Assessment of Drivers of Deforestation and Forest Degradation in the Seima Protected Forest 2010-2014

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Cambodia REDD+ Programme

Disclaimer

This information brief was prepared **Ung Vises, Matt Nuttall, Alex Diment, Phien Sayon, Donal Yeang** and **Jeff Silverman** of the Wildlife Conservation Society (WCS), drawing on their experiences in developing and implementing the Seima Protection Forest REDD+ Project under voluntary carbon market. The work of producing the brief was funded by UNDP under the UN-REDD Programme. However, the views and recommendations reflected in the brief are not necessarily those of the Cambodia REDD+ Taskforce, the Forest Administration, the General Directorate for Administration of Nature Conservation and Protection (Ministry of Environment), UNDP or the UN-REDD Programme.

Table of Contents

1. Introduction

Reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (REDD+) is to provide positive financial incentives to countries to reduce emissions through avoided deforestation and forest degradation, and to compensate these countries based on their performance. The success of REDD+ is entirely dependent on the successful implementation of strategies to address drivers of deforestation and forest degradation. The parties to the United Nations Framework Convention on Climate Change (UNFCCC) decided to adopt the "Warsaw Framework for REDD+" in the 19th Conference of the Parties (COP19) in Poland and the framework also recognizes the importance of addressing the drivers of deforestation and forest degradation in the context of REDD+ (UNFCCC, 2013). The Warsaw Framework for REDD+ encourages all parties, relevant organizations, and the private sector and other stakeholders, to continue their work to address drivers of deforestation and forest degradation and to share the results of their work on this matter, including via the web platform on the UNFCCC website. In Cambodia, the national REDD+ roadmap identifies some of the direct and indirect drivers, based on a consultation among various stakeholders and however, additional research is required to accurately understand the drivers of deforestation and forest degradation in Cambodia (FA, 2011b). As a result, documentation of lessons learnt on assessment of drivers of deforestation and forest degradation in the context of REDD+ implementation in Cambodia is very critical in order to support the development of the national REDD+ strategy. This information brief identifies drivers of deforestation and forest degradation, the response mechanisms trialed, and the effectiveness of the different mechanisms that exists in the Seima Protection Forest REDD+ demonstration site.

According to the 2010 forest cover assessment, Cambodia, with approximately 10.3 million hectare of forest on 57% of the whole country area, is one of the most forested country in southeast Asia(FA, 2011a). Forests in Cambodia, as with forests across South East Asia, are under pressure from a variety of threats that are driving deforestation at an alarming rate. The diversity and scale of the threats makes the management and conservation of legally protected forests one of the greatest challenges to Cambodia's natural resource management. Despite 29% of Cambodia's landmass enjoying legal protection (Kapos *et al.*, 2010), deforestation rates continue to climb, and the drivers of forest loss are increasing. The primary drivers of forest loss in Cambodia include placement of agro-industrial economic land concessions, local and large-scale agricultural expansion, population increases which drives migration to "frontier" forested landscapes, and logging of luxury timber for the domestic and international markets. These drivers are compounded by low government capacity and a lack of political will to effectively conserve remaining forests. In recent years there have been

positive steps taken by the Cambodian government to increase the protection of conservation areas (e.g. moratorium on Economic Land Concessions), and government capacity at all levels of protected area management is increasing. In many protected areas the government is supported by local and international non-governmental organizations (NGO's) which provide both financial and technical support to their government counterparts, and in these areas the rates of forest loss tend to be significantly lower than unsupported areas.

Seima Protected Forest (SPF) in Mondulkiri and Kratie Provinces is managed by the Forestry Administration (FA) of the Ministry of Agriculture, Forests, and Fisheries (MAFF), and the Wildlife Conservation Society (WCS) has supported the government in management of the site for over 10 years. Forest cover loss in SPF is significantly less than many areas in Cambodia (Evans et al., 2012), yet despite heavy investments of resources both by the government and by WCS, deforestation rates continue to increase. The drivers behind forest cover loss in SPF are varied, and therefore is it necessary to identify the causes – both legal and illegal – in order to identify points of intervention and strategies to mitigate the loss of forest cover within the protected forest.

Protected Area Downsizing, Downgrading, and Degazettement (PADDD) is an initiative by the World Wide Fund for Nature (WWF) and aims to identify, quantify, and track the legal loss of protected areas around the world (Mascia & Pailler, 2011). An exercise in mapping and quantifying the legal loss of protected area land within SPF and the adjacent Snuol Wildlife Sanctuary (SWS) highlighted important legal mechanisms within SPF that are responsible for forest cover loss (WCS, 2013).
This report aims to quantify all areas of forest loss within SPF, both legal and illegal, in order to:

1) Quantify the amount of forest cover lost between 2010 and 2014
2) Calculate the changes in rates of forest cover loss between 2010 and 2014
3) Identify areas within SPF that are hotspots for deforestation
4) Identify the different mechanisms by which forest loss is occurring

2. Method and Study Area

The Seima Protected Forest (SPF) is located in eastern Cambodia in Mondulkiri and Kratie provinces (Map 1), whose eastern boundary borders Vietnam. It was declared in 2002 as a Biodiversity Conservation Area. In recognition of its importance for biodiversity and environmental services, the area was declared a Protected Forest by Prime Ministerial sub-decree in 2009. The total size of the Protected Forest is 2,927 km^2 (292,690 ha). The Core Protection Forest is 1,879 km^2 (187,983 ha). The combined area of the Buffer zones east and west of the core is 1,047km^2 (104,707 ha). The area is now managed for conservation of biodiversity, environmental services and livelihoods by the

Department of Wildlife and Biodiversity of the Forestry Administration. Technical and financial assistance is provided by the Wildlife Conservation Society (WCS), who have been working in Cambodia since 1999, and active in southern Mondulkiri since 2000.

SPF protects large areas of Annamite mountain evergreen/semievergreen forest and Eastern Plains deciduous forest and includes many small wetlands. Of 41 Globally Threatened vertebrate species recorded (4 Critically Endangered and 14 Endangered), many occur in globally or regionally outstanding populations, including elephants, primates, wild cattle, several carnivores and a range of large birds. The site is also the ancestral home to a large number of ethnic Bunong people, for whom the forest is a key source of income and central to their spiritual beliefs.

Key direct threats are unsustainable resource extraction (hunting, logging, fishing, other plant harvests) and forest clearance. These harm both biodiversity and local livelihoods. Drivers include population growth (due to births and migration), improving road access, the actions of large mining and agri-business companies, weak law enforcement and governance frameworks, limited recognition of the value of biodiversity and environmental services and rising regional/global demand for both wild products and agricultural produce.

Monitoring via remote sensing is a vital aspect of the project and allows managers to identify new areas of clearanace and forest loss, and track exisitng hotspot areas. GIS technicians take advantage of freely available, high resolution imagery provided by various satellites in order to monitor forest loss. The LANDSAT satellites (previously LANDSAT 7, more recently LANDSAT 8) which were launched by NASA but are now operated by the United States Geological Survey (USGS) provide satellite images every 14 days to a resolution of 30m x 30m. LANDSAT 8 has 8 spectral bands, allowing for accurate differentiation of land cover between forest and non-forest. BING imagery is also freely available and provides images of 1m x 1m resolution which is extremely useful in land-use classification. The MODIS FIRMS satellite identifies fires within areas of interest and sends e-mails to registered users highlighting areas of possible fires.

GIS staff dowload satellite imagery on a regular basis and begin a process of image classification (Image 1).

