree strategy for CBET in BPL in consultation with local communities including marketing and promotion plan	*	*				WWT, CCK, CBET adviser and facilitator, FA, Takeo Tourism Dept., local communities	Final strategic document
3. Establish community-based ecotourism group (CBETG)	*					FA, CCK, CBET adviser and	Official approval at provincial level

Activity	Y1	Y2	Y3	Y4	Y5	Co-deliverers	Means of verification
						facilitator, WWT, Takeo Tourism Dept.	
4. Prepare CBETG regulations, incl. pricing for service provision and revenue-sharing policy between CBETG and CFi's		*				FA, CCK, CBET adviser and facilitator, CBETG, CFi's, WWT	CBETG regulations
5.Undertake marketing and promotion activities		*	*	*	*	FA, CBETG, Takeo Tourist Dept, WWT	
6. Design and deliver training and awareness programme for CBETG	*	*	*	*	*	FA, CBET consultant, CCK, WWT	Training reports
7. Construct tourism infrastructure as recommended in CBET strategy		*	*	*		CCK, WWT, FA	Field check & map
8. Purchase equipment as required by CBET strategy		*	*	*		FA, CCK, WWT	Receipts, inventory
8. Project rep(s) to attend and provide reports at quarterly BPL liaison panel meetings	*	*	*	*	*		Meeting minutes

Table 8.1- Approximate budget for community-based ecotourism activities listed above that require separate funding

Activity	Cost/yr ($)	Total ($)
1. Undertake market analysis of CBET at BPL	10,000	10,000
2. Develop plan for community-based ecotourism	2,000	2,000
3. Establish community-based ecotourism group (CBETG)	1,000	1,000
5. Marketing and promotion	2,000	8,000
6. Training programme for community-based ecotourism group	1,000	5,000
7. Construct tourism infrastructure	50,000	50,000
8. Purchase equipment	5,000	5,000
	Total ($)	81,000

6.4. Biodiversity and water management project

Project plan

Purpose: To increase crane use of BPL and enhance wider biodiversity through conservation management of habitats and hydrology.

Table 9- Activities to be implemented under the biodiversity management project

Activity	Y1	Y2	Y3	Y4	Y5	Co-deliverers	Means of verification
1. Undertake condition assessment of quality/quantity of crane feeding habitat	*				*	FA, WWT, universities,	Report produced in years 1 and 5
2. Measure elevation throughout reserve	*					FA, Independent contractor, Takeo Dept. of Water Res.	Detailed elevation map
3. Design habitat management trials in buffer zone to assess feasibility of/requirement for enhancing grassland and aquatic habitats important to cranes throughout BPL	*					FA, WWT, Takeo Water Dept, CCK, consultant	Report with recommendations
4. Construct infrastructure/purchase equipment for trials as required		*				WWT/BL, FA, Contractor	Field check & map
5. Conduct trials as agreed and recommended.		*	*	*	*	FA, WWT, CFis, CCK	BMRs
6. Use BPL liaison panel and other community forums to raise awareness of proposals/activities, allow participation in decision-making, report on progress	*	*	*	*	*	FA, WWT, CCK	Meeting minutes, training events
7. Undertake monitoring as recommended in trial report		*	*	*	*	WWT, CFis, FA	Monitoring reports
8. Prepare report on habitat trial with recommendations for future action					*	WWT/BL, , FA	Final report on habitat trial
9. Disseminate report findings to all stakeholders					*	WWT, FA	Stakeholders receive reports
10. Prepare invasive non-native species (INNS) management plan		*				WWT, FA	Plan produced
11. Implement INNS plan		*	*	*	*	WWT, FA plus local labour	Field check, quarterly and annual report
12. Prepare survey and monitoring protocol	*					WWT, FA	Report
13. Conduct biodiversity survey and monitoring as per protocol and	*	*	*	*	*	FA, WWT, Consultants,	Reports

Activity	Y1	Y2	Y3	Y4	Y5	Co-deliverers	Means of verification
produce reports						Universities	
14. Conduct research on ecology of Sarus Cranes and BPL biodiversity	*	*	*			FA, WWT, Universities	Study reports, scientific publications
15. Repeat ecosystem service assessment undertaken in 2012 by WWT and produce/disseminate report					*	FA, WWT, CCK	Final report
16. Project rep(s) to attend and provide reports at quarterly BPL liaison panel meetings	*	*	*	*	*		Meeting minutes, reports

