THE STATUS OF KEY SPECIES IN KEO SEIMA WILDLIFE SANCTUARY 2022

ស្ថានភាពនៃប្រភេទសត្វព្រៃសំខាន់ៗនៅក្នុងដែនជម្រកសត្វព្រៃកែវសីមាឆ្នាំ ២០២២

WCS Cambodia

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EXECUTIVE SUMMARY

Biodiversity monitoring is an important part of protected area management, and is used to inform conservation action strategies and assess the effectiveness of conservation measures. Keo Seima Wildlife Sanctuary (KSWS) has a diverse and mature biodiversity monitoring programme, with the assessment of key species population statuses forming a significant part of this programme. Here we report on the 2022 population survey, updating the previously published 10-year assessment covering 2010-2020 published previously. This update includes the distribution and population size of 13 key species within KSWS.

The population trends of four primate species are encouraging. **Populations of black-shanked douc, Germain's silvered langur, yellow-cheeked crested gibbon, and pig-tailed macaque have all remained stable over the past 12 years** (Fig 1). Considering these species are thought to be in decline globally, maintaining stable populations in KSWS represents a significant conservation success.

Populations of long-tailed macaque, red muntjac, green peafowl, and wild pig have declined significantly in KSWS, with all four species experiencing population reductions of 40-85% since 2010 (Fig 1). Without urgent improvements in protection and conservation effort, these declines are likely to continue. In the 2020 assessment, populations of long-tailed macaque, green peafowl, and wild pig were considered healthy. In only two years, their population trends have worsened, highlighting the intensity and immediacy of the threats that wildlife faces in KSWS.

Populations of banteng, gaur, stump-tailed macaque, Eld's deer, and sambar have completely collapsed in KSWS over the past 12 years (Fig 1). Their densities are now too low to be accurately monitored using line transect methods. Across Cambodia, these species have been lost from areas outside of protected areas for many decades. However even within KSWS, given current population trends and the intensity of threats, it is likely that these species have fallen below the population size threshold needed to support their persistence. Completely removing the drivers of decline may only stall the local extinction of these species within KSWS. However, pairing the removal of drivers with drastic ex-situ conservation work and reintroduction may still provide opportunity for recovery.

Rates of declines in KSWS are likely to be significantly slower than those outside of the protected area, illustrating KSWS' success in mitigating certain threats. In addition, **maintaining stable populations of four globally threatened primate species demonstrates the positive impact of KSWS' management.** Despite the near total loss of four ungulate and one primate species, **urgent action has the potential to reverse declines in long-tailed macaque, red muntjac, green peafowl and wild pig.** Interventions should focus on reducing the use of snares and hunting with dogs, tackling illegal forest clearance, decreasing wildlife trafficking and consumption, and stopping further granting of land concessions in KSWS to private companies. In some cases, ex-situ measures may be needed. Improving the capacity of law enforcement personal and KSWS' managers will accelerate the progress of these interventions.

*Table 1. Global population trend, IUCN Red List status, and Keo Seima Wildlife Sanctuary trends, and 2022 population estimates. * denotes trends based on expert assessment. Population estimates unavailable for five species due to low encounter rates.*

English name	Global trend	IUCN status	KSWS trend	2022 estimate (Number of individuals)
Black-shanked douc	Declining	Critically Endangered	Stable	20,133
Yellow-cheeked crested gibbon	Declining	Endangered	Stable	1,129
Germain's silvered langur	Declining	Endangered	Stable	4,095
Pig-tailed macaque	Declining	Vulnerable	Stable	2,702
Long-tailed macaque	Declining	Endangered	Decreasing	1344
Green Peafowl	Declining	Endangered	Decreasing	234
Wild pig	Stable	Least Concern	Decreasing	282
Red muntjac	Declining	Least Concern	Decreasing	535
Banteng	Declining	Endangered	Decreasing	-
Gaur	Declining	Vulnerable	Decreasing	-
Stump-tailed macaque	Declining	Vulnerable	Decreasing	-
Eld's deer	Declining	Endangered	Decreasing*	-
Sambar	Declining	Vulnerable	Decreasing*	-

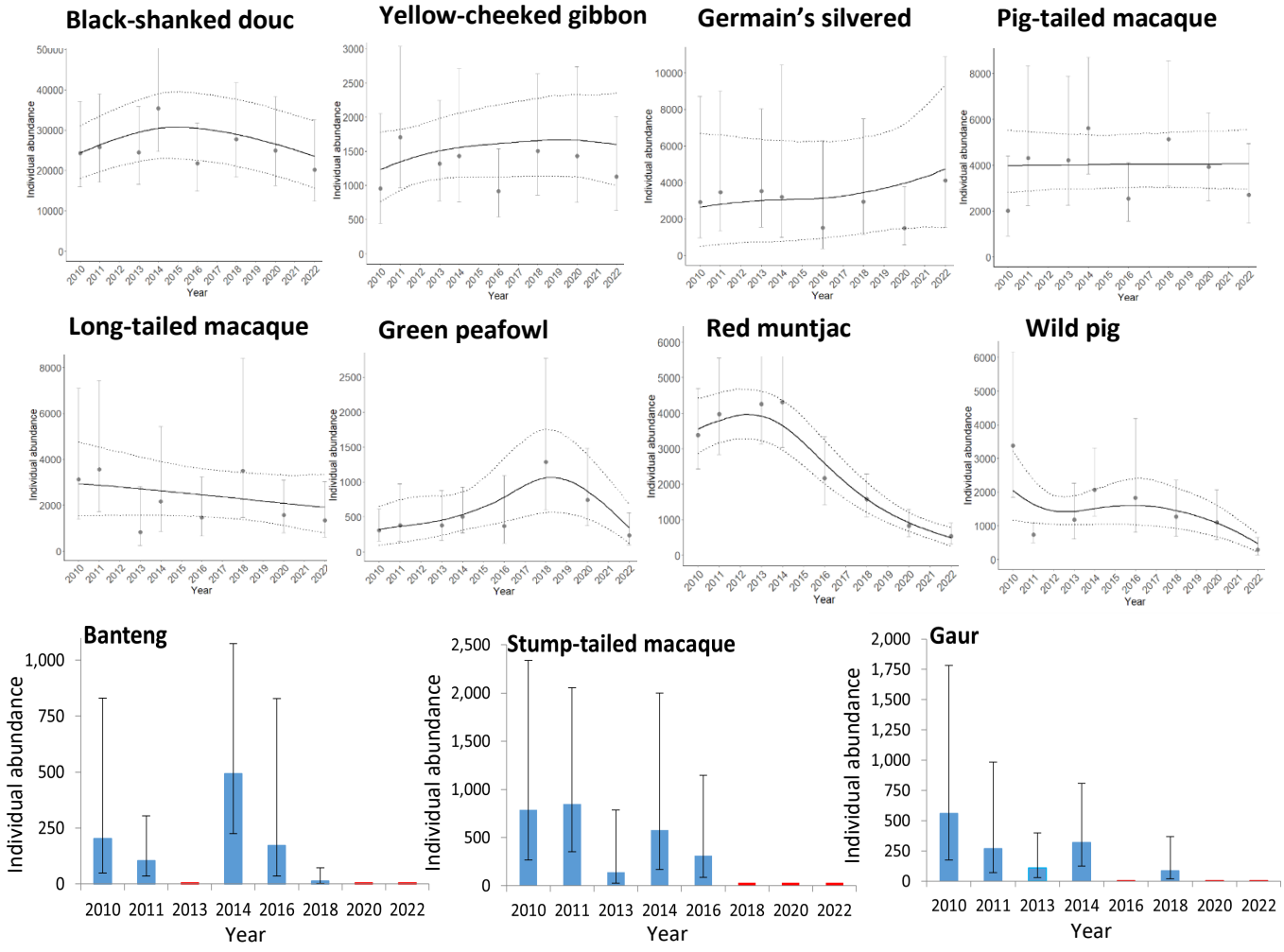


Figure 1. Population assessments and trends for key species in the REDD+ project area of KSWS from 2010-2022. Black lines show population trend, dotted lines show 95% trend confidence intervals. Grey dots show conventional distance sampling estimates and vertical lines show confidence intervals. In the bar charts blue bars represent conventional distance sampling individual annual estimates, adjoined black vertical lines present annual standard error estimates. Red bars show years where sufficient data was not collected to estimate population size.

សេចក្តីសង្ខេប

កម្មវិធីត្រួតពិនិត្យដីរចម្រុះគឺជាផ្នែកសំខាន់មួយនៃការគ្រប់គ្រងតំបន់ការពារធម្មជាតិ កម្មវិធីនេះត្រូវបានប្រើដើម្បីផ្តល់ជាយុទ្ធសាស្ត្រដល់សកម្មភាពអភិរក្សនិងវាយតម្លៃប្រសិទ្ធភាពនៃវិធានការអភិរក្ស។ដែនជម្រកសត្វព្រៃកែវសីមា(KSWS)បានអនុវត្តកម្មវិធីត្រួតពិនិត្យដីរចម្រុះជាយូរមកហើយ ដើម្បីធ្វើការវាយតម្លៃអំពីស្ថានភាពចំនួនប្រភេទសត្វព្រៃសំខាន់ៗនេះជារបាយការណ៍សិក្សាស្រាវជ្រាវឆ្នាំ២០២២ ដោយធ្វើបច្ចុប្បន្នភាពពីរបាយការណ៍វាយតម្លៃ១០ឆ្នាំ (២០១០-២០២០) ដែលបានបោះពុម្ពផ្សាយកន្លងមក។ ការធ្វើបច្ចុប្បន្នភាពនេះដោយរួមបញ្ចូលរបាយ និងចំនួនសត្វព្រៃនៃប្រភេទសំខាន់ៗចំនួន១៣ ប្រភេទដែលមានវត្តមាននៅក្នុងដែនជម្រកសត្វព្រៃកែវសីមា។

របាយការណ៍បានបង្ហាញថាសត្វព្រៃពពួកពានចំនួន ៤ ប្រភេទ រួមមាន **ស្វាកន្ទុយស ទោចថ្ពាល់លឿង ស្វាក្រមា និងស្វាគ្រោស របាយពួកវាគឺមានចំនួនថេរ គិតក្នុងរយៈពេល១២ឆ្នាំកន្លងមកនេះ។**

ដោយហេតុថាប្រភេទសត្វទាំងនេះត្រូវបានគេគិតថាបានរងការគម្រាមកំហែង និងចំនួនរបស់វាកំពុងធ្លាក់ចុះជាសកល ប៉ុន្តែការរក្សាបាននូវចំនួនសត្វព្រៃទាំងនេះឱ្យមានស្ថេរភាពនៅក្នុងដែនជម្រកសត្វព្រៃកែវសីមាគឺបញ្ជាក់ឱ្យឃើញពីភាពជោគជ័យនៃការងារអភិរក្សដ៏សំខាន់នេះ។ ចំនួន**សត្វស្វាក្តាម ឈ្លូស ក្ងោក និងជ្រូកព្រៃ បានធ្លាក់ចុះយ៉ាងខ្លាំងនៅក្នុងដែនជម្រកសត្វព្រៃកែវសីមា** សត្វទាំង៤ប្រភេទនេះរបាយរបស់វាមានការធ្លាក់ចុះពី៤០-៨៥%ចាប់តាំងពីឆ្នាំ២០១០មកប្រសិនបើពុំមានវិធានការការពារនិងអភិរក្សជាបន្ទាន់ទេនោះការថយចុះនៃចំនួនសត្វទាំងនេះនឹងបន្តទៅទៀត។