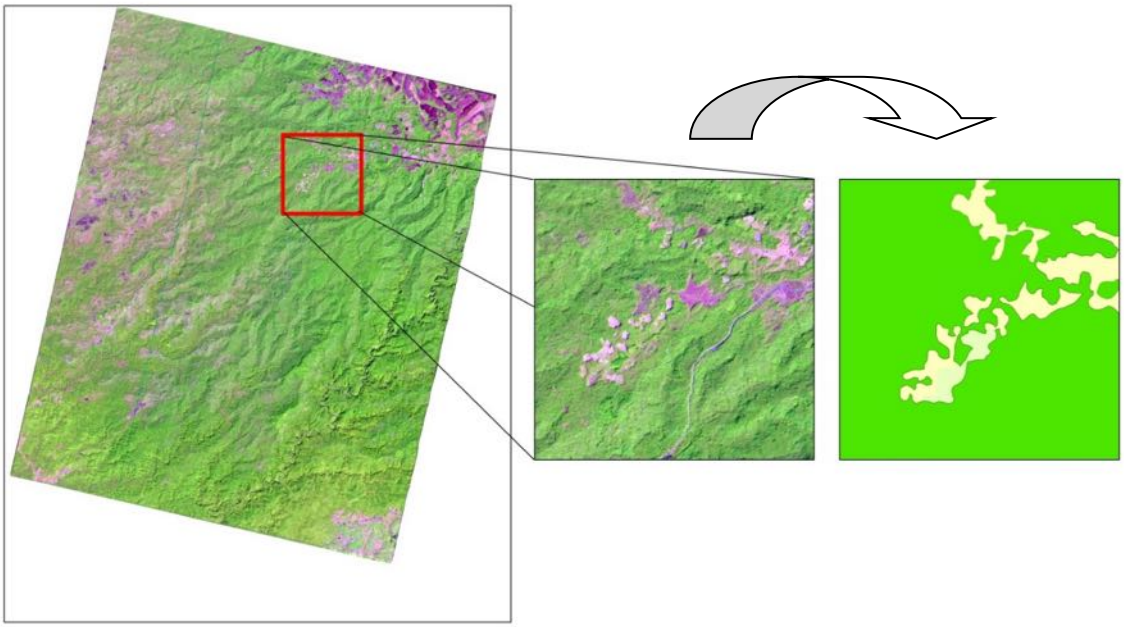
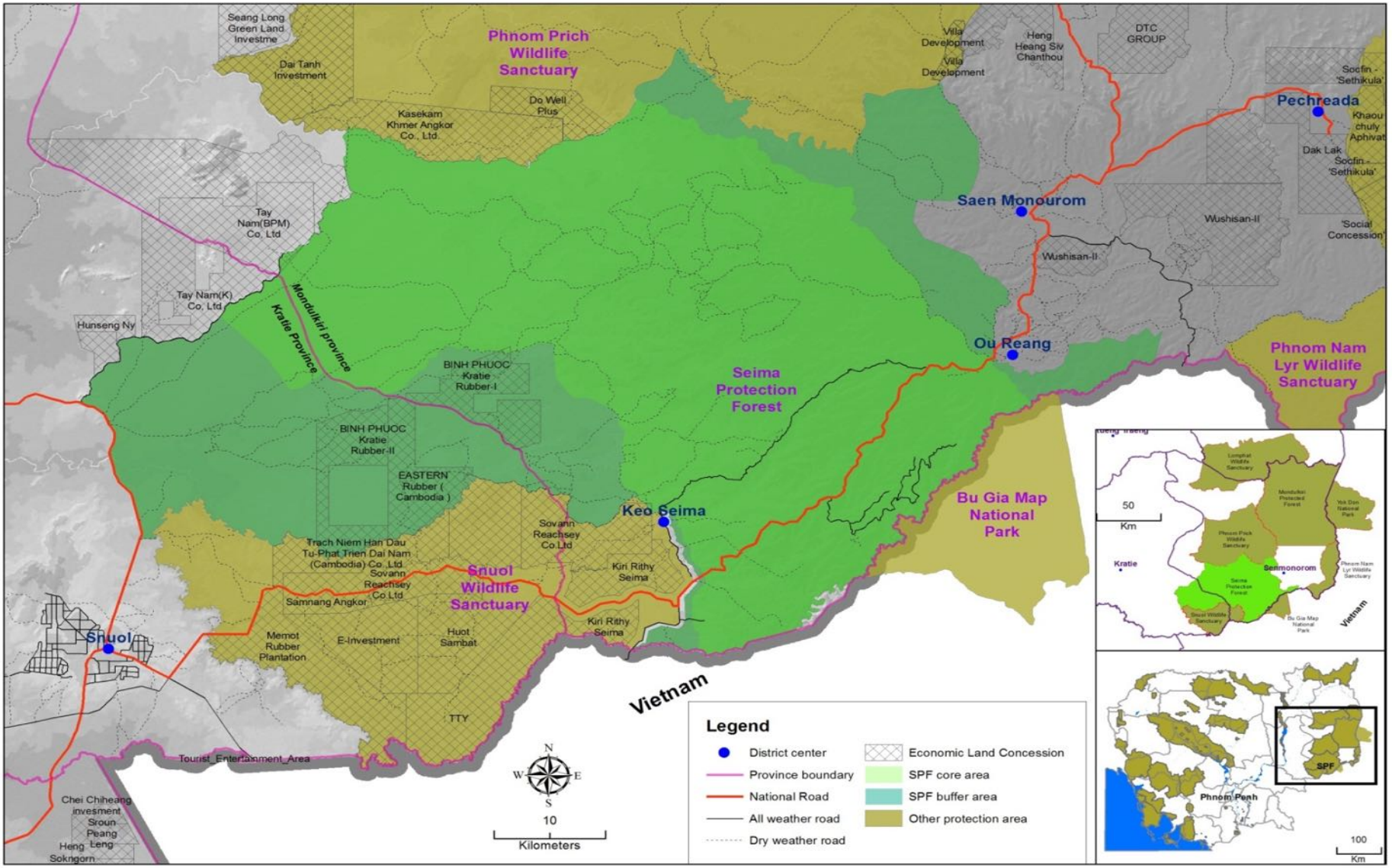


Image 1. The process of image classification from a satellite image to a vector shapefile which can then be manipulated and analyzed in a GIS.



Map 1. Showing the location of the Eastern Plains Landscape (EPL) in Cambodia (small, bottom), Seima Protected Forest in the EPL (small, top), and a detailed map of SPF

For this report, the loss of forest cover has been assessed between the years 2010 to 2014. Because of the often complex legal mechanisms by which land is allocated and cleared, and the blurry lines of legality during the lengthy processes of some legal land allocations (for example Indigenous Community Land Titles), we have taken 2010 as a strict baseline. Therefore all land that was cleared prior to 2010 has been, for the purposes of this study, classified as "legal" regardless of the previous process by which it was cleared. Clearance that occurred pre-2010 has also been excluded from the calculations. Furthermore, we have refrained from attempting to allocate quantified illegal forest loss to specific features, such as villages and Economic Land Concessions (ELC). It is extremely difficult to know where the "sphere of influence" ends, and therefore we have avoided arbitrarily selecting a buffer around, say, a village, and attaching sections of illegal forest loss to that village. A similar problem exists with ELC's. There is no doubt that illegal forest clearance surrounding the ELC's is influenced (if not entirely caused by) the ELC itself, through various micro-mechanisms. Yet there are also villages near the ELC's which will also be partly responsible for illegal land clearance in the area, and it is virtually impossible to correctly ascertain upon whom responsibility should be placed. We have selected an arbitrary area around each feature in order to create the maps. This was done by visually assessing the area and deciding where the majority of the land clearance ended. We have reported the final calculations for the whole of SPF at the end of the report. Finally, there are a number of villages within SPF that are in the process of receiving their Indigenous Community Land Titles. For the villages that have undergone the initial land-use planning stage, and therefore have provisional land parcels mapped, we have included them under the "legal" category (labeled as "ICT Process") as it is assumed that these areas will soon be titled. There is a chance the size and shape of the land titles will change slightly in the latter stages of the process, but the differences will be negligible.