Table 9.1- Approximate budget for biodiversity management activities listed above that require separate funding

Activity	Cost/yr ($)	Total ($)
1. Undertake condition assessment of quality/quantity of crane feeding habitat	3,000	6,000
2. Measure elevation throughout reserve (hire land surveyors)	5,000	5,000
4. Construct infrastructure/purchase other requirements for habitat trials as required	10,000	10,000
7. Undertake monitoring of habitat trials as required	2,000	8,000
11. Implement INNS plan	2,000	10,000
13. Implement survey and monitoring protocol	5,000	25,000
14. Conduct research on ecology of Sarus Cranes and BPL biodiversity	20,000	40,000
15. Repeat ESA	2,500	2,500
	Total ($)	106,500

6.5. Demarcation and land tenure Project

Project plan

Purpose: To assist wetland users in understanding the location of protected zones and habitats and to establish legal rights of tenure and through that to reduce/prevent land encroachment on the remaining wetland. This project will also facilitate more sustainable participation from wetland users if they feel more secure regarding land tenure.

Table 10- Activities to be implemented under the demarcation project

Activity	Y1	Y2	Y3	Y4	Y5	Co-deliverers	Means of verification
1. Provide land titles to local people for agricultural areas & settlements according to existing regulations for the protected areas	*					Land Management Dept with other relevant authorities under direction of FA	Land titling report & map, legal titles granted
2. Prepare plan for additional demarcation and interpretation of reserve and CFi (plus other zones as appropriate)	*					FA, BPL panel, FiA	Plan produced
3. Undertake demarcation and interpretation as recommended in plan	*	*	*			FA & FiA in collaboration with local authorities	Field check & map
4. Raise awareness in local communities of zones, demarcation and regulations		*	*	*	*	WWT, FA & FiA	Monthly summary reports, attendees at meetings
5. Project rep(s) to attend and provide reports at quarterly BPL inter-agency advisory panel meetings	*	*	*	*	*		Meeting minutes

Table 10.1- Approximate budget for demarcation activities listed above that require separate funding

Activity	Cost/yr ($)	Total ($)
1. Provide land titles to local people for agricultural areas & settlements within the reserve	50,000	50,000
3. Implement demarcation and interpretation plan	10,000	30,000
	Total ($)	80,000

6.6. Laws and regulations Project

Project plan

Purpose: To stop/reduce illegal activities, safeguard natural habitats and protected biodiversity and assist in equitable provision of ecosystem services. This will be done through the awareness raising programmes identified here and elsewhere in the plan and by law enforcement patrols. The existing LCG which currently enforces laws and regulations at BPL will be retained but formally re-constituted and will also include at least one member of the local community.

Table 11- Activities to be implemented under the laws and regulations project

Activity	Y1	Y2	Y3	Y4	Y5	Co-deliverers	Means of verification
1. Establish and maintain law enforcement team (i.e. re-constitute LCG)	*	*	*	*	*	FA, local communities	Progress reports
2. Ensure adequate infrastructure, supplies and equipment for law enforcement team	*	*	*	*	*	FA, relevant NGOs	Equipment inventory, expense reports
3. Develop and implement training programme (including training in MIST)	*	*	*	*	*	FA, trainers	Training reports
4. Conduct daily systematic patrols covering all wetland areas on a weekly basis	*	*	*	*	*	Local conservation group	MIST reports
5. Use MIST for data collection and reporting		*	*	*	*	Local conservation group	MIST reports
6. Collaborate delivery of awareness raising activities as required	*	*	*	*	*	LCG, WWT/BL	Awareness raising in summary reports
7. Project rep(s) to attend and provide reports at quarterly BPL liaison panel meetings	*	*	*	*	*		Meeting minutes, quarterly reports

Table 11.1- Approximate budget for activities listed above that require separate funding

Activity	Cost/yr ($)	Total ($)
1. Establish and maintain law enforcement team (salaries, incl. central law enforcement coordinator)	13,000	65,000
2. Ensure adequate infrastructure, supplies and equipment (office & boat maintenance, batteries, replacement of old equipment, *etc.*)	2,500	12,500
3. Training programme	2,000	10,000
4. Conduct daily patrols (fuel)	3,000	15,000
	Total ($)	102,500

6.7 Awareness and capacity building project

Project plan

Purpose: To ensure local communities, FA and other partners and groups are aware of the values and importance of BPL in general and to build capacity to participate in the design and delivery of all planned activities. A specific activity within this project will be to undertake a general scoping assessment of wetland activities at BPL related to risks to human and animal health. This will be important because it will detail for the first time whether current management practices represent a risk and if so, how these can be reduced or mitigated. Underlying the need for this activity is the idea that unwise management of natural resources be harmful to human and in this case, wetland health.