នៅក្នុងរបាយការវាយតម្លៃឆ្នាំ២០២០ចំនួនសត្វស្វាក្តាម ក្ងោក និងជ្រូកព្រៃត្រូវបានវាយតំលៃថាមានចំនួនកើនឡើង និងចំនួនថេរ។ ក្នុងរយៈពេលតែពីរឆ្នាំប៉ុណ្ណោះរបាយរបស់ពួកវាមានការថយចុះយ៉ាងលឿន ដោយបានគូសបញ្ជាក់ថាមាន កត្តាគំរាមកំហែងដែលសត្វព្រៃប្រឈមនៅក្នុងដែនជម្រកសត្វព្រៃកែវសីមា។

សត្វព្រៃប្រភេទទន្សោង ខ្លឹង ស្វាអង្គត់ រមាំង និងប្រើស ចំនួនរបស់ពួកវាបានថយចុះស្ទើរតែទាំងស្រុងនៅក្នុងដែនជម្រកសត្វព្រៃកែវសីមាក្នុងរយៈពេល១២ឆ្នាំកន្លងមកនេះ។ ដង់ស៊ីតេរបស់ប្រភេទសត្វទាំងនេះគឺទាបពេកដែលមិនអាចត្រួតពិនិត្យបានយ៉ាងត្រឹមត្រូវតាមវិធីសាស្ត្រឆ្លងកាត់បន្ទាត់ត្រង់សិក។ នៅទូទាំងប្រទេសកម្ពុជា ប្រភេទសត្វទាំងនេះត្រូវបានយកចិត្តទុកដាក់ការពារ និងមានការគ្រប់គ្រងបានល្អអស់រយៈពេលជាច្រើនទសវត្សរ៍មកហើយ។ ទោះបីជាយ៉ាងណាក៏ដោយ សូម្បីតែនៅក្នុងដែនជម្រកសត្វព្រៃកែវសីមាដែលបានផ្តល់ព័ត៌មានពីចំនួន និងការគំរាមកំហែងដែលប្រភេទសត្វទាំងនេះបានធ្លាក់ចុះក្រោមកម្រិតមួយដែលយើងចាំបាច់ធ្វើត្រូវការគាំទ្រដល់ការបន្តពូជរបស់ពួកវាឡើងវិញ។

ដូច្នេះទាមទារការលុបបំបាត់ចោលទាំងស្រុងនូវកត្តាគំរាមកំហែងជំរុញនៃការធ្លាក់ចុះទើបអាចបញ្ឈប់ការផុតពូជក្នុងស្រុកនៃប្រភេទសត្វទាំងនេះនៅក្នុងដែនជម្រកសត្វព្រៃកែវសីមា។

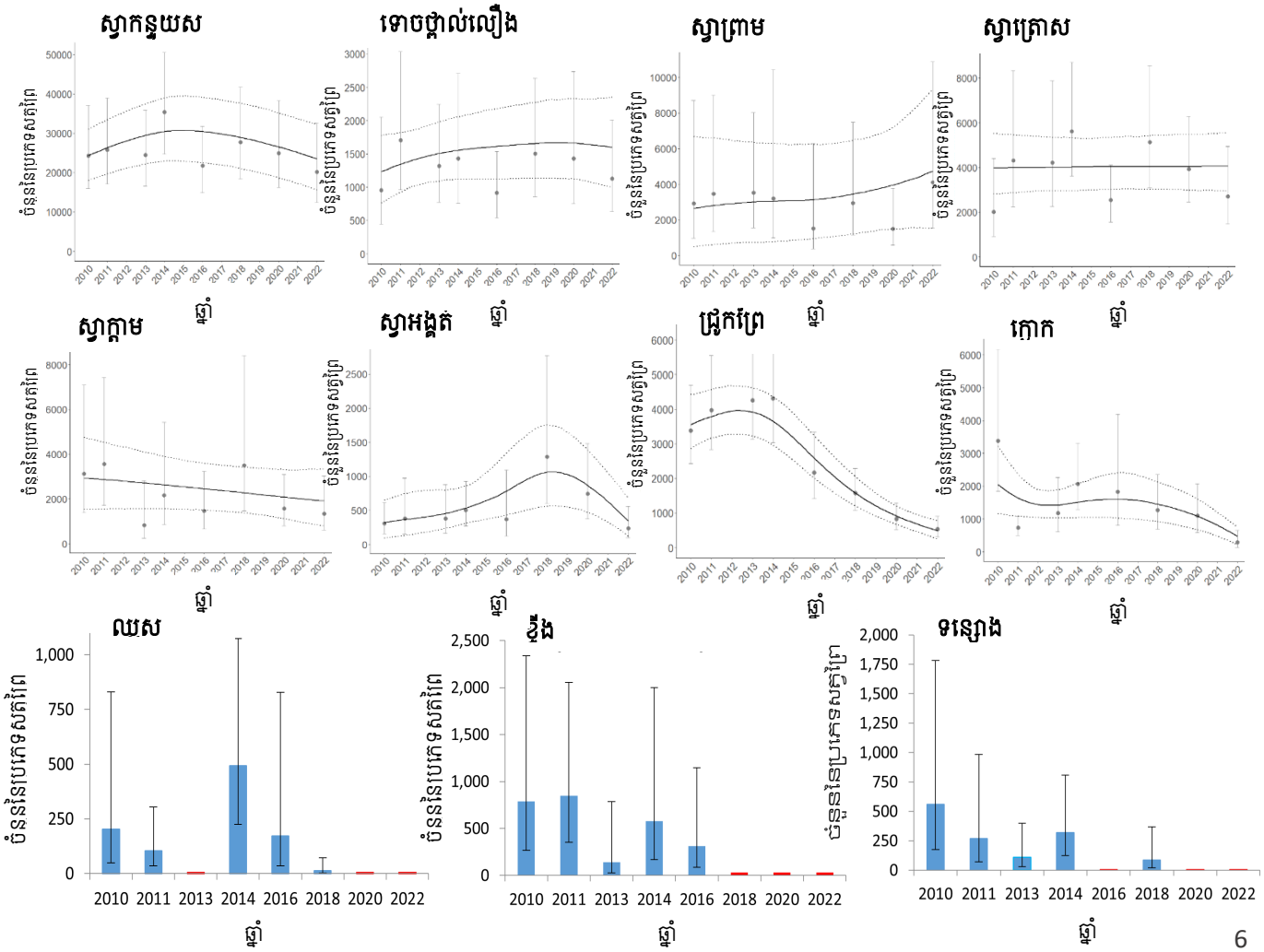
អត្រានៃការធ្លាក់ចុះរបាយសត្វព្រៃនៅក្នុងដែនជម្រកសត្វព្រៃកែវសីមា ទំនងជាមានភាពយឺតយ៉ាវជាងការធ្លាក់ចុះរបាយសត្វព្រៃដែលនៅខាងក្រៅតំបន់ការពារ ដែលនេះបង្ហាញពីភាពជោគជ័យរបស់ដែនជម្រកសត្វព្រៃកែវសីមាក្នុងការកាត់បន្ថយការគំរាមកំហែងមួយចំនួន។ **លើសពីនេះការរក្សាបាននូវចំនួនសត្វព្រៃដែលមានស្ថេរភាពនៃប្រភេទ ពានដែលរងការគំរាមកំហែងជាសាកលចំនួន៤ប្រភេទក៏បង្ហាញពីឥទ្ធិពលវិជ្ជមាននៃការគ្រប់គ្រងរបស់ដែនជម្រកសត្វព្រៃកែវសីមាផងដែរ**។ ទោះបីជាមានការថយចុះស្ទើរតែទាំងស្រុងនៃប្រភេទសត្វក្រចកដំ ពាម ចំនួន៤ប្រភេទ និងប្រភេទសត្វពានរមួយប្រភេទក៏ដោយ **គឺយើងត្រូវមានសកម្មភាពបន្ទាន់ដើម្បីបញ្ឈៀសការថយចុះថែមទៀតនៃពពួកសត្វស្វាក្តាម ឈ្លូស ក្ងោក និងជ្រូកព្រៃផងដែរ។** កិច្ចអន្តរាគមន៍គួរតែផ្តោតលើការកាត់បន្ថយការដាក់អន្ទាក់ ការប្រមាញ់ដោយសត្វឆ្កែ ដោះស្រាយការកាប់រានព្រៃឈើខុសច្បាប់កាត់បន្ថយការជួញដូរ និងការប្រើប្រាស់សត្វព្រៃ និងបញ្ឈប់ការផ្តល់សម្បទានដីបន្ថែមទៀតនៅក្នុងដែនជម្រកសត្វព្រៃកែវសីមាដល់ក្រុមហ៊ុនឯកជន។ ក្នុងករណីខ្លះកម្មវិធីបង្កាត់ពូជក៏ជាតម្រូវការផងដែរ។

ការបង្កើនសមត្ថភាពនៃការអនុវត្តច្បាប់សម្រាប់មន្ត្រី និងអ្នកគ្រប់គ្រងនៅដែនជម្រកសត្វព្រៃកែវសីមា គឺនឹងពន្លឿនដំណើរការនៃកិច្ចអន្តរាគមន៍ទាំងនេះ។

តារាង 1. ស្ថានភាពសត្វព្រៃជាសកល, ស្ថានភាពសត្វព្រៃតាម IUCN, ស្ថានភាពសត្វព្រៃក្នុងដែនជម្រកសត្វព្រៃកែវសីមា, និង ចំនួនប៉ាន់ប្រមាណសត្វព្រៃក្នុងដែនជម្រកសត្វព្រៃកែវសីមា ឆ្នាំ ២០២២(រាប់ជាក្បាល)។
កំណត់ត្រាទិន្នន័យទាំងនេះគឺផ្អែកលើការវាយតម្លៃរបស់អ្នកជំនាញ។

ឈ្មោះសត្វព្រៃ	ស្ថានភាពសត្វព្រៃជាសកល	ស្ថានភាពសត្វព្រៃ តាម IUCN	ស្ថានភាពសត្វព្រៃក្នុងដែនជម្រកសត្វព្រៃកែវសីមា	ចំនួនប៉ាន់ប្រមាណសត្វព្រៃក្នុងដែនជម្រកសត្វព្រៃកែវសីមា ឆ្នាំ ២០២២(ក្បាល)
ស្វាកន្ទុយស	ចំនួនថយចុះ	ប្រភេទជិតផុតពូជបំផុត	ចំនួនថេរ	២០១៣៣
ទោចថ្ពាល់លឿង	ចំនួនថយចុះ	ប្រភេទជិតផុតពូជ	ចំនួនថេរ	១១២៩
ស្វាព្រាម	ចំនួនថយចុះ	ប្រភេទជិតផុតពូជ	ចំនួនថេរ	៤០៩៥
ស្វាគ្រោស	ចំនួនថយចុះ	ប្រភេទកពុងរងការគម្រាមកំហែង	ចំនួនថេរ	២៧០២
ស្វាក្តាម	ចំនួនថយចុះ	ប្រភេទជិតផុតពូជ	ចំនួនថយចុះ	១៣៤៤
ស្វាអង្គត់	ចំនួនថយចុះ	ប្រភេទកំពុងរងការគម្រាមកំហែង	ចំនួនថយចុះ	-
ក្ងោក	ចំនួនថយចុះ	ប្រភេទជិតផុតពូជ	ចំនួនថយចុះ	២៣៤
ជ្រូកព្រៃ	ចំនួនថេរ	ប្រភេទរងគ្រោះតិចតួច	ចំនួនថយចុះ	២៨២
ឈ្លូស	ចំនួនថយចុះ	ប្រភេទរងគ្រោះតិចតួច	ចំនួនថយចុះ	៥៣៥
ទន្សោង	ចំនួនថយចុះ	ប្រភេទជិតផុតពូជ	ចំនួនថយចុះ	-
ខ្លឹង	ចំនួនថយចុះ	ប្រភេទកំពុងរងការគម្រាមកំហែង	ចំនួនថយចុះ	-
រមាំង	ចំនួនថយចុះ	ប្រភេទជិតផុតពូជ	ចំនួនថយចុះ	-
ប្រើស	ចំនួនថយចុះ	ប្រភេទកំពុងរងការគម្រាមកំហែង	ចំនួនថយចុះ	-