3. Forest loss from 2010-2014

Forest loss within SPF has taken various forms over the years. Between 2010 and 2014 several main activities have been identified which have resulted in forest cover loss. The key point is that much of the forest loss has been conducted through legal mechanisms. It is hoped that this information will provide useful information to managers by highlighting exactly which activities are responsible for forest cover loss within SPF, and where the hotspots for illegal deforestation are.

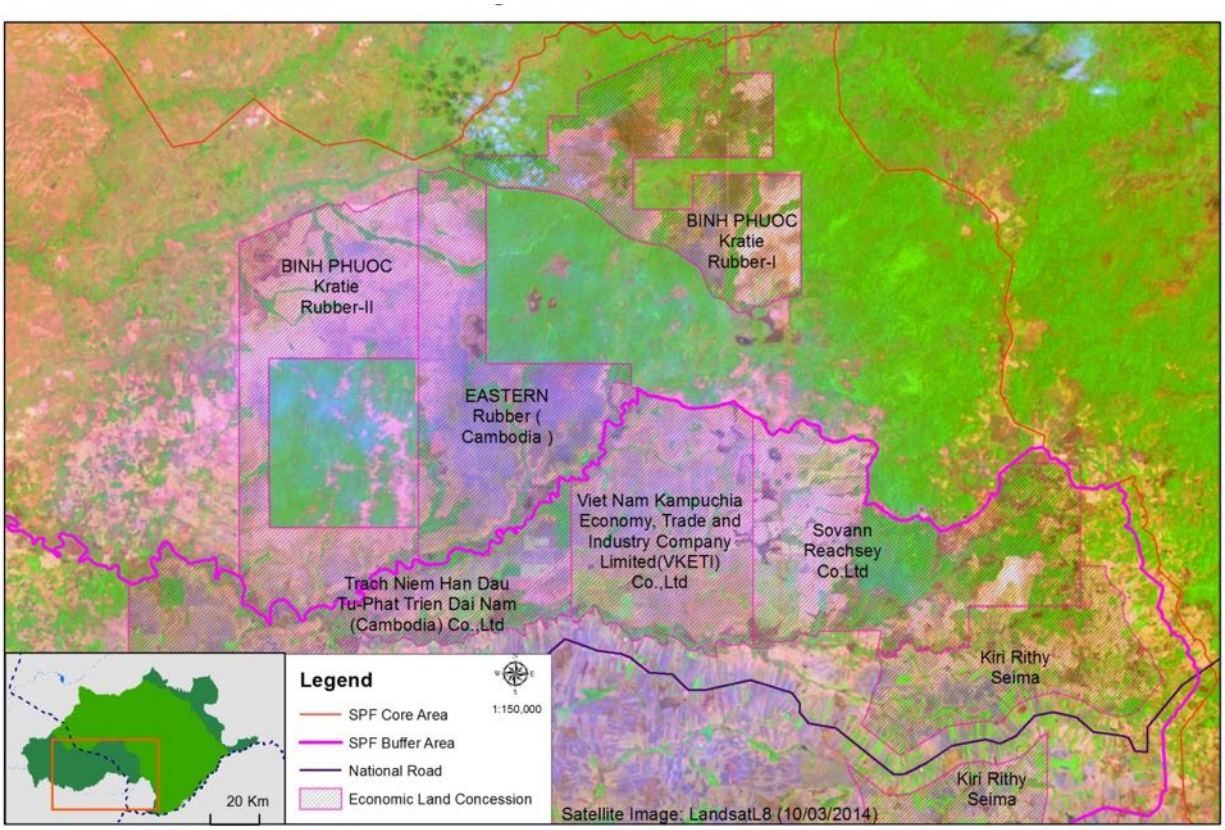
The five key activities which will be examined are:

- Economic Land Concessions
- Directive 01
- Indigenous Community Land Titles (completed)
- Indigenous Community Land Titles (in progress)

- Unassociated illegal land clearance

3.1. Economic Land Concession

In 2010, three ELC's were allocated to two separate companies within the buffer zone of SPF (Map 2). The Binh Phuoc Kratie Rubber company were allocated two concessions (Binh Phuoc I and II, Map 2) and Eastern Rubber Cambodia was allocated one (Map 2). These three concessions were originally the legal maximum size – 10,000ha. The FA lobbied the government to reduce the sizes based on the concessions being placed within a protected area, and was successful. The total area of land allocated between all three concessions is 16,519ha (Table 1).



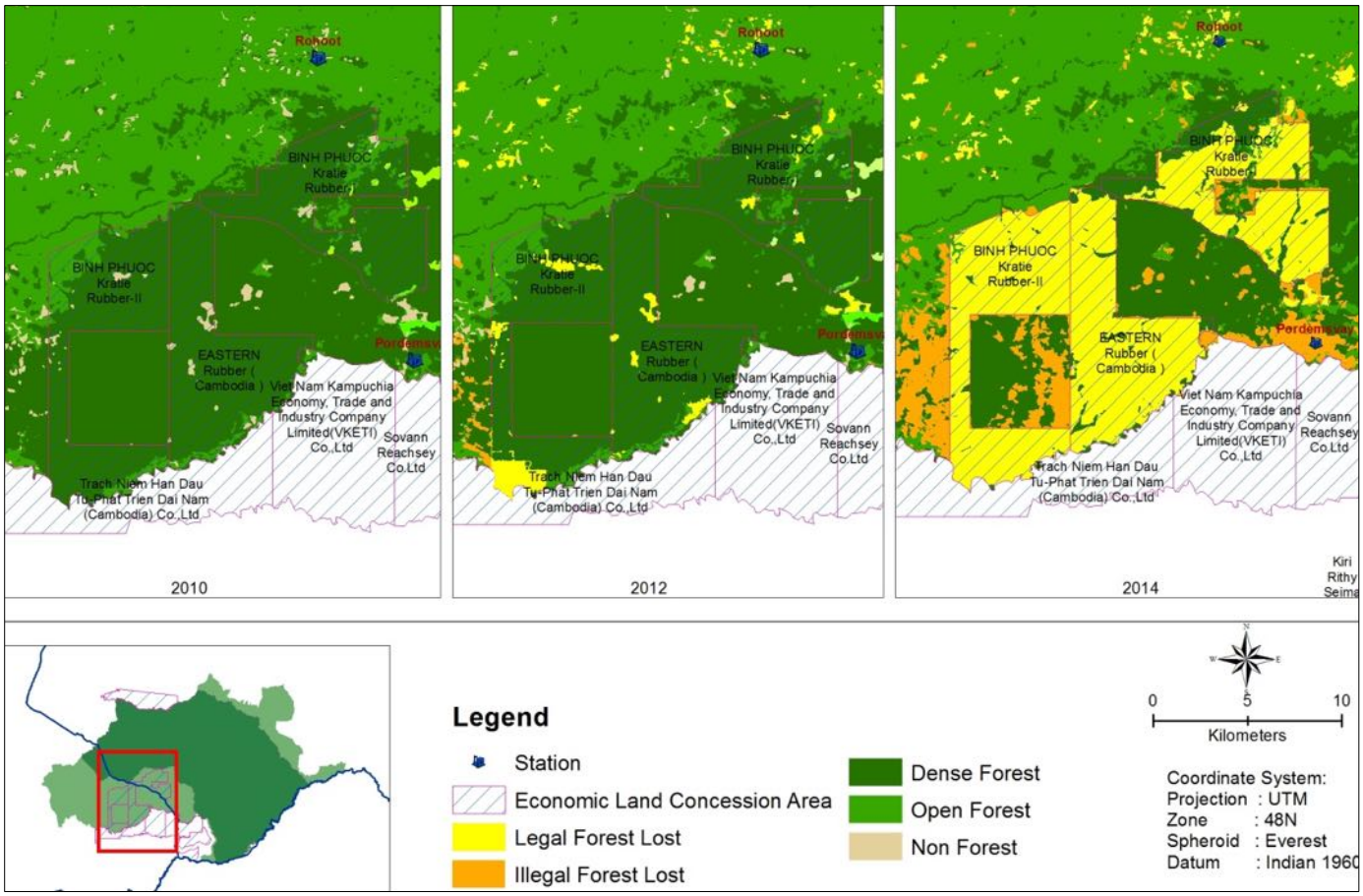
Map 2. Economic Land Concessions within Seima Protected Forest. Binh Phuoc Kratie Rubber I totals 5439ha, Binh Phuoc Kratie Rubber II totals 5537ha, and Eastern Rubber Cambodia totals 5543ha. Areas of purple signify cleared land, and areas of green signify remaining forest cover.