Bespoke training programmes will be delivered for each project but all will be based on the principle of sustainable and wise-use of the wetland.

Table 12- Activities to be implemented under the awareness and capacity building project

Activity	Y1	Y2	Y3	Y4	Y5	Co-deliverers	Means of verification
1. Undertake risk assessment to scope existence (real or potential) of pests/diseases related to human and animal/bird use of BPL identifying examples of good and bad practice (based on Ramsar guidelines)		*				FA, WWT, CCK	Report
2. Disseminate results, recommend actions to reduce/eradicate risks		*	*			FA, WWT, CCK	Partners and stakeholders receive reports
3. Identify all training, capacity-building and awareness raising needs and develop consolidated plan for all such activities (see individual project plans above)	*					WWT, CCK	Plan produced
4. Implement plan	*	*	*	*	*	FA, WWT, CCK	Minutes of meetings and attendance lists
5. Project rep(s) to attend and provide reports at quarterly BPL liaison panel meetings	*	*	*	*	*	FA, WWT, CCK	Meeting minutes

Table 12.1- Approximate budget for activities listed above that require separate funding

Activity	Cost/yr ($)	Total ($)
1. Risk assessment	5,000	5,000
All costs for training and capacity programme are identified elsewhere		
Total		5,000

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Appendices

Appendix 1. List of flora identified in the February 2013 rapid botanical survey

(Le Phat Quoi and Nguyen Huu Thien 2013)

	Family	Scientific name	English name
1	Acanthaceae	*Ruellia tuberosa*	
2	Amaranthaceae	*Alternanthera sessilis*	Sessile joyweed
3	Asteraceae	*Sphaeranthus indicus*	
4		*Blumea lacera*	Blumea
5		*Enydra fluctuans*	Limnophyte
6	Boraginaceae	*Heliotropium indicum*	Indian turnsole
7	Ceratophyllaceae	*Ceratophyllum demersum*	Common hornwurt
8	Commelibaceae	*Commelina bengalensis*	Dayflower
9	Convolvulaceae	*Ipomoea aquatica*	Water spinach
10		*Ipomoea nil*	Binweed
11		*Merremia umbellata*	Vine blossom
12		*Aniseia martinicensis*	White Jacket
13	Cyperaceae	*Cyperus difformis*	Small Flower Umbrella
14		*Cyperus compactus*	
15		*Cyperus rotundus*	Coco grass, Purple nutsedge, Nutgrass
16		*Cyperus digitatus*	
17		*Cyperus elatus*	
18		*Cyperus iria*	Rice flat sedge
19		*Cyperus trialatus*	
20		*Cyperus malaccensis*	
21		*Eleocharis dulcis*	Water chestnut
22		*Fimbristylis microcarya*	
23		*Fimbristylis miliacea*	
24		*Scirpus maritimus*	Alkali
25		*Scirpus grossus*	Giant bulrush
26	Euphorbiaceae	*Phyllanthus reticulatus*	
27	Fabaceae	*Sesbania sesban*	Sesban
28		*Mimosa pigra*	Giant mimosa
29	Menyanthaceae	*Nymphoides indica*	Water snowflake
30	Myrtaceae	*Melaleuca cajuputi*	Melaleuca
31	Nelumbonaceae	*Nelumbo nucifera*	Lotus
32	Nympheaceae	*Nymphaea pubescens*	Water lily
33		*Nymphaea nouchali*	Water lily
34	Onagraceae	*Ludwigia stolonifera/hyssopifolia*	Seedbox
35		*Ludwigia adscendens*	Water primrose