រូបភាពទី ១.ការវាយតម្លៃពីរបាយ និងចំនួននៃប្រភេទសត្វព្រៃសំខាន់ៗនៅក្នុងតំបន់គម្រោងរវៀងបូកនៃដែនជម្រកសត្វព្រៃកែវសីមា ពីឆ្នាំ ២០១០ ដល់ឆ្នាំ ២០២២ ។ បន្ទាត់ខ្មៅបង្ហាញពីការប្រែប្រួលនៃចំនួនសត្វព្រៃ បន្ទាត់ចំនុចបង្ហាញពីកំរិតលំអៀង ៩៥ ភាគរយ។
ចំណុចពណ៌ប្រផេះបង្ហាញពីការប៉ាន់ប្រមាណគំរូពីចម្ងាយធម្មតា ហើយបន្ទាត់បញ្ឈរបង្ហាញពីកំរិតលំអៀង។ តារាងរបារបង្ហាញលទ្ធផលប្រចាំឆ្នាំ។ របារពណ៌ខៀវតំណាងឱ្យរបាយប៉ាន់ស្មានប្រចាំឆ្នាំនៃប្រភេទសត្វព្រៃនិមួយៗ ។



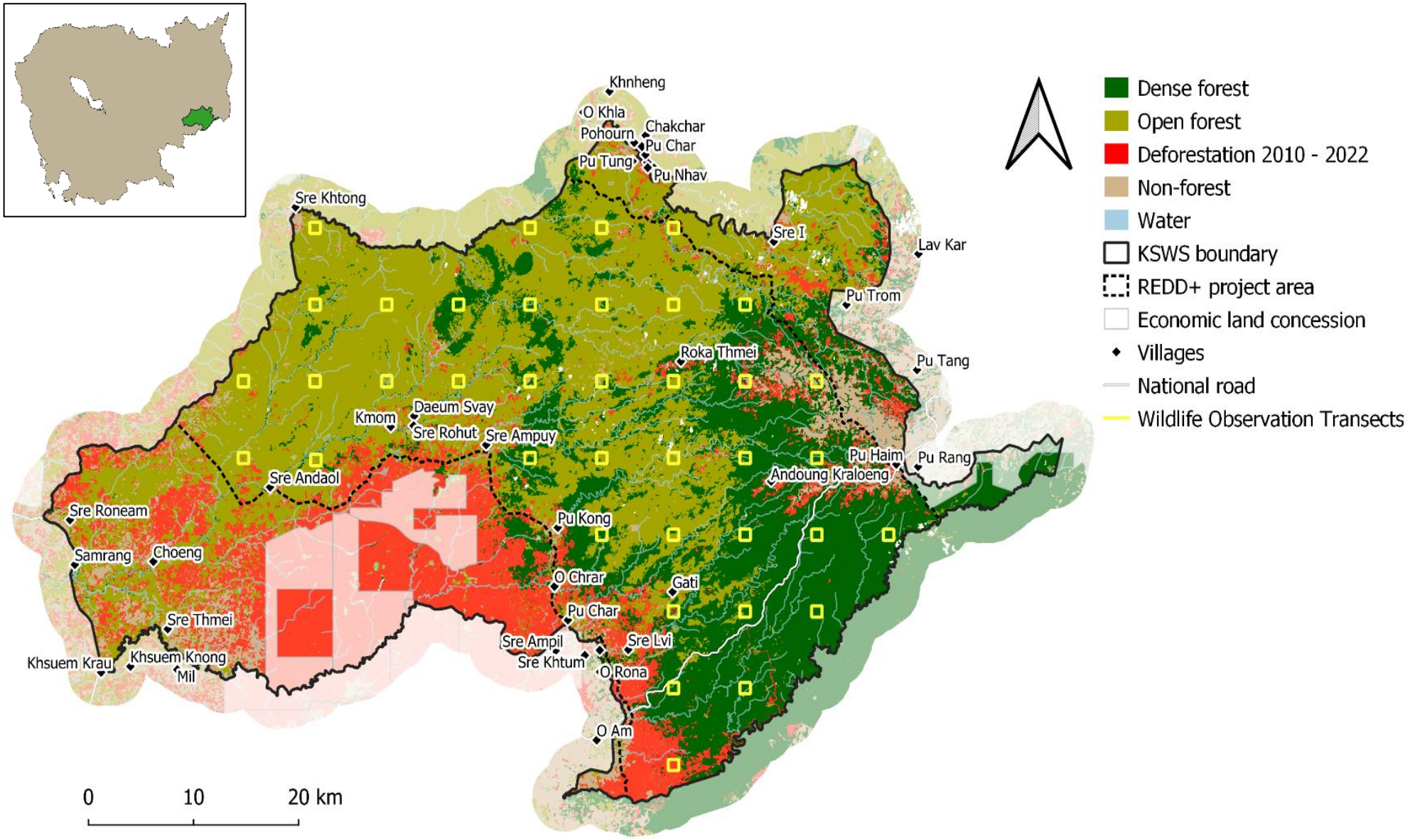


Figure 2. Habitat type and location of survey transects in Keo Seima Wildlife Sanctuary. Inset displays the location of Keo Seima within Cambodia.

INTRODUCTION

Keo Seima Wildlife Sanctuary

Keo Seima Wildlife Sanctuary (KSWS) is a 292,690 ha protected area (PA) located in Mondulkiri and Kratie provinces of eastern Cambodia (WCS Cambodia, 2015). The PA forms part of the Eastern Plains Landscape protected area complex. KSWS is comprised of a mosaic of habitat types, producing a diverse ecosystem rich in contrasting habitats. In the east the Annamite Mountains, recognised as one of Asia's great centres of endemism (Stattersfield et al, 1998), support rich evergreen and semi-evergreen forests. The west of KSWS is comprised of deciduous dipterocarp forest, thought to be one of the most threatened and least effectively protected forest types globally (Janzen, 1988; Hoekstra et al, 2004). Bamboo dominated forests are found in the south and pockets of semi-natural grassland constitute the northwest of the park (Mann, 2010).

With more than 1,000 species, KSWS holds the highest number of species recorded within any Cambodian PA (Griffin, 2019). This includes 85 globally threatened species (including 13 Critically Endangered and 27 Endangered); for many of these, the populations in KSWS are globally or regionally important (WCS Cambodia, 2015). Of particular importance are populations of Asian elephant and the diversity of carnivore, bird, primate, deer, and cattle species.

Accompanying the diversity of wildlife is a rich cultural heritage, with KSWS being the homeland of the Bunong indigenous ethnic group. The Bunong are mostly animists with strong cultural beliefs, who traditionally practise swidden agriculture and natural resource extraction (Pollard and Evans, 2009). Bunong remains the traditional spoken language though Khmer fluency is increasing, mirroring the in-migration of Khmer settlers seen throughout Mondulkiri (Pollard and Evans, 2009).

Key Species Monitoring

Recognising the importance of KSWS's biodiversity and the threats it faces, regular line transect monitoring assessments were initiated in 2005, aiming to monitor the distribution and population of 13 key species (Griffin and Nuttall, 2020). Methodological changes were made in 2010, standardising and increasing the spatial extent of data collection. These methods are still used, with surveys occurring every two years. The strength of this continued monitoring lies in its potential to inform PA management, advise targeted conservation efforts and provide long-term species population trend data. It has become one of Asia's longest running species population monitoring datasets.

In 2020, a 10-year assessment of key species population and distribution trends in 2010-2020 was completed, with the results detailed in Nuttall et al, 2021. The success of the KSWS in protecting arboreal species (those living in trees) was confirmed, with observation of stable population trends. However, populations of most terrestrial species (those living on the ground) declined, with snaring and hunting with dogs identified as the main drivers of declines. The 2022 survey comes at a critical time when the drivers of land use change and species population declines continue to intensify KSWS.

METHODS

Annual population size estimates

In KSWS 39 square transects, each 4km long, are positioned systematically throughout the REDD+ project area, providing an unbiased sample of KSWS' habitats and species distributions (Fig 2). During assessment years, each transect is sampled eight times, using distance sampling methods to collect data when key species are observed. Data are used to model species-specific detection functions, representing the proportion of groups of individuals observed at increasing distances from the transect. Observational data and detection functions are then used to calculate species densities. To refine species density calculations covariates, such as habitat type or time of day are modelled to account for analogous variables. Multiplying species densities by the survey area extrapolates the values to provide density estimates of groups or individuals across the REDD+ project area. For species seen in groups, this value is then multiplied by the average group size to provide individual-level population estimates.

Population trends

Generalised additive models (GAMs) and bootstrapping are used to estimate smoothed population trend curves. The detailed methods used to produce species-specific population trends can be found in Nuttall et al. (2021) https://doi.org/10.1111/csp2.614

Spatial distribution

Using survey effort adjusted species observations, species specific encounter rates are calculated. Encounter rates are interpolated across the REDD+ project area using Kernel density estimates (KDEs), to produce distribution heat maps. Encounter rates are assigned to each transect centroid, giving weight to the species distributions being plotted. Standardised kernel radius is calculated using the number of sampling points and the standard distance between them. Using the same methods, range contractions are calculated using 2010 and 2022 data subsets. Based on the equal interval binning method of encounter rates within the 2010 heat maps, 2022 encounter rates are scaled to fit these the 2010 bins, making the two periods comparable.

RESULTS

This 2022 assessment focuses on the current condition and population trends of key species in KSWS.

STABLE POPULATIONS

Cambodia is a challenging conservation landscape, with the drivers of land use change and the pressures of wildlife exploitation widespread throughout the country. KSWS is able to relieve some of these pressures, though wildlife populations within the PA boundary remain threatened. In this context, maintaining a stable population can be considered a conservation success.

Table 2. Summary of key species with stable populations in KSWS.