Table 1. Economic Land Concessions within Seima Protected Forest.

Name	PROVINCE	Allocated land (Ha)	CONTRACT	Effect (Year)	Deforest start
BINH PHUOC Kratie Rubber-II	Kratie	5537	12-11-10	2011	2010-11
EASTERN Rubber (Cambodia)	Kratie	5543	12-11-10	2011	2012
BINH PHUOC Kratie Rubber-I	Mondulkiri	5439	12-11-10	2011	2012

3.1.1 Legal and Illegal Forest Lost

One of the major issues surround ELC's within protected areas is the problem of land clearance that occurs in the immediate vicinity of the legally allocated areas. Due to the size of the three ELC's within SPF, monitoring and policing the borders and the adjacent areas is a massive task, and one that requires significant investments of time, manpower, and resources. It is not possible to have patrol teams monitoring this area at all times, and therefore illegal forest clearance occurs (Map 3). As mentioned in section 2, it is very difficult to ascertain who is responsible for this illegal clearance. SPF management and enforcement teams regularly receive reports that it is company staff, associates of company staff, outsiders pretending to be company staff, local people, and many other combinations of the above. It is likely that all of the above are occurring, but to what degree is unknown.

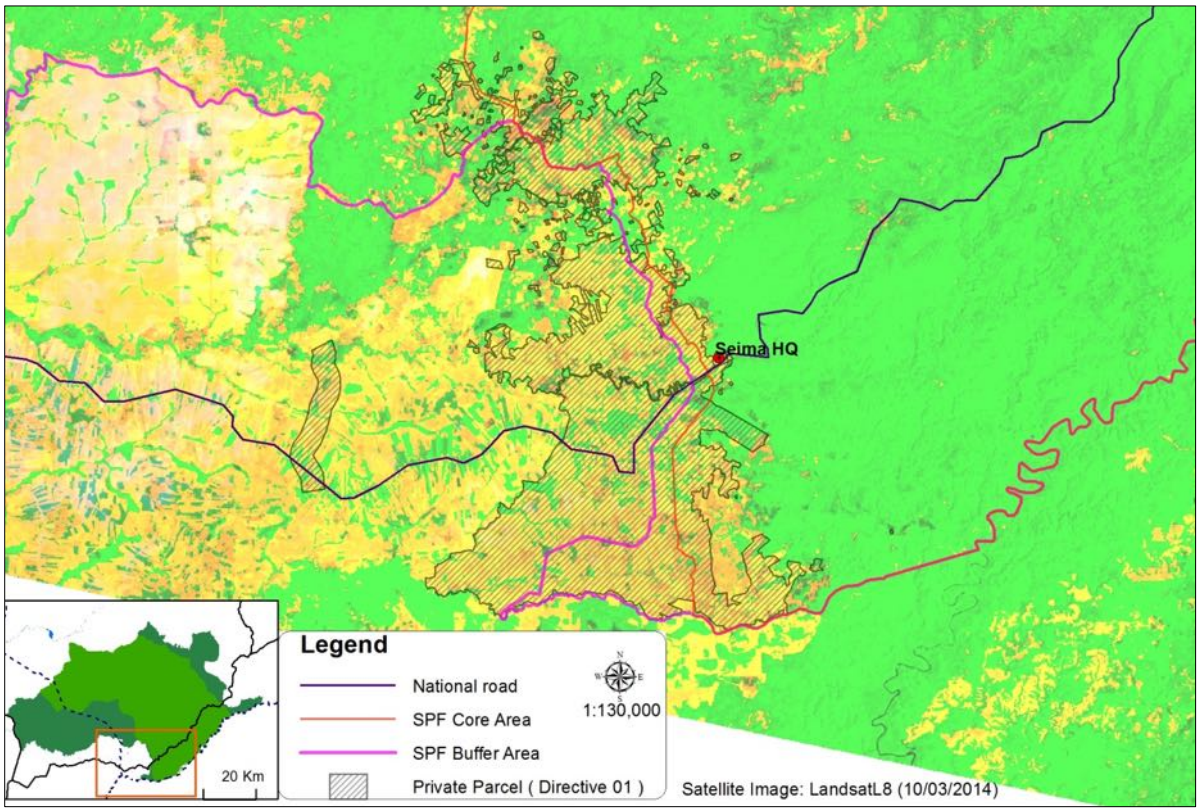


Map 3. The areas of legal and illegal forest loss in 2010, 2012, and 2014 in the Economic Land Concessions and surrounding area

3.2 Directive 01

In May 2012 the Prime Minister issued Directive 01 which was intended to both settle disputes between concessionaires and local people, and to ensure that all families in Cambodia had individual

land titles. This was a massive undertaking, with thousands of students employed to go all over the country and measure the land that each family had. It was decided that only land already being used was allowed to be measured (i.e. no land for future use). This had the unfortunate result of encouraging people to clear as much new land as they could before the students came to measure, thus increasing the quantity of land that was titled. In SPF this problem was concentrated in the south eastern corner of the forest (Map 4), and resulted in two problems. First, illegal land clearance that had occurred previously was measured and land titles were issued, thus becoming "legal". Second, new areas of forest within SPF were rapidly cleared in order for the land to be measured and claimed.



Map 4. The area that was measured and titled under the Directive 01 initiative.

A total area of 5958.6ha was measured and land titles were issued for these areas (Table 2). This has resulted in these illegally cleared areas within the SPF borders becoming legal. The original area measured inside SPF borders was significantly larger, but thanks to a concerted effort by the FA and WCS, many of these areas were cancelled.