	Family	Scientific name	English name
36	Oxalidaceae	*Oxalis corniculata*	Wood sorrel
37	Poaceae	*Cynodon dactylon*	Couch grass
38		*Eragrostis atrovirens*	
39		*Brachiaria mutica*	Para Grass
40		*Echinochloa crusgalli*	
41		*Echinochloa pyramidalis*	
42		*Eleusine indica*	Goose grass
43		*Echinochloa stagnina*	Hippo grass, Creeping paddy weed
44		*Ischaemum indicum*	
45		*Hymenachne acutigluma*	
46		*Ischaemum rugosum*	
47		*Saccharum spontaneum*	Kans grass
48		*Coix aquatica*	
49		*Phragmites vallatoria (karka)*	Tall reed
50		*Chloris barbata*	
51		*Leersia hexandra*	Cutgrass
52		*Paspalum scrobiculatum*	Kodo millet
53		*Panicum repens*	Torpedo grass
54		*Oryza rufipogon*	Wild rice
55		*Sclerachne punctata*	
56		*Leptochloa chinensis*	Chinese sprangletop
57		*Echinochloa colonum*	Junglerice
58	Polygonaceae	*Polygonum hydropiper/ tomentosum*	Marshpepper, Knotweed
59	Pontederiaceae	*Eichhornia crassipes*	Water hyacinth
60		*Monochoria hastate*	Pondweed, Arrowleaf, False pickerelweed
61	Pteridaceae	*Acrostichum aureum*	Golden leather fern
62	Rubiaceae	*Morinda sp.*	
63		*Neolamarckia cadamba*	Kadam
64	Salviaceae	*Salvinia cucullata*	Giant water fern
65	Sphenocleaceae	*Sphenoclea zeylanica*	Gooseweed

Appendix 2. List of bird species recorded in BPL between 2001 and present

(Nomenclature follows BirdLife International 2012)

	Family	Scientific name	English name
1	Acanthizidae	*Gerygone sulphurea*	Golden-bellied Gerygone
2	Accipitridae	*Accipiter gularis*	Japanese Sparrowhawk
3		*Circus melanoleucos*	Pied Harrier
4		*Circus spilonotus*	Eastern Marsh Harrier
5		*Elanus caeruleus*	Black-shouldered Kite
6		*Pandion haliaetus*	Osprey
7	Alcedinidae	*Alcedo atthis*	Common Kingfisher
8		*Ceryle rudis*	Pied Kingfisher
9		*Halcyon capensis*	Stork-billed Kingfisher
10		*Halcyon pileata*	Black-capped Kingfisher
11		*Halcyon smyrnensis*	White-throated Kingfisher
12		*Todiramphus chloris*	Collared Kingfisher
13	Anatidae	*Anas poecilorhyncha*	Indian Spot-billed Duck, Western Spot-billed Duck
14		*Anas querquedula*	Garganey
15		*Nettapus coromandelianus*	Cotton Pygmy-goose
16		*Sarkidiornis melanotos*	Comb Duck
17		*Dendrocygna javanica*	Lesser Whistling-duck
18	Anhingidae	*Anhinga melanogaster*	Oriental Darter
19	Apodidae	*Cypsiurus balasiensis*	Asian Palm Swift
20	Ardeidae	*Ardea cinerea*	Grey Heron
21		*Ardea purpurea*	Purple Heron
22		*Ardeola bacchus*	Chinese Pond Heron
23		*Ardeola speciosa*	Javan Pond Heron
24		*Bubulcus ibis*	Cattle Egret
25		*Butorides striatus*	Little Heron
26		*Casmerodius albus*	Great Egret
27		*Egretta garzetta*	Little Egret
28		*Ixobrychus cinnamomeus*	Cinnamon Bittern
29		*Ixobrychus sinensis*	Yellow Bittern
30		*Mesophoyx intermedia*	Intermediate Egret
31		*Nycticorax nycticorax*	Black-crowned Night-Heron
32	Charadriidae	*Charadrius dubius*	Little Ringed Plover
33		*Pluvialis fulva*	Pacific Golden Plover
34		*Vanellus cinereus*	Grey-headed Lapwing
35		*Vanellus indicus*	Red-wattled Lapwing