English name	Khmer name	Cambodian Law	Global distribution	Importance of KSWS population
Black-shanked douc	ស្វាកន្ទុយស	Rare	Restricted	Global
Yellow-cheeked crested gibbon	ទោចថ្ពាល់លឿង	Rare	Restricted	Global
Germain's silvered langur	ស្វាព្រាម	Common	Unclear	Global
Pig-tailed macaque	ស្វាត្រៃស	Common	Wide	National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BLACK-SHANKED DOUC (*Pygathrix nigripes*)

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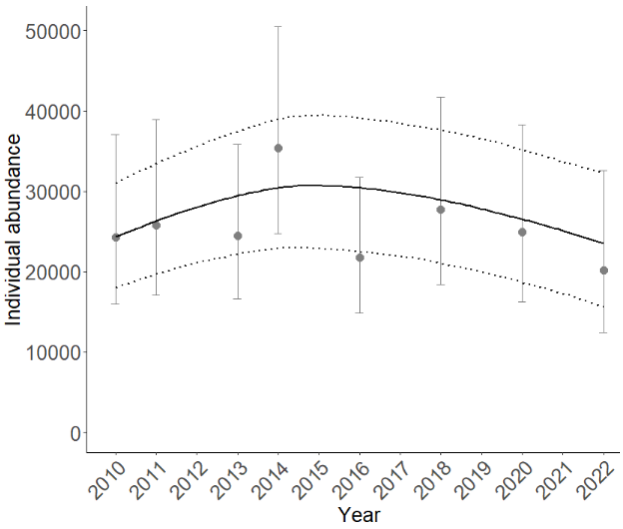


Figure 3. Estimated number of black-shanked douc individuals within KSWS' REDD+ project area from 2010-2022. The black line represents the population trend, with dotted lines denoting 95% confidence intervals. Grey dots show conventional distance sampling estimates, with vertical lines representing estimate confidence intervals.

Population trend

The global population of black-shanked douc is thought to have decreased by more than 50% in the last 36 years (Duc et al, 2021). Within KSWS their populations have remained **stable** over the past 12 years. An estimated 20133 black-shanked douc individuals inhabit KSWS as of 2022, with their KSWS range thought to be the species' stronghold holding the largest global population (*Fig 3*).

Distribution

Black-shanked douc range widely in KSWS within evergreen and semi-evergreen habitats. Within KSWS their highest density is around Andoung Kraloeng village (*Fig 4*).

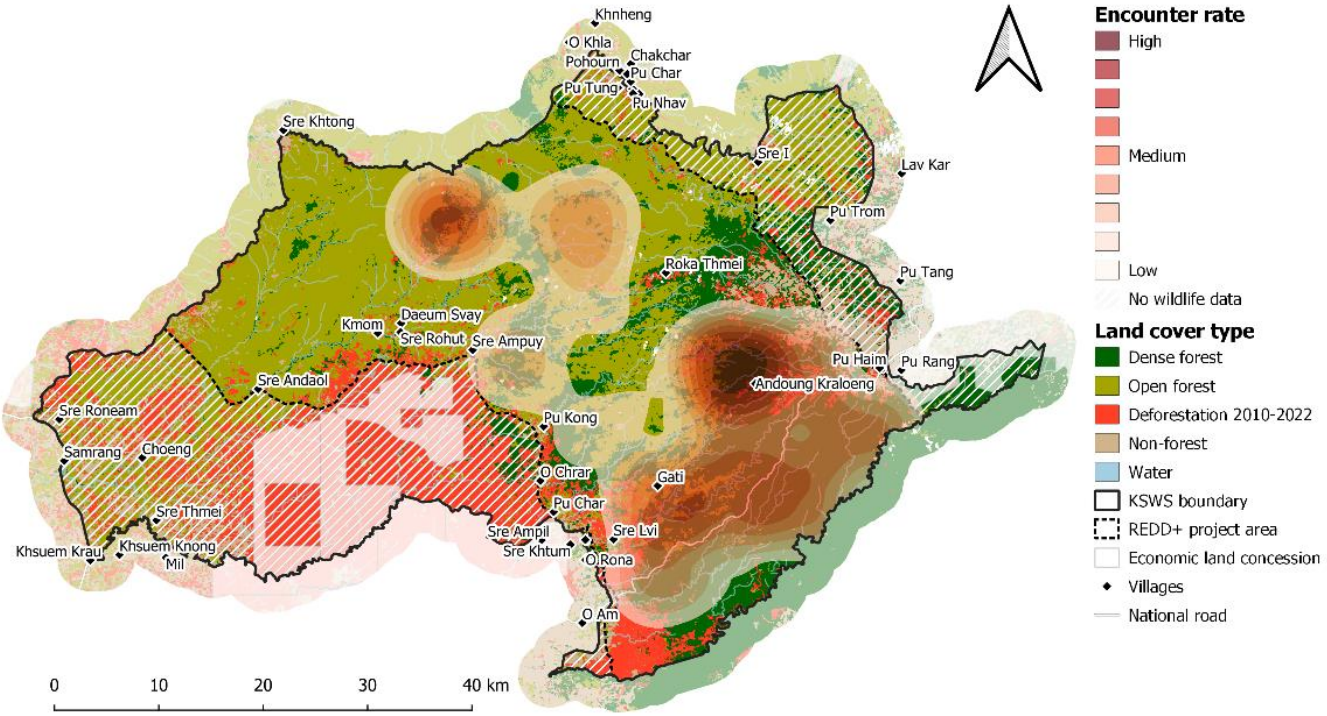


Figure 4. Distribution of black-shanked douc within KSWS' REDD+ project area in 2022.

YELLOW-CHEEKED CRESTED GIBBON (*Nomascus gabriellae*)

EN

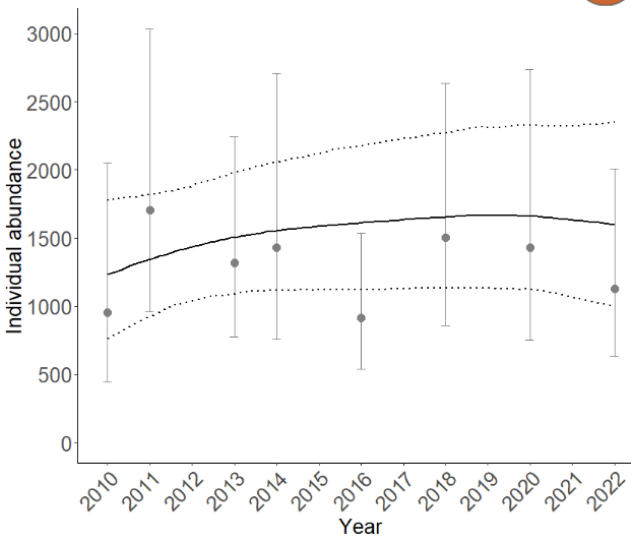


Figure 5. Estimated number of yellow-cheeked crested gibbon individuals in KSWS' REDD+ project area in 2010-2022. The black line represents the population trend, with dotted lines denoting 95% confidence intervals. Grey dots show conventional distance sampling estimates, with vertical lines representing estimate confidence intervals.

Population trend

Populations of southern yellow-cheeked crested gibbon are thought to be decreasing globally (Rawson et al, 2020). An estimated 1129 individuals occupy KSWS, with their populations remaining **stable** over the past 12 years. This stability makes the KSWS population particularly important as populations decline outside of this range. In addition this population is thought to be the largest globally (*Fig 5*).

Distribution

Southern yellow-cheeked crested gibbons range widely in KSWS, in evergreen and semi-evergreen habitats. Their highest densities are found around O'Khtung and Andoung Kraloeng villages (*Fig 6*).

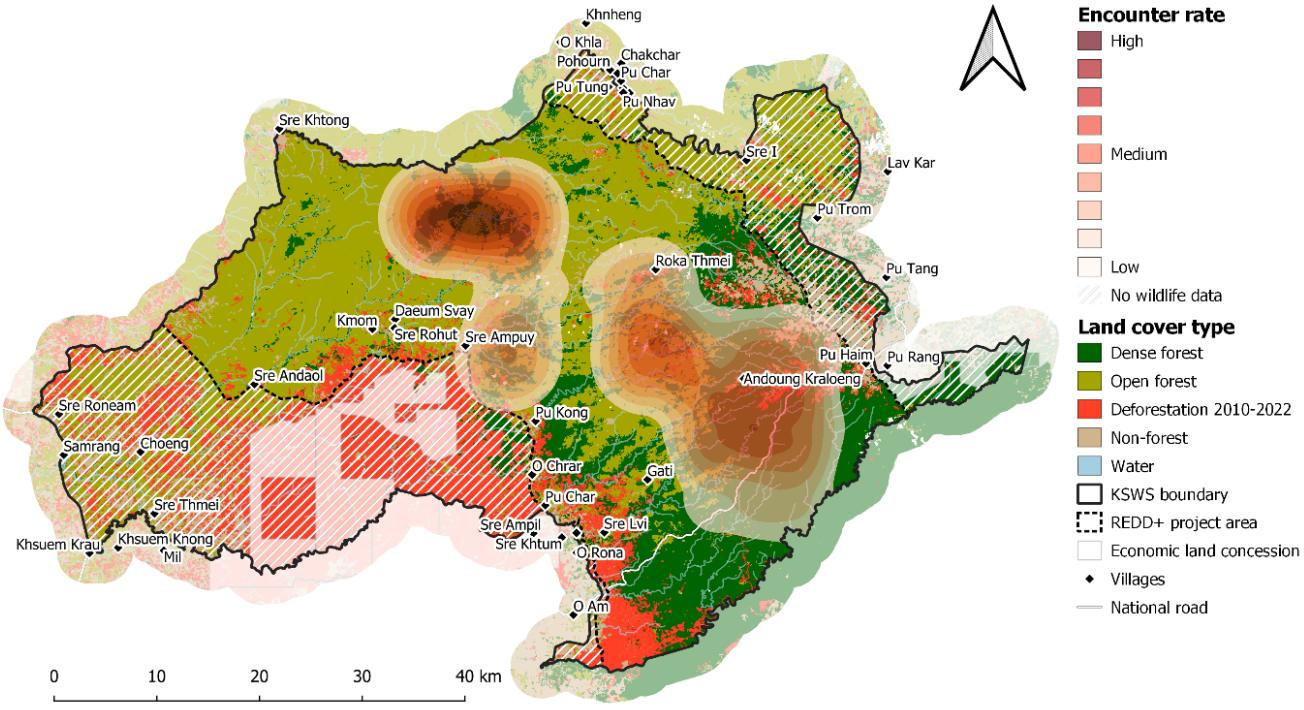
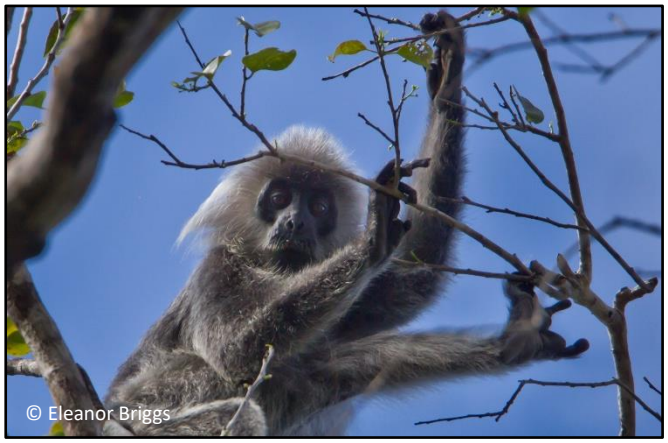


Figure 6. Distribution of southern yellow-cheeked crested gibbon within KSWS' REDD+ project area in 2022.