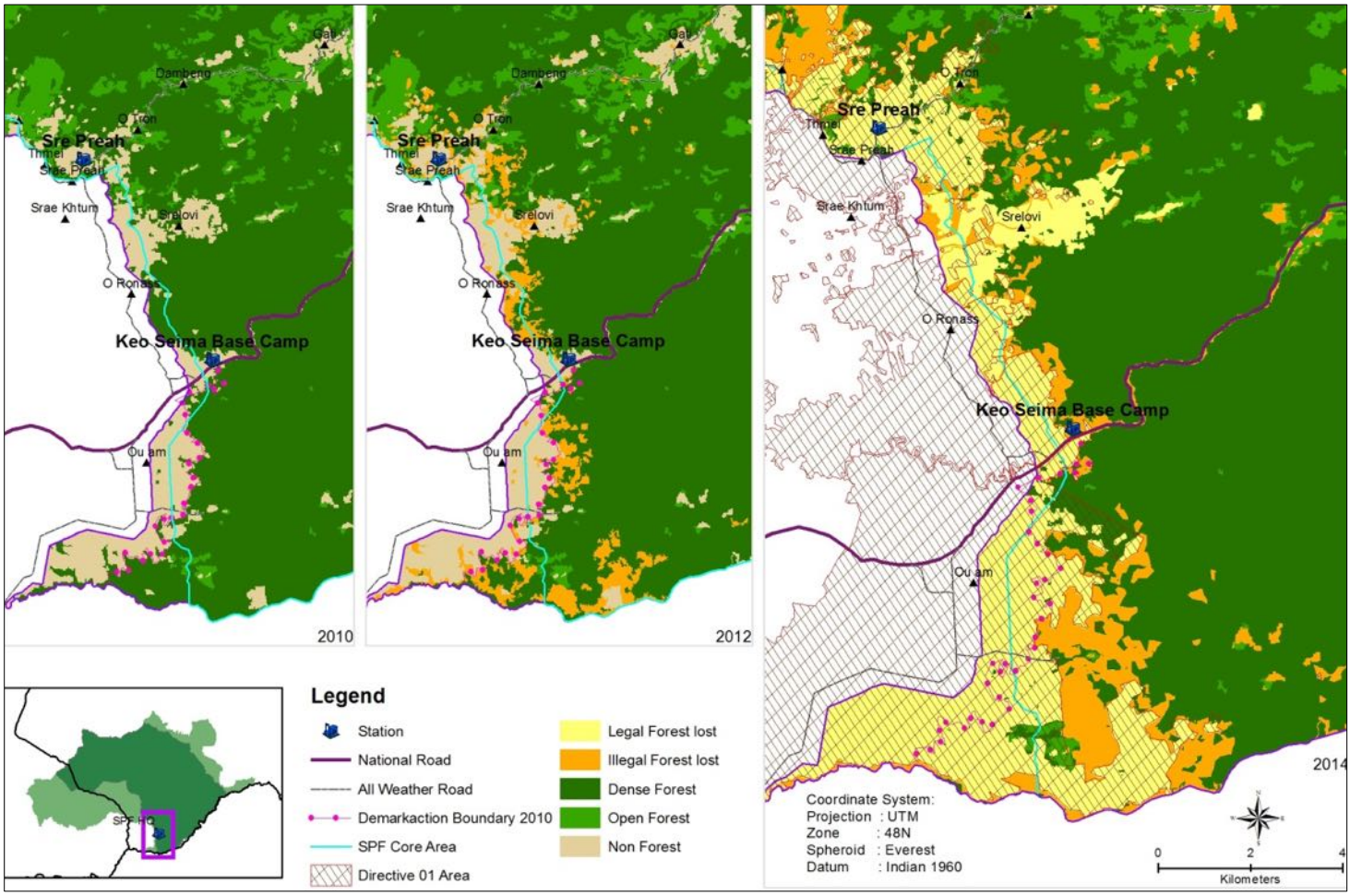
Table 2. The area within SPF that was measured and had land titles issued

Section	Total area legal loss (Ha)
Buffer to Order 01 Boundary	3828.29

Core Area to Order 01 Boundary		2130.31

3.2.1 Legal and Illegal Forest Loss

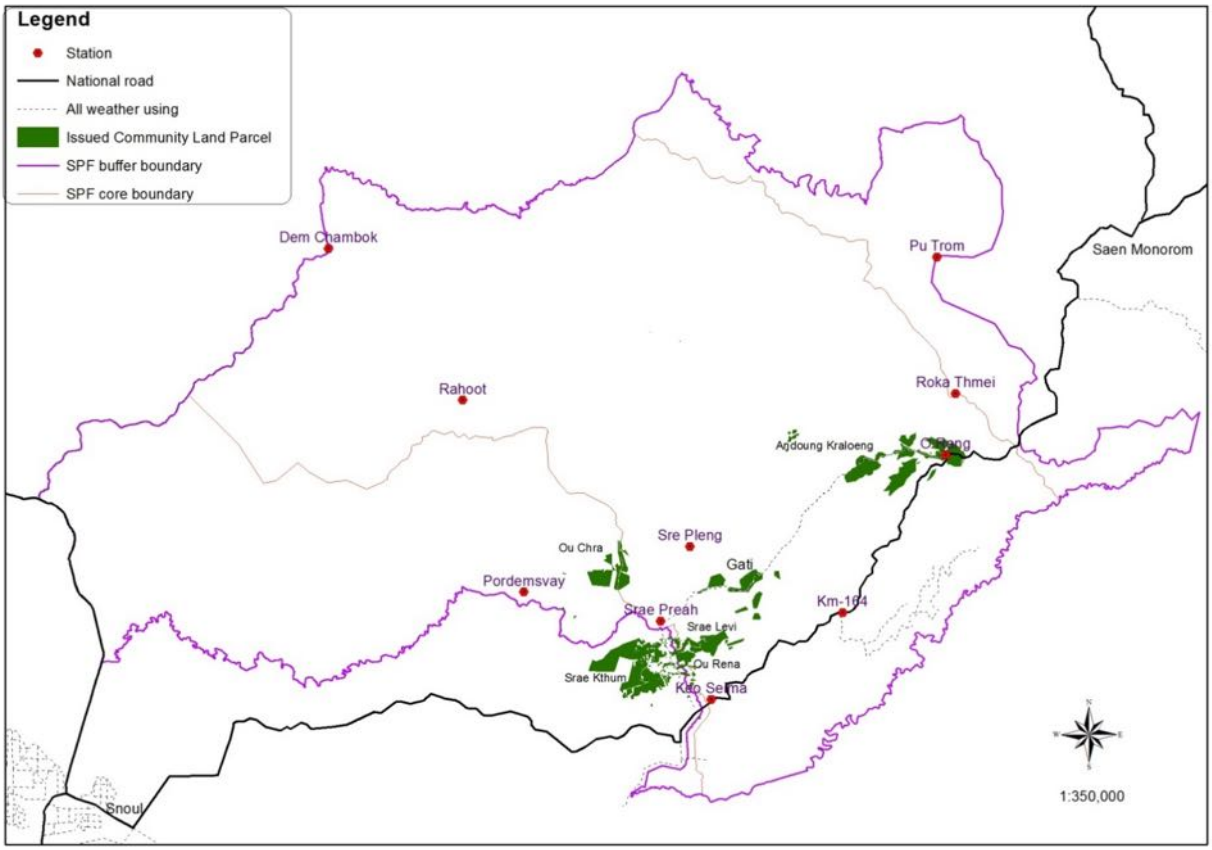
The South Eastern corner of SPF has historically been an area of rapid illegal land clearance. In 2010, the SPF management signed a new agreement with the communities in that area which legalized all of the previous land clearance, and effectively moved the boundary of SPF to accommodate this. Demarcation was undertaken and it was hoped that this would reduce further illegal land clearance (Map 5). This had limited success, and the problems in this area have been further exacerbated by Directive 01.



Map 5. The results of the new agreement and demarcation in 2010 (the pink line). In 2012, illegal forest clearance had been reduced (middle map) but not halted. Under Directive 01 large areas of illegally cleared land became legal (right map). However illegal land clearance is still rife in this area (right map).