	Family	Scientific name	English name
36	Ciconiidae	*Anastomus oscitans*	Asian Openbill
37		*Leptoptilos dubius*	Greater Adjutant
38		*Leptoptilos javanicus*	Lesser Adjutant
39		*Mycteria leucocephala*	Painted Stork
40	Cisticolidae	*Cisticola juncidis*	Zitting Cisticola
41		*Prinia hodgsonii*	Grey-breasted Prinia
42		*Prinia inornata*	Plain Prinia
43	Columbidae	*Streptopelia chinensis*	Spotted Dove
44		*Streptopelia tranquebarica*	Red Collared Dove
45	Cuculidae	*Cacomantis merulinus*	Plaintive Cuckoo
46		*Centropus sinensis*	Greater Coucal
47		*Centropus bengalensis*	Lesser Coucal
48	Dicruridae	*Dicrurus macrocercus*	Black Drongo
49	Emberizidae	*Emberiza aureola*	Yellow-breasted Bunting
50	Estrildidae	*Lonchura malacca*	Black-headed Munia
51	Glareolidae	*Glareola maldivarum*	Oriental Pratincole
52	Gruidae	*Grus antigone*	Sarus Crane
53	Hirundinidae	*Hirundo rustica*	Barn Swallow
54		*Riparia riparia*	Sand Martin
55	Jacanidae	*Hydrophasianus chirurgus*	Pheasant-tailed Jacana
56		*Metopidius indicus*	Bronze-winged Jacana
57	Laniidae	*Lanius cristatus*	Brown Shrike
58	Laridae	*Chlidonias hybridus*	Whiskered Tern
59		*Chlidonias leucopterus*	White-winged Tern
60		*Sterna caspia*	Caspian Tern
61	Meropidae	*Merops orientalis*	Green Bee-eater
62		*Merops philippinus*	Blue-tailed Bee-eater
63	Motacillidae	*Anthus rufulus*	Paddyfield Pipit
64		*Motacilla flava*	Yellow Wagtail
65	Muscicapidae	*Copsychus saularis*	Oriental Magpie Robin
66		*Luscinia svecica*	Bluethroat
67		*Saxicola caprata*	Pied Bushchat
68		*Saxicola torquata*	Common Stonechat
69	Nectariniidae	*Nectarinia jugularis*	Olive-backed Sunbird
70	Otididae	*Houbaropsis bengalensis*	Bengal Florican
71	Passeridae	*Passer domesticus*	House Sparrow
72		*Passer flaveolus*	Plain-backed Sparrow
73		*Passer montanus*	Eurasian Tree Sparrow
74	Pelecanidae	*Pelecanus philippensis*	Spot-billed Pelican

	Family	Scientific name	English name
75	Phalacrocoracidae	*Phalacrocorax carbo*	Great Cormorant
76		*Phalacrocorax fuscicollis*	Indian Cormorant
77		*Phalacrocorax niger*	Little Cormorant
78	Ploceidae	*Ploceus hypoxanthus*	Asian Golden Weaver
79		*Ploceus manyar*	Streaked Weaver
80		*Ploceus philippinus*	Baya Weaver
81	Pycnonotidae	*Pycnonotus blanfordi*	Streak-eared Bulbul
82		*Pycnonotus goiavier*	Yellow-vented Bulbul
83	Rallidae	*Amaurornis phoenicurus*	White-breasted Waterhen
84		*Gallicrex cinerea*	Watercock
85		*Gallinula chloropus*	Common Moorhen
86		*Porphyrio porphyrio*	Purple Swamphen
87		*Porzana fusca*	Ruddy-breasted Crake
88	Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt
89	Rostratulidae	*Rostratula benghalensis*	Greater Painted Snipe
90	Scolopacidae	*Actitis hypoleucos*	Common Sandpiper
91		*Calidris subminuta*	Long-toed Stint
92		*Gallinago gallinago*	Common Snipe
93		*Tringa glareola*	Wood Sandpiper
94		*Tringa nebularia*	Common Greenshank
95		*Tringa ochropus*	Green Sandpiper
96		*Tringa stagnatilis*	Marsh Sandpiper
97		*Tringa totanus*	Common Redshank
98	Sturnidae	*Acridotheres grandis*	White-vented Myna
99		*Acridotheres tristis*	Common Myna
100		*Sturnus contra*	Asian Pied Starling
101		*Sturnus nigricollis*	Black-collared Starling
102	Sylviidae	*Acrocephalus bistrigiceps*	Black-browed Reed Warbler
103		*Acrocephalus orientalis*	Oriental Reed Warbler
104		*Locustella certhiola*	Rusty-rumped Warbler
105		*Megalurus palustris*	Striated Grassbird
106	Threskiornithidae	*Platalea minor*	Black-faced Spoonbill
107		*Plegadis falcinellus*	Glossy Ibis
108		*Threskiornis melanocephalus*	Black-headed Ibis
109	Turnicidae	*Turnix suscitator*	Barred Buttonquail
110	Zosteropidae	*Zosterops palpebrosus*	Oriental White-eye