GERMAIN'S SILVERED LANGUR (*Trachypithecus germaini*)

EN



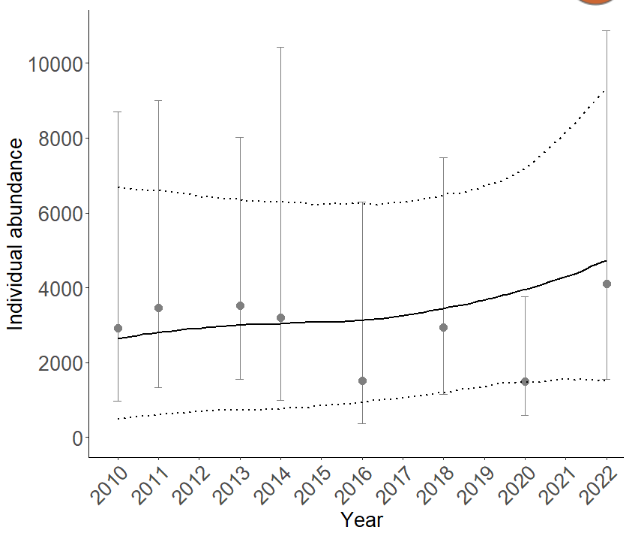


Figure 7. Estimated number of Germain's silvered langur individuals within KSWS' REDD+ project area in 2010-2022. The black line represents the population trend, with dotted lines denoting 95% confidence intervals. Grey dots show conventional distance sampling estimates, with vertical lines representing estimate confidence intervals.

Population trend

The global population of Germain's silvered langur is thought to have declined by 50% over the last 36 years (Duc et al, 2022), and KSWS represents an important site for this species. Within KSWS populations have fluctuated but remained **stable** over the past 12 years, with an estimated 4,095 individuals inhabiting KSWS in 2022 (*Fig 7*).

Distribution

Germain's silvered langur have a restricted range in KSWS, with populations confined to the northern semi-evergreen forests around O'Khtung where they are found in very high densities. Individuals have been reported outside of these areas, however these scattered individuals are likely to be at low densities (*Fig 8*).

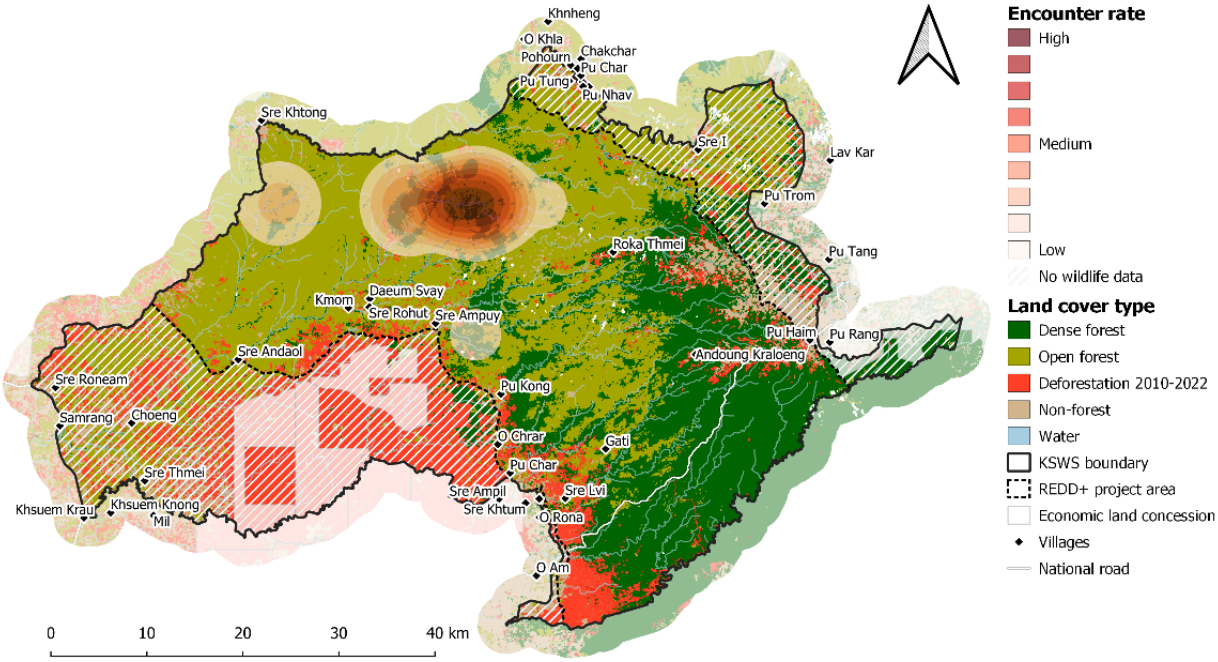


Figure 8. Distribution of Germain's silvered langur within KSWS' REDD+ project area

PIG TAILED MACAQUE (*Macaca leonina*)

VU

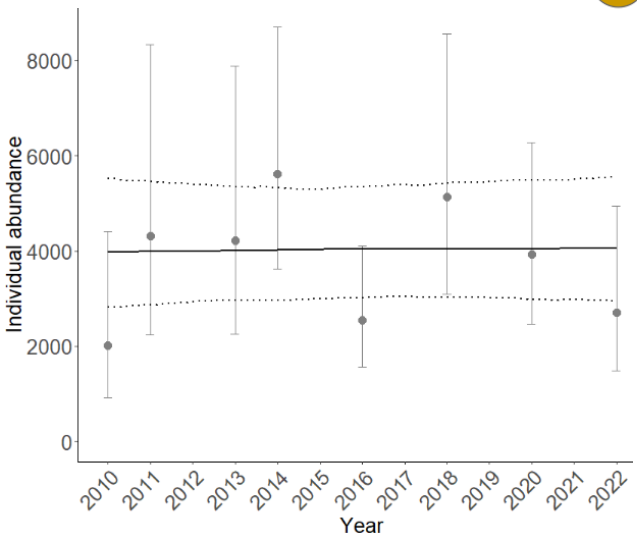


Fig 9. Estimated number of northern pig-tailed macaque individuals within KSWS' REDD+ project area in 2010-2022. The black line represents population trend, with dotted lines denoting 95% confidence intervals. Grey dots show conventional distance sampling estimates, with vertical lines representing estimate confidence intervals.

Population trend

Northern pig-tailed macaques are thought to have declined by over 30% globally in the last 36 years (Boonratana et al, 2022). The KSWS population has remained **stable** over the past 12 years. In 2022 an estimated 2,702 pig-tailed macaque individuals inhabit KSWS (*Fig 9*).

Distribution

Northern pig-tailed macaques range widely within KSWS's evergreen and semi-evergreen habitats. Their highest densities are found near O'Khtung village (Fig 10).

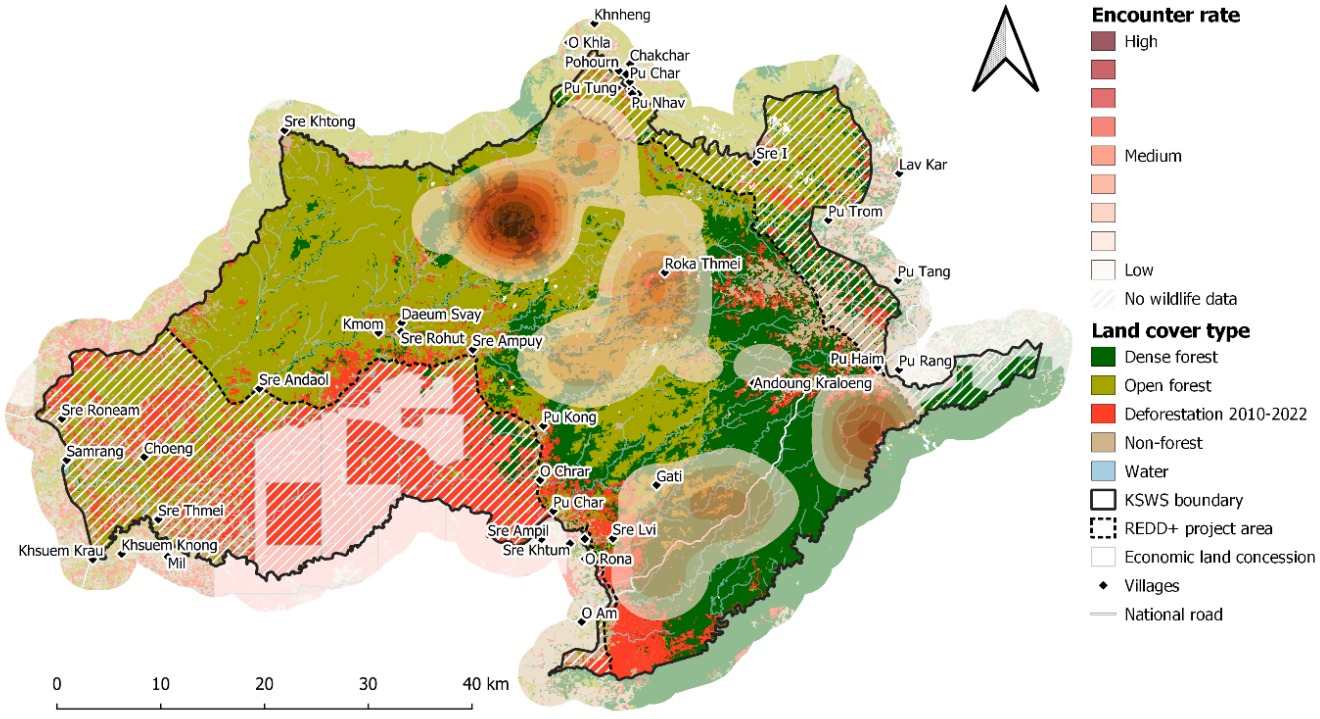


Figure 10. Distribution of northern pig-tailed macaque within KSWS' RED+ project area in 2022.

Declining populations

Although KSWS is able to reduce the impact of certain threats, for some species this mitigation is inadequate. These are the species to watch closely as management decisions are made.

Table 3. Summary of key species with declining populations in KSWS.

English name	Khmer name	Cambodian Law	Global distribution	Importance of KSWS population
Long-tailed macaque	ស្វាក្តាម	Common	Wide	-
Green peafowl	ក្ងោក	Rare	Restricted	Global
Red muntjac	ឈ្លូស	Common	Wide	-
Wild pig	ជ្រូកព្រៃ	Common	Very wide	-

LONG-TAILED MACAQUE (*Macaca fasciularis*) DOWN 49-55% in 12 years

EN

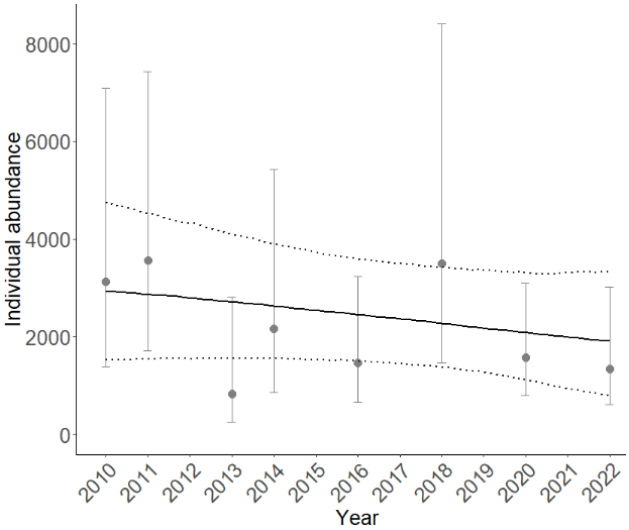


Figure 11. Estimated number of long-tailed *macaque individuals within KSWS' REDD+ project area from 2010-2022. The black line represents the population trend, with dotted lines denoting 95% confidence intervals. Grey dots show conventional distance sampling estimates, with vertical lines representing estimate confidence intervals.*

Population trend

Though wide ranging in southeast Asia, long-tailed macaque populations are thought to be slowly declining (Hansen et al, 2022). Their population in KSWS appeared stable in 2020, but the 2022 KSWS reassessment has clarified fluctuations and confirmed that the population is gradually **declining**. In 2022, the KSWS population consists of and estimated 1,344 individuals (Fig 11).