3.3 Indigenous Community Land Titles (ICT)

A central aspect of the management strategy is to assist all villages who wish it to obtain communal land titles, thereby strengthening their ability to participate in conserving their own resources, and to collaborate with the FA in co-management. The right to communal land titles is provided by the Land Law (2001) with detailed procedures set out in Subdecree 83 (2009). The initial focus of community work in Seima was on Participatory Land-use planning (PLUP) and as in 2003-4 GTZ funded the very early stages of this in Andoung Kraloeng (AK) village. AK was the first village in the

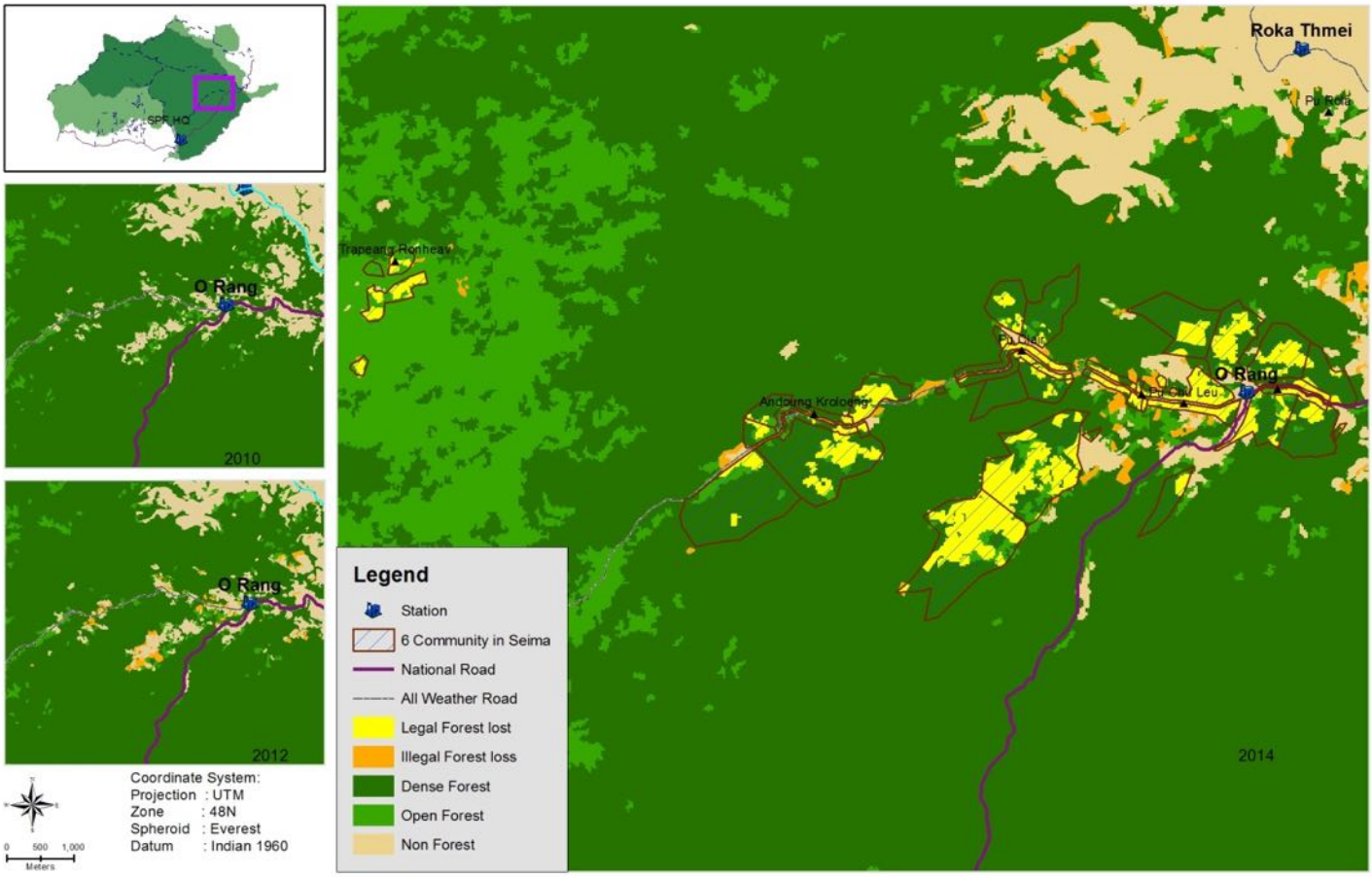


Map 6. Locations of ICTs within SPF

3.3.1 Legal and Illegal deforestation

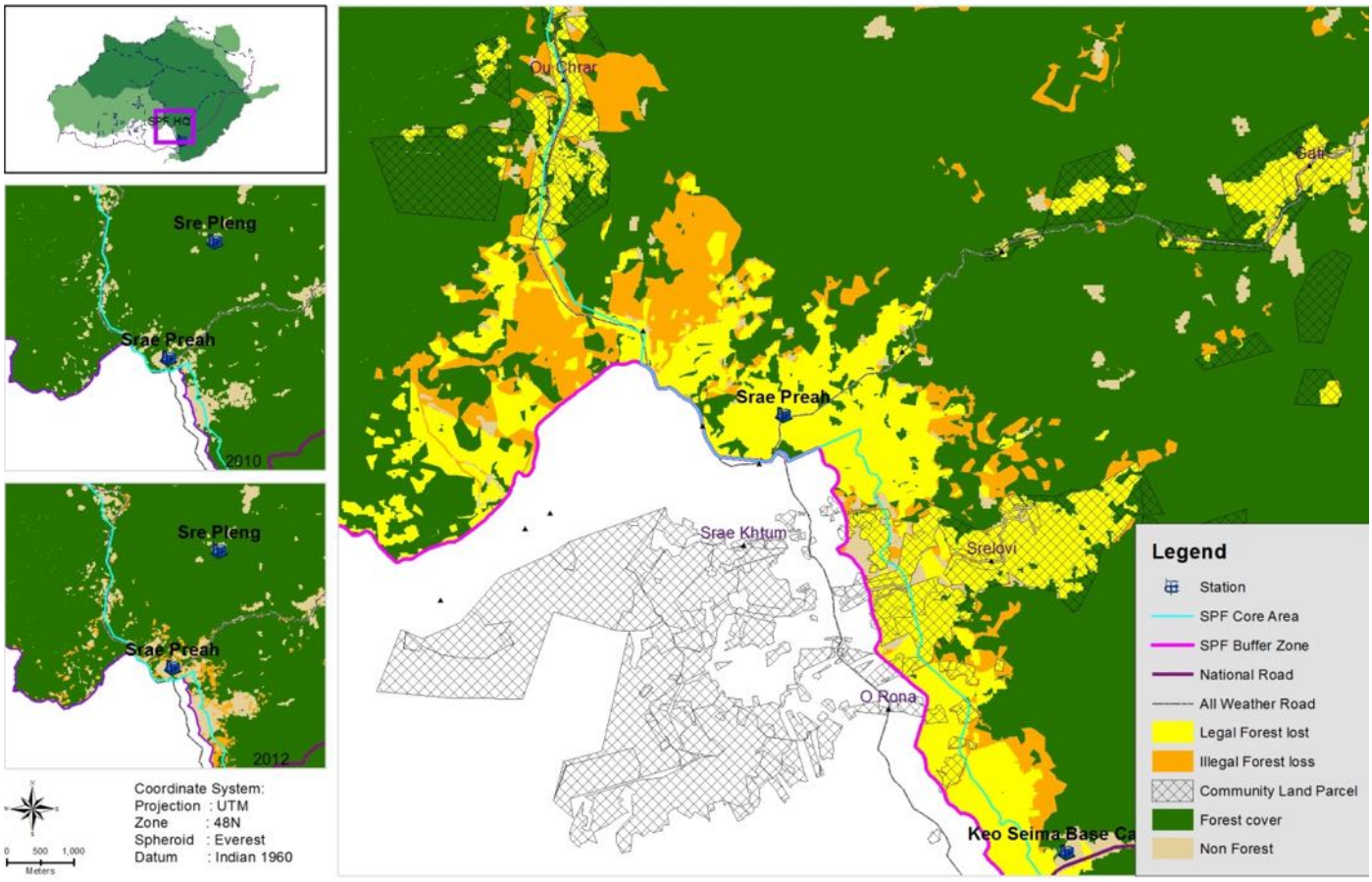
When examined, Andong Kraloeng (AK) has predominantly complied with the allocated land parcels of their ICT (Map 7) with only small patches of illegal clearing in the vicinity of the village. As mentioned in the methods section, we have not attempted to quantify the legal and illegal cleared land around villages, due to the difficulties associated with interpreting which village is responsible. This is particularly the case in circumstances such as AK and Rokathemei (map 7) where the two

villages are in close proximity to each other. Another factor which makes such analysis difficult is that there is no reliable way of ascertaining whether illegal clearing is being done by members of those villages, or outsiders. Small patches of clearing further away from the villages is just as likely to be caused by individuals who do not officially belong to a certain village (Map 7 & 8).