Distribution

Long-tailed macaques are habitat generalists, but in the south of KSWS sites around Sre Lvi and Kati represent important areas. O'Khtung also supports high densities (Fig 12).

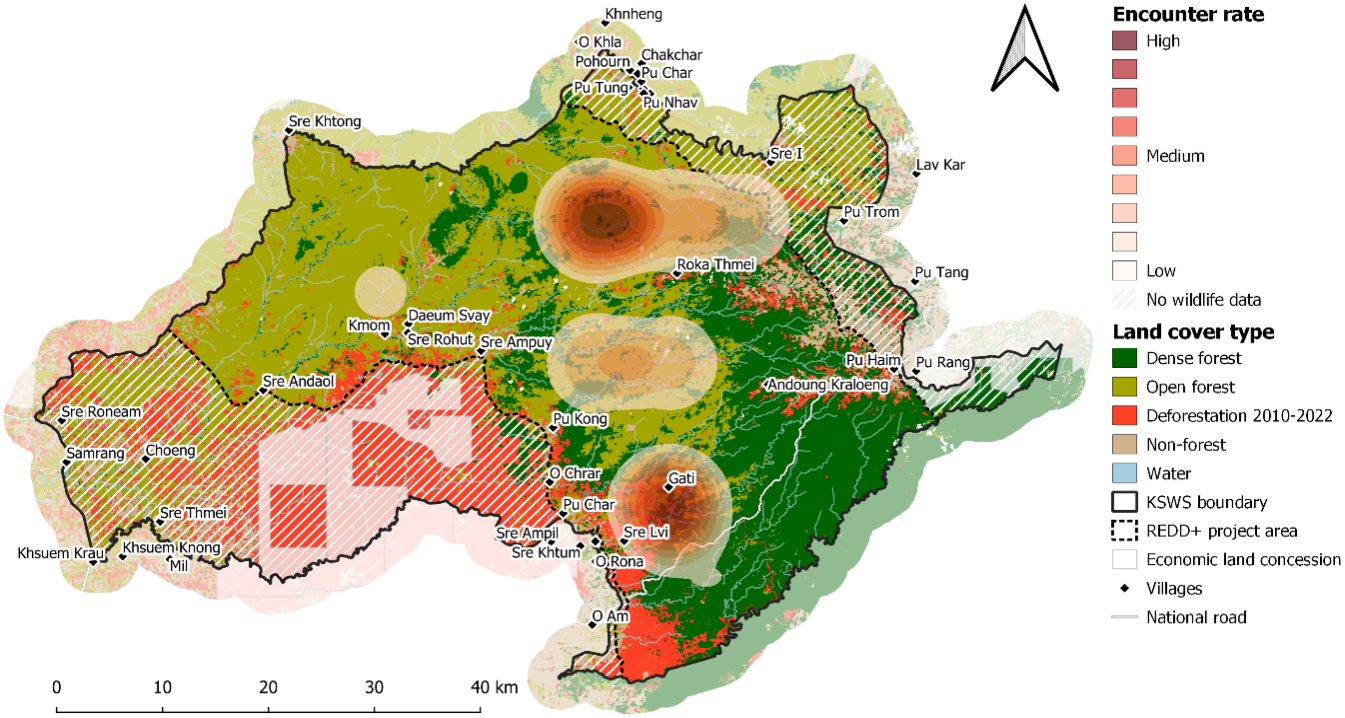
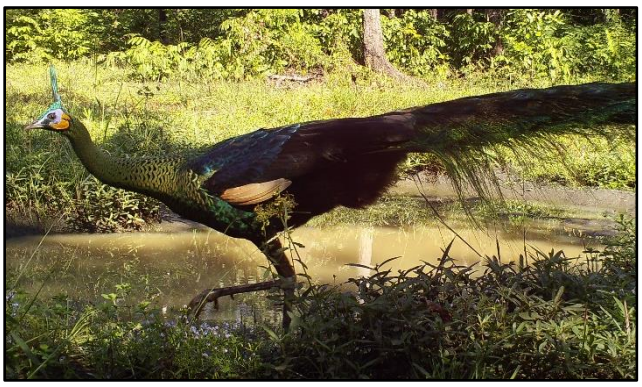


Figure 12. Distribution of long-tailed macaque within KSWS' REDD+ project area in 2022.

GREEN PEAFOWL (*Pavo muticus*)

DOWN 40-64% in 8 years

EN



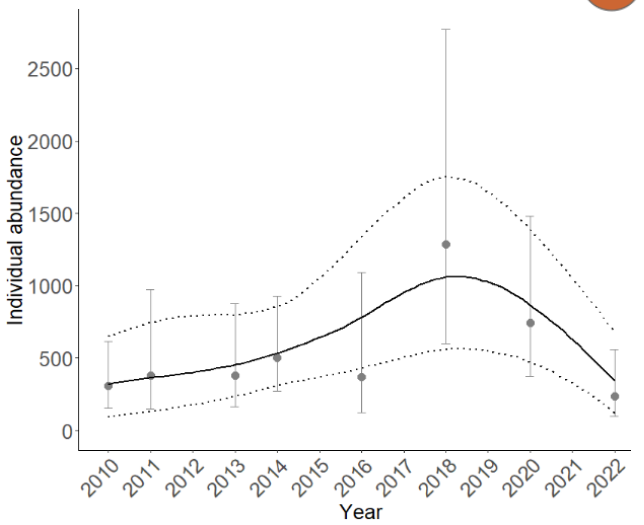


Figure 13. Estimated number of green peafowl *individuals within KSWS' REDD+ project area from 2010-2022. The black line represents the population trend, with dotted lines denoting 95% confidence intervals. Grey dots show conventional distance sampling estimates, with adjoined vertical lines representing estimate confidence intervals.*

Population trend

The global population of green peafowl is thought to be 10,000-20,000 mature individuals, and decreasing (Birdlife International, 2018). The 2020 KSWS population assessment categorized green peafowl as increasing. However, the 2022 survey revealed that the sharp **decline** in population size after 2018 has continued. KSWS now contains an estimated 234 individuals, the lowest population size since the beginning of the key species population assessment in 2010 (Fig 13).

Distribution

Green peafowl favor dry deciduous dipterocarp and open forest types. In KSWS their distributions are patchy, with high densities around the Sre Pleng area, which contains one of KSWS' largest trapaengs (Fig 14).

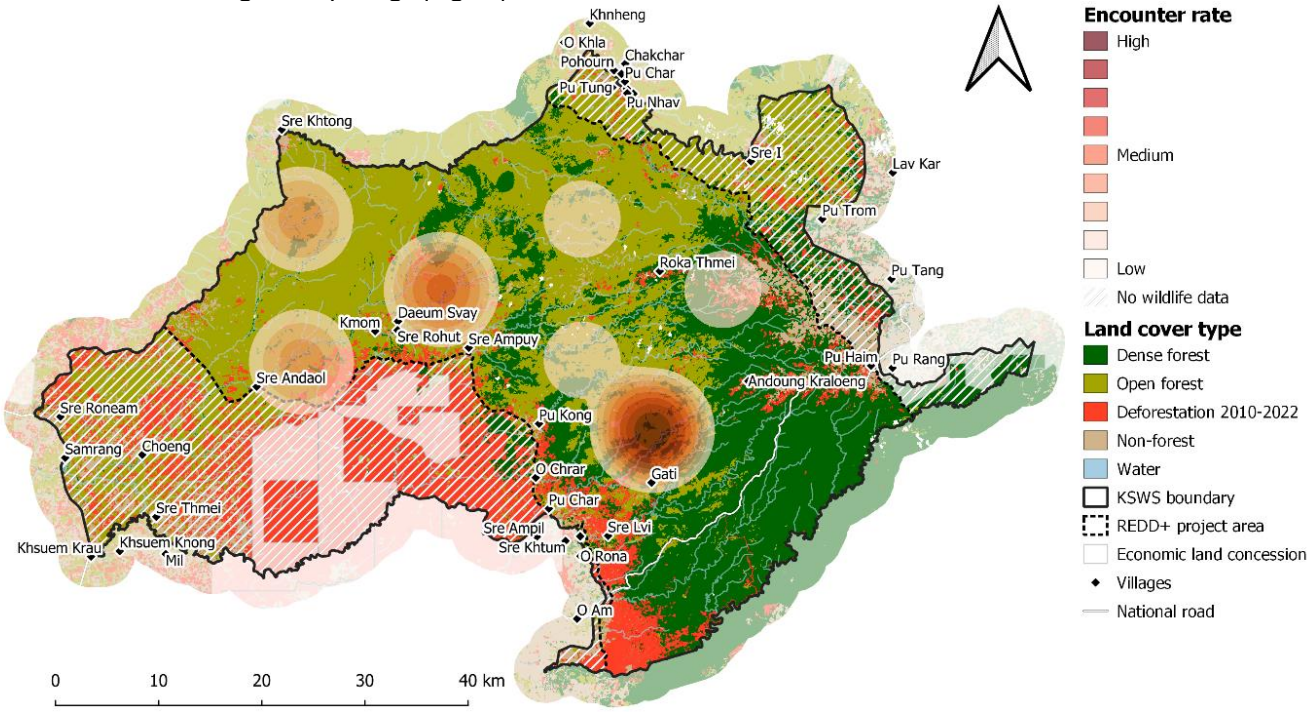


Figure 14. Distribution of green peafowl within KSWS' REDD+ project area in 2022.

Range contraction

Significant populations were once found in the dry deciduous dipterocarp and semi-evergreen forests of the Sandal and Sre Chhouk areas. Now reduced densities are confined to the areas surrounding Sre Chhok and Sre Pleng (Fig 15).