Map 7. Legal and illegal land clearance surrounding Andong Kraloeng village.

The villages of O'Rana, Sre Levi, Sre Khtum, Sre Preah, and O'Chrar are all in very close proximity both to each other and to the borders of the Protected Forest (Map 8). Historically this area has seen high levels of land clearance. Much of this was done before 2010, and so for this study, some of this land has been designated as legal due to the 2010 baseline. The problem of attaching patches of clearance to certain villages is clear in this case (Map 8)



Map 8. Legal and illegal land clearance, and ICT boundaries for O'Rana, Sre Levi, Sre Khtum, and Sre Preah

4. Summary results and discussion

The total deforestation rate is calculated for SPF on an annual basis and is compared with Snuol Wildlife Sanctuary (SWS), which acts as a control site i.e. a site with no active conservation interventions (Table 3). There has been a large increase in the deforestation rate both in the core zone and in SPF as a whole (buffer and core together) (Table 3). The increase in deforestation rate for the whole of SPF between the periods 2010-2012 and 2012-2014 is particularly alarming (7.5%) when viewed in the context of previously calculated rates. However, when the various mechanisms that we have described above - which allow legal clearance of forest - are excluded from the calculations, we see that only 42% of forest loss between 2010 and 2014 has been caused by illegal activities (Table 4). What is also interesting is we can see the impact of the ELC clearance by separating the time period into 2010-2012 and 2012-2014. In the first time period, 34.3% of forest loss was from legal activities, and the majority (65.7%) was from illegal activities. In the second time period, this situation has reversed – 65.7% of forest loss was caused by **legal** activities, and only

34.2% by **illegal** activities. The total size of the area lost in the two time periods also shows a large difference, with 71 km^2 being lost between 2010-2012 and 220km^2 between 2012-2014. Over the whole period (2010-2014), the ELCs account for 47.6% of the total forest area lost.

The legality of both economic land concessions and erroneously placed individual land titles does not reduce the contradiction, in terms of management, with the original objectives outlined in the Prime Ministerial sub-decree that established Seima Protected Forest in 2009, and the implementation of such activities within the borders of SPF precludes successful preservation of the forested estate in the long-term. Despite some laudable successes by the FA in reducing the impacts of land allocations within SPF, the availability of staff and resources on the ground has made enforcement of illegal clearing surrounding ELCs and Directive 01 land parcels extremely challenging. Although causation is difficult to prove, it is clear that the presence of legal forest clearance (particularly ELC's and individual land titles) within the borders of SPF has a detrimental effect on forest crime by increasing the occurrence of illegal clearance (Map 3 & 5).

ELCs are large, industrial activities that significantly increase the workload of enforcement teams and create a number of problems for protected areas. A few examples include:

- They significantly increase the length of perimeter or "edge" that teams have to patrol
- They bring scores of workers who are difficult for patrol teams to monitor and regulate
- Local people and non-associated outsiders pretend to be company workers which reduces the threat of arrest when illegally clearing
- It is easy for disputes between companies and PA staff to arise regarding legal boundaries of land because of variations in maps and waypoints

Individual land titles create similar problems including:

- People will clear larger areas than they have been legally allocated, and measuring, checking, and monitoring each individual land title is a huge task and impossible with current resources
- People with no land title will place themselves between titled plots, thus making differentiation and enforcement difficult.
- Fraudulent land titles are often sold to people who will then clear land under the belief they are doing so legally. Fake land titles are often in fact real documents, but they have been sold by influential people and allocated outside of Directive 01, and therefore contradict the SPF sub-decree.
- In-migration is increased as word spreads that people have access to pristine forested land, and the need for a legal land title is not communicated

Indigenous Community Land Titles are seen as a positive way for indigenous communities residing within SPF to secure legal tenure of their traditional lands and practices. They undergo a rigorous process of participatory land-use planning (PLUP) whereby specific areas of land are allocated to specific activities such a present agriculture, future shifting agriculture, spirit forests and burial forests. The communities are also entitled to maintain traditional use of forest resources such as the collection of liquid resin, honey, medicine, rattan, and other non-timber forest products. ICTs play a duel role in protecting the traditional lands of the indigenous people from in-migration and land grabs, and they also protect much of the core zone of SPF from the future allocation of large ELCs and rapidly expanding villages.

The challenge associated with events such as ELCs and government initiatives such as Directive 01 comes with identifying potential intervention points, as they vary significantly from interventions aimed at illegal activities. Where illegal activities can be challenged using a range of "field" techniques such as strategic law enforcement, community engagement, environmental education, and sustainable livelihood development, ELCs require a higher level of intervention aimed at the development stage. Some of the key legal requirements of ELCs are in fact intervention points, as it is believed that these criteria are poorly implemented, if at all. These requirements include:

1) Land is registered as State Private land
2) Land-use plan had been adopted by State Land Management Committee
3) Environmental and Social impact assessments are conducted
4) No resettlement issues – no involuntary resettlement by land owners
5) Public consultations are conducted

Forewarning is also a vital requirement if large-scale events such as ELCs or government initiatives such as Directive 01 are to be mitigated, and at best, prevented.

Table 3. Deforestation rate in Seima Protected Forest and Snuol Wildlife Sanctuary between 1998 and 2014

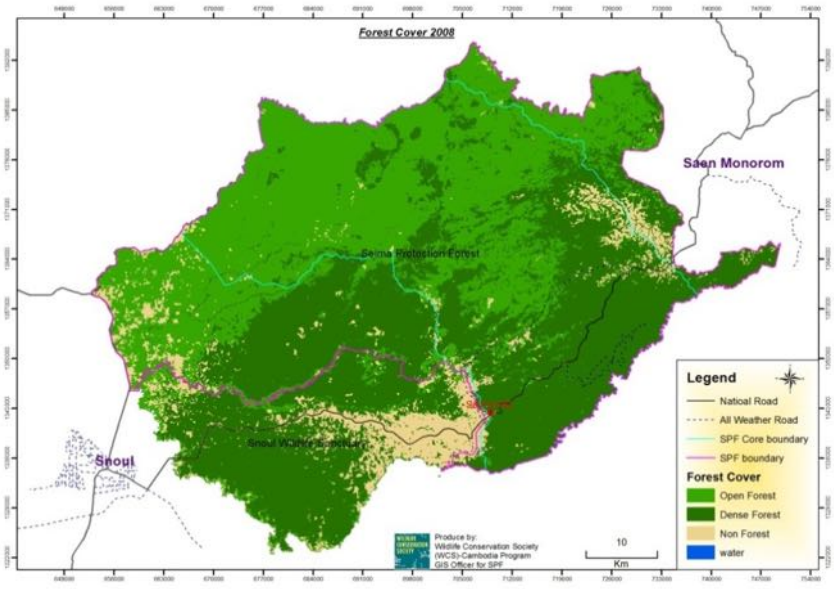
	1998-2002	2002-2008	2008-2010	2010-2012	2012-2014
SPF Total	0.04%	0.27%	0.61%	1.11%	7.51%
SPF Core	0.03%	0.16%	0.30%	0.25%	1.50%
Snuol WS	0.17%	2.81%	3.26%	13.36%	32.14%