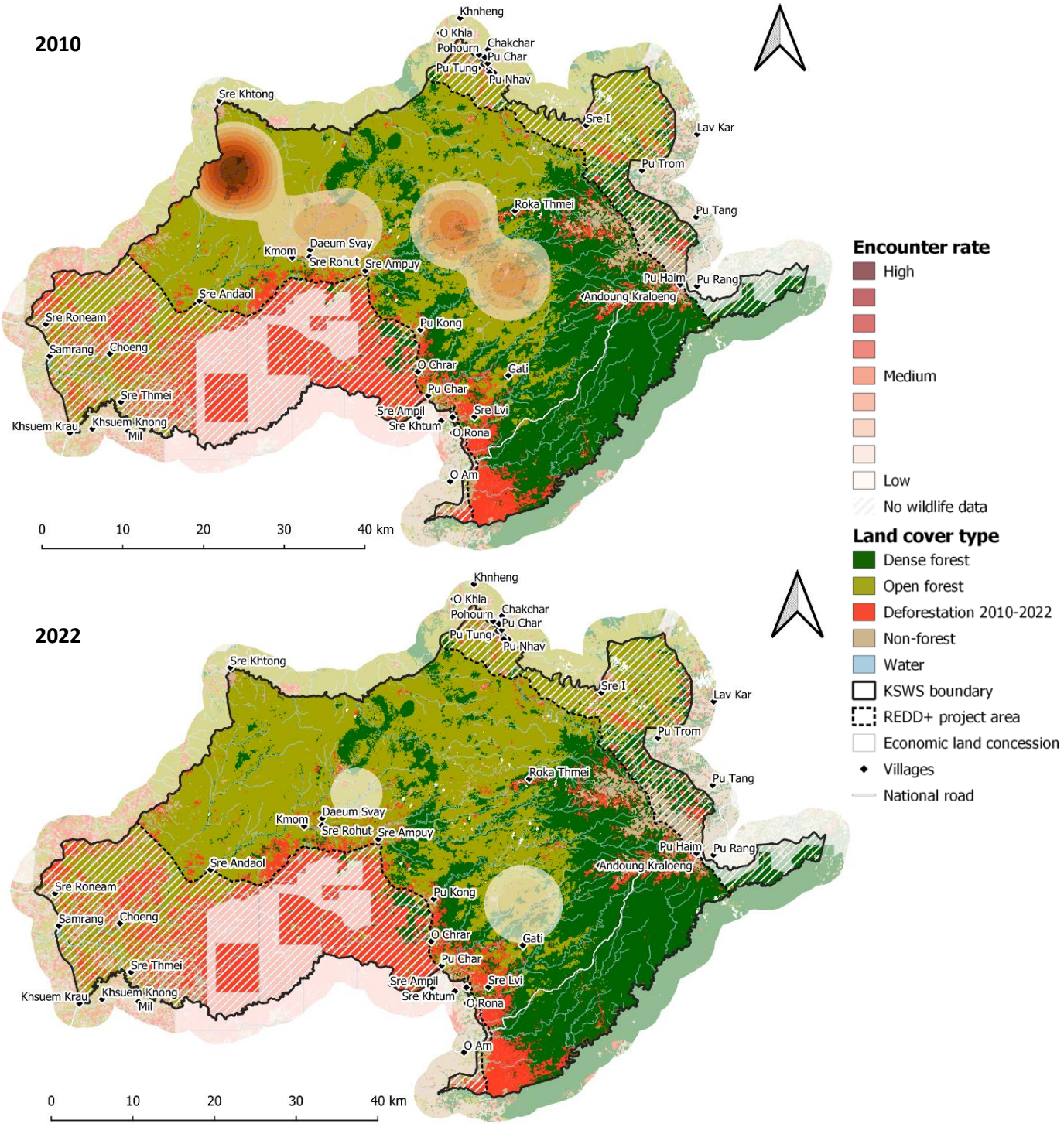


Figure 15. Distribution of green peafowl in 2010 (top) and 2022 (bottom). Distributions in lower panel adjusted to match the scale used on the 2010 map to facilitate direct comparison.

NORTHERN RED MUNTJAC (*Muntiacus vaginalis*) DOWN 80-86% in 12 years

LC

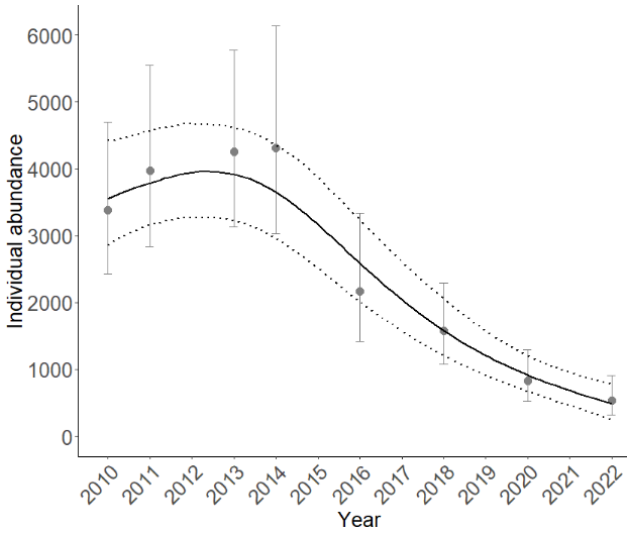


Figure 16. Estimated number of northern red muntjac individuals within KSWS' REDD+ project area from 2010-2022. The black line represents the population trend, with dotted lines denoting 95% confidence intervals. Grey dots show conventional distance sampling estimates, with vertical lines representing estimate confidence intervals.

Population trend

The global population of red muntjac is unknown but likely large, though it is thought to be declining across it's range (Timmins et al, 2016). The consistent **decline** of red muntjac in KSWS since 2013 is continuing, with an estimated 535 individuals currently inhabiting KSWS (Fig 16).

Distribution

Red muntjac range widely at low densities in dry deciduous dipterocarp and open forest types in KSWS. Their highest densities are found in the areas surrounding Roka Thmei and Sre Ronyav (Fig 17).

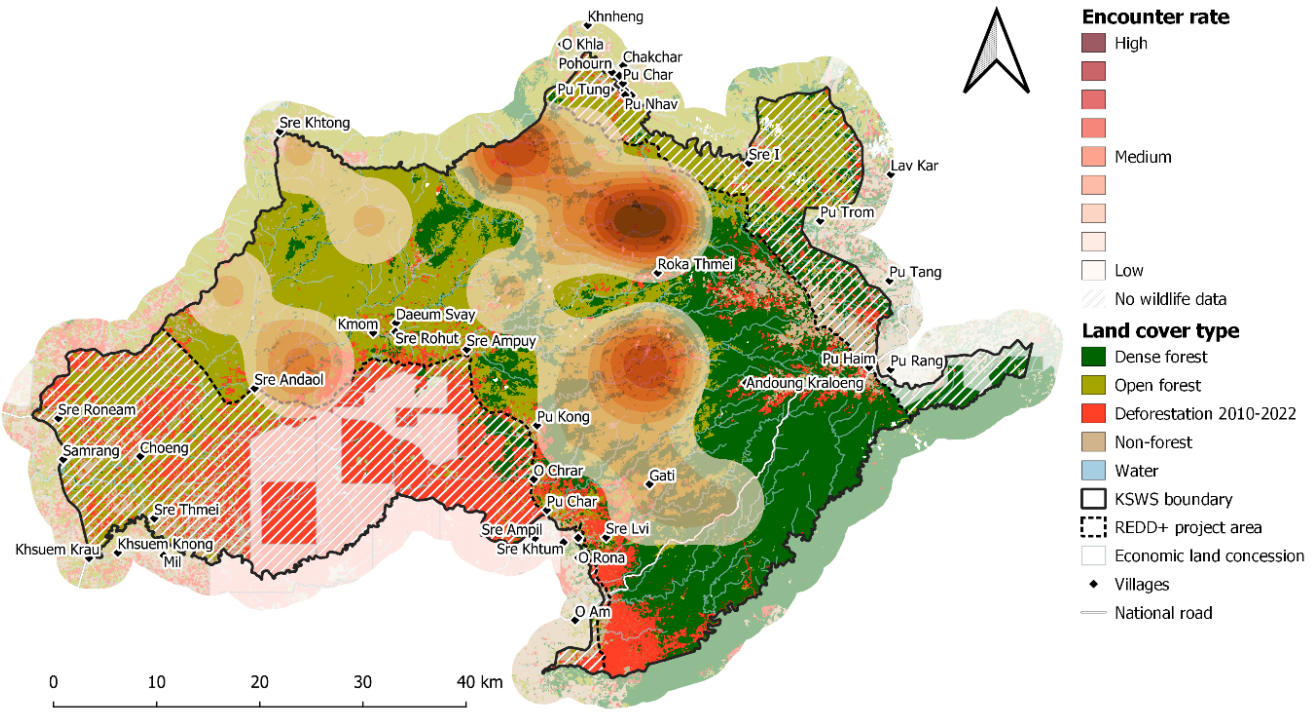


Figure 17. Distribution of red muntjac within KSWS' REDD+ project area in 2022.

Range contraction

Once widely distributed within dry deciduous dipterocarp and semi-evergreen forests, population declines have led to harsh range contractions, with the remaining largest distribution near O'Khtung area (Fig 18).

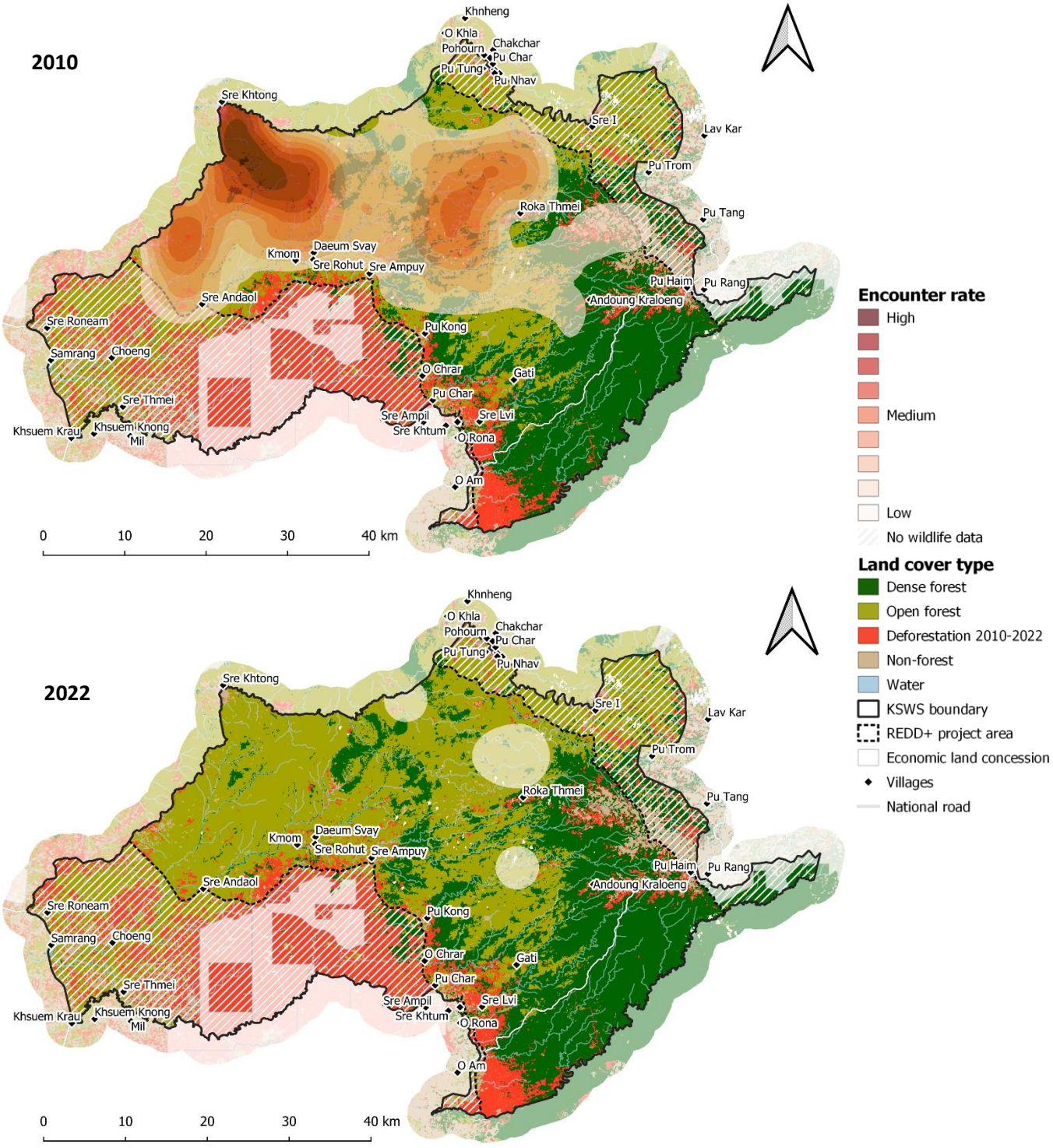


Figure 18. Distribution of red muntjac in 2010 (top) and 2022 (bottom). Distributions in lower panel adjusted to match the scale used on the 2010 map to facilitate direct comparison.