Table 4. Total area deforested in SPF between 2010-2014 separated by activity

	Total area deforested					
	2010-2012		2012-2014		2010-2014	
	Ha	km²	Ha	km²	Ha	km2
ELC	629.29	6.29	13219.53	132.19	13848.82	138.48
Directive 01	1064.59	10.65	812.88	8.13	1877.47	18.78
ICT Complete	251.09	2.51	213.45	2.13	464.54	4.64
ICT Process	497.47	4.97	192.71	1.93	690.19	6.90
Illegal	4670.59	46.71	7534.69	75.34	12205.28	122.05
Total	**7113.04**	**71.13**	**21973.25**	**219.72**	**29086.29**	**290.85**
Total legal	2442.45	24.42	14438.56	144.38	16881.01	168.80
% legal	34.3	34.3	65.71	65.71	58	58
Total illegal	4670.59	46.71	7534.69	75.34	12205.28	122.05
% illegal	65.7	65.7	34.29	34.29	42	42

5. Conclusion

Seima Protected Forest is under severe threat from a host of activities. Land clearance is arguably the most damaging, and as the previous sections have shown, deforestation rates (caused by legal and illegal activities) are increasing every year. The conservation project has been operational for over 10 years, but if the forest as a viable ecosystem that is able to support a diverse range of species is to persist in the long-term, the project will need to not only remain, but to increase. The project will need to adapt management practices and strategy to match changing threats as they appear. Nevertheless, the success of the project thus far must be recognized, particularly in the context of other protected areas in Cambodia. The disappearance of almost all forested land south of SPF, including in Snuol Wildlife Sanctuary, is testament to the scale of the deforestation problem. But the SPF core zone remains relatively intact (Map 9), and the deforestation rate in the SPF core zone is 2% that of areas outside the protected area. That is a huge difference which demonstrates the relative success of the project. Nevertheless, the rate at which forest cover has been lost between 2012 and 2014 (Map 9) is a stark reminder of the challenges that lies ahead. The results of this study have highlighted the deforestation hotspots within SPF, which are areas that are experiencing disproportionately high levels of forest clearance (Map 8). These areas need to be a primary focus for enforcement teams in the immediate future.


Forest Cover 2008
Saen Monorom
Seima Protection Forest
Snoul
Snoul Wildlife Sanctuary
Legend
Natioal Road
All Weather Road
SPF Core boundary
SPF boundary
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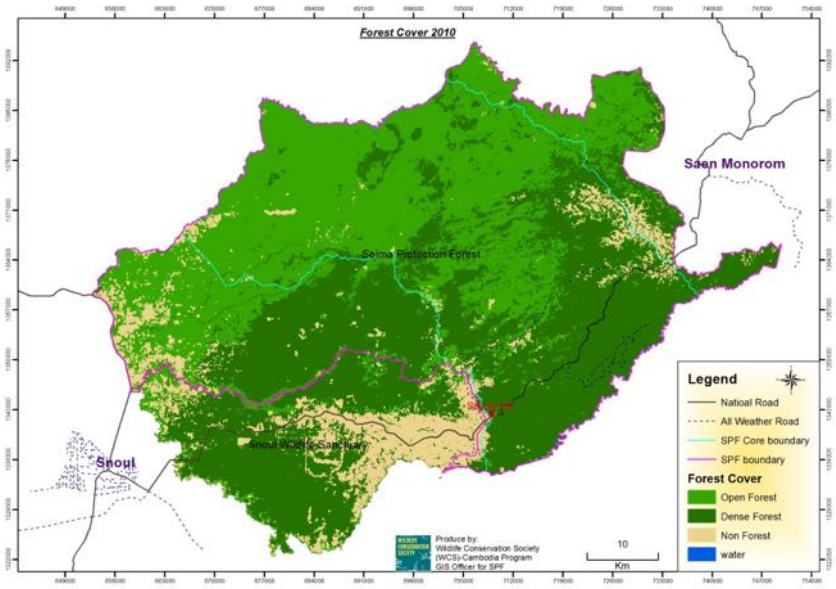
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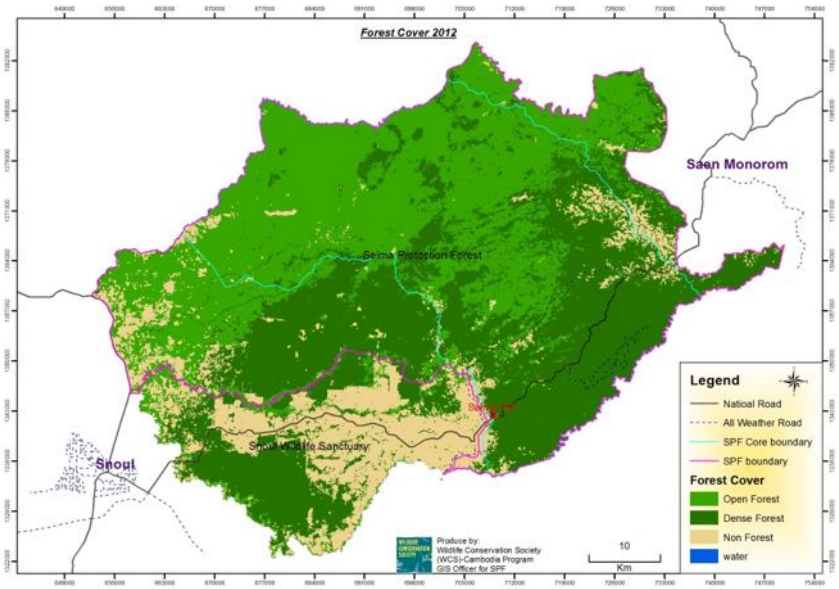
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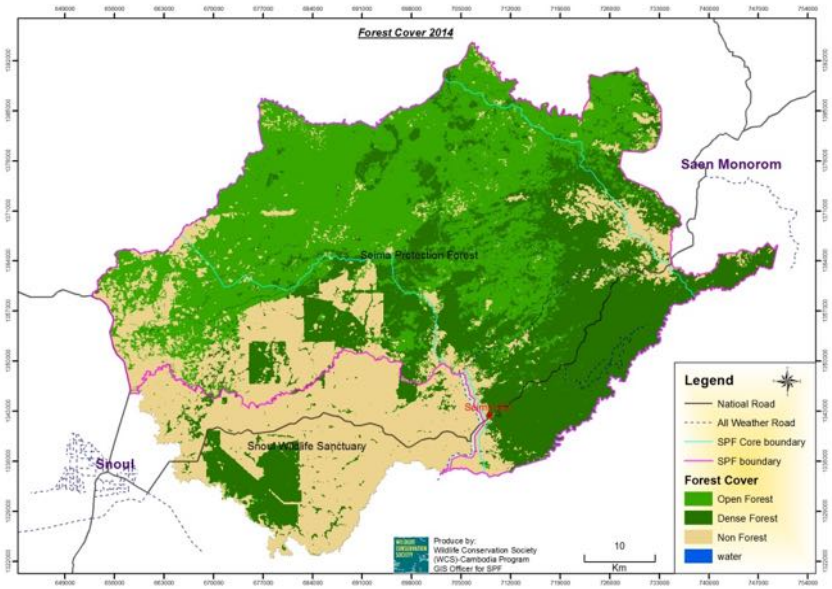
10
Km


Forest Cover 2014
Saen Monorom
Seima Protection Forest
Snoul
Snoul Wildlife Sanctuary
Legend
Natioal Road
All Weather Road
SPF Core boundary
SPF boundary
Forest Cover
Open Forest
Dense Forest
Non Forest
water
Produce by:
Wildlife Conservation Society
(WCS)-Cambodia Program
GIS Officer for SPF
10
Km

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