WILD PIG (*Sus scrofa*)

DOWN 65-83% in 12 years

LC

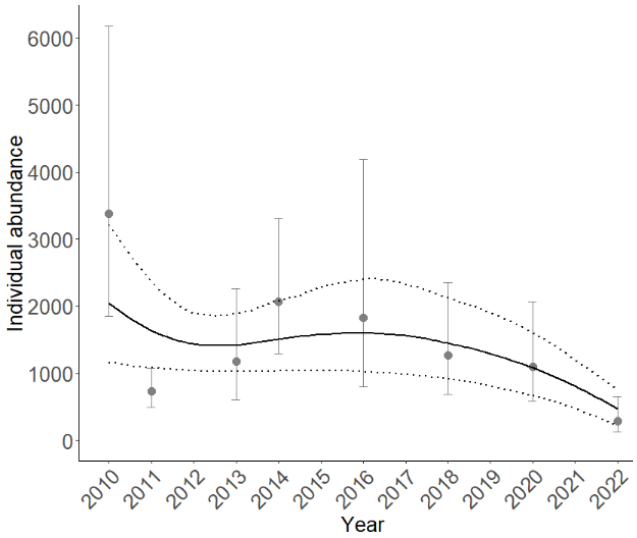


Fig 19. Estimated number of wild pig individuals within KSWS' REDD+ project area in 2010-2022. The black line represents the population trend, with dotted lines denoting 95% confidence intervals. Grey dots show conventional distance sampling estimates, with vertical lines representing estimate confidence intervals.

Population trend

The global population of wild pig is unknown but likely large given its broad global range (Keuling and Leus, 2019). Wild pig populations naturally fluctuate, however the consistent decline seen since 2016 in KSWS is likely a response to increasing pressures on the population. An estimated 282 wild pig individuals inhabit KSWS in 2022 (Fig 19).

Distribution

The distribution of wild pigs in KSWS is now restricted. Remaining individuals are clustered around O'Am, Sre Andaol and O'Khtung (Fig 20).

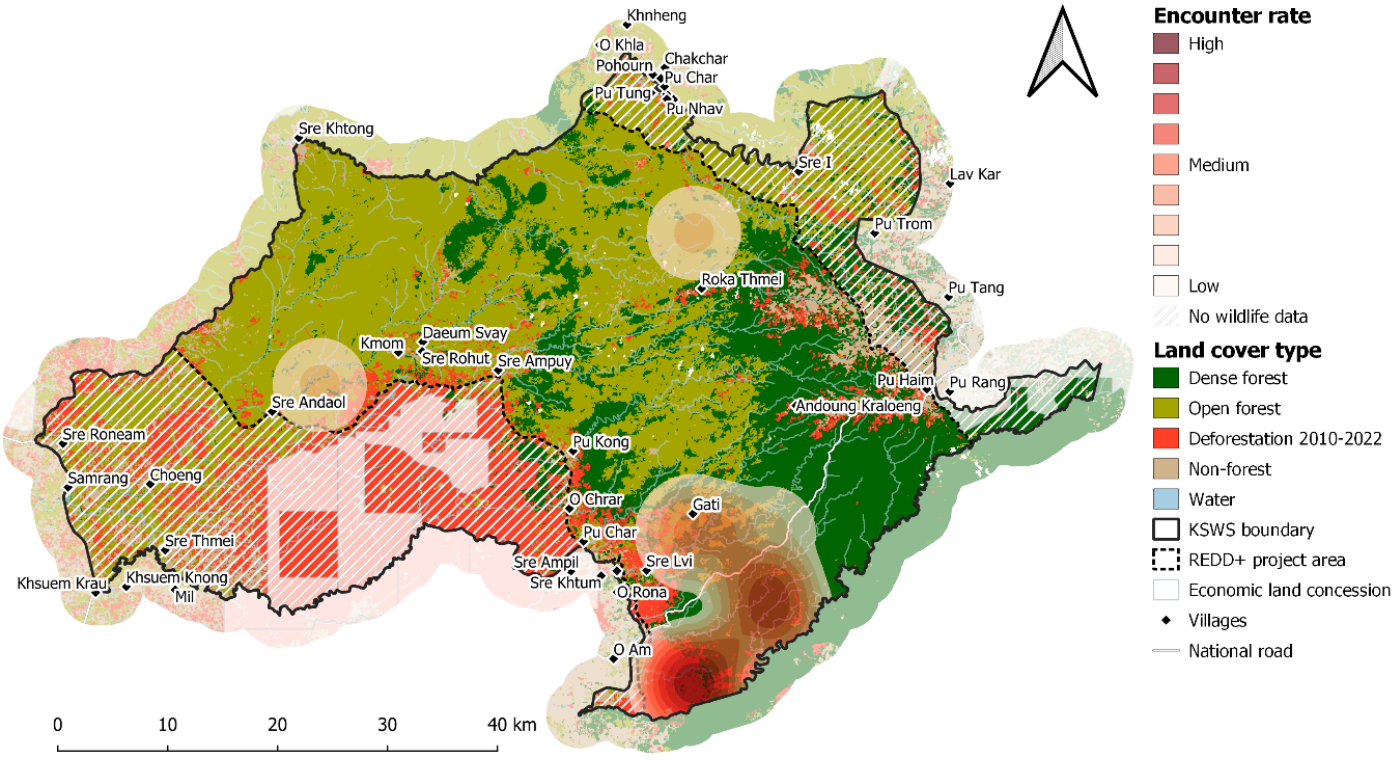


Figure 20. Distribution of wild pig within KSWS' REDD+ project area in 2022.

Range contraction

The stronghold of the species is now restricted to southern KSWS, north of the O'Am area (Fig 21), although wild pig are likely to exist at very low densities outside of this range.

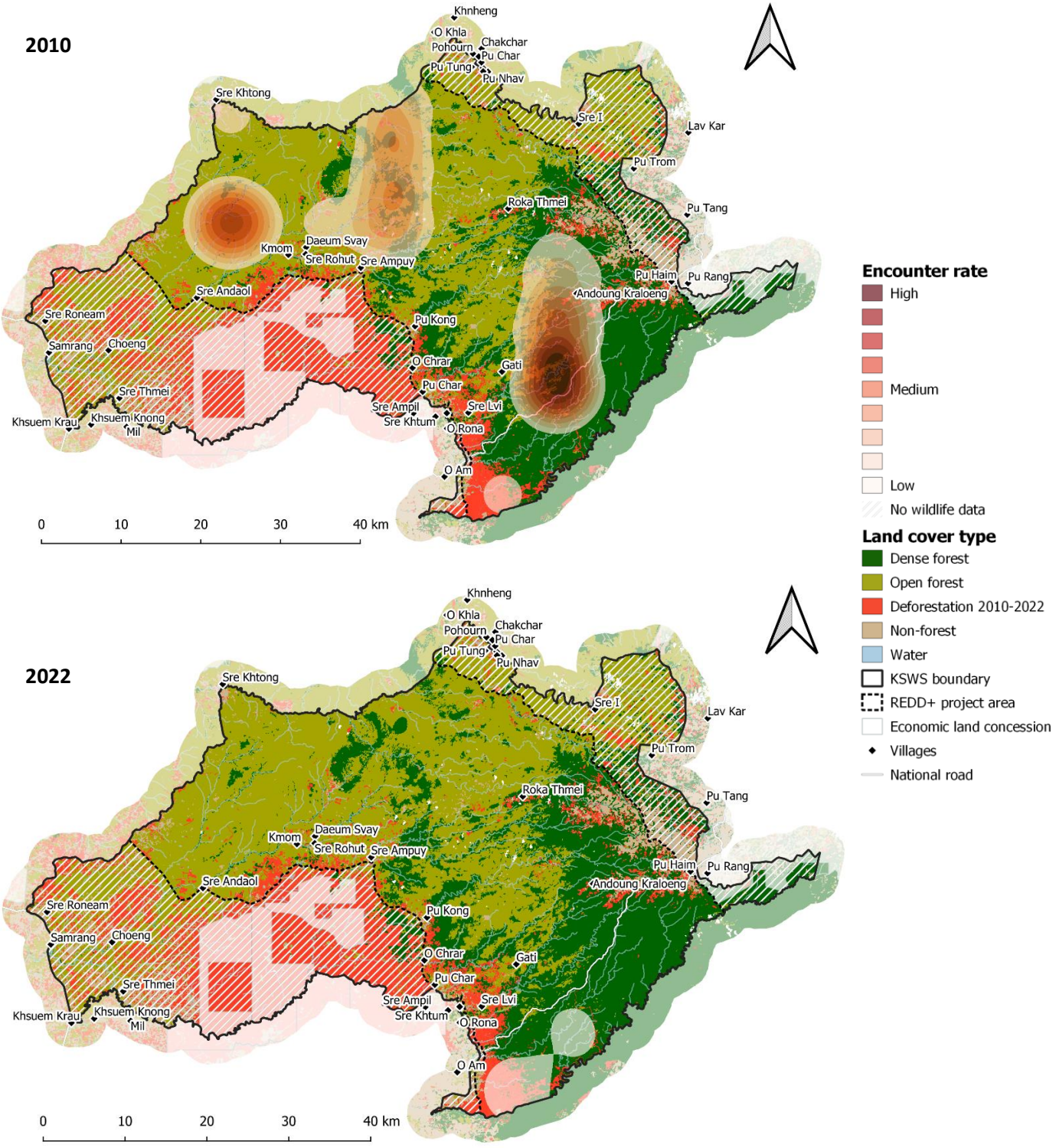


Figure 21. Distribution of wild pig in 2010 (top) and 2022 (bottom). Distributions in lower panel adjusted to match the scale used on the 2010 map to facilitate direct comparison.

NEAR LOCAL EXTINCTION

The population densities of the four species included in this section are very low; no detections were made during the 2022 survey, despite observers walking a total of 1,260km. This yields an encounter rate of less than 0.0008 individuals per kilometre. The size of such small populations cannot be reliably estimated, therefore it is difficult to apply the standardised metrics that have been used used to estimate trends for other key species in KSWS. Without considerable conservation effort and expenditure, or in some cases ex-situ breeding programmes, these population crashes are likely to be irreversible.

Threats: Deforestation and degradation, Hunting for consumption, Snaring, Hunting with dogs.

Table 4. Summary of key species with stable populations in KSWS.

English name	Khmer name	Cambodian Law	Global distribution	Importance of KSWS population
Banteng	ទន្សោង	Rare	Restricted	Global
Gaur	ខ្ទីង	Rare	Restricted	Regional
Stump-tailed macaque	ស្វាអង្គត់	Common	Wide	Regional
Eld's deer	រមាំង	Endangered	Restricted	Regional
Sambar deer	ប្រើស	Common	Wide	Possibly regional




BANTENG (*Bos javanicus*)

Banteng were last formally sighted during transect observations in 2018. Focused camera trapping efforts have been made to confirm whether the species is still present in KSWS. Images containing two large males were taken in May 2022 (Fig 22). It is therefore likely that the species is present in greatly reduced population sizes (Fig 23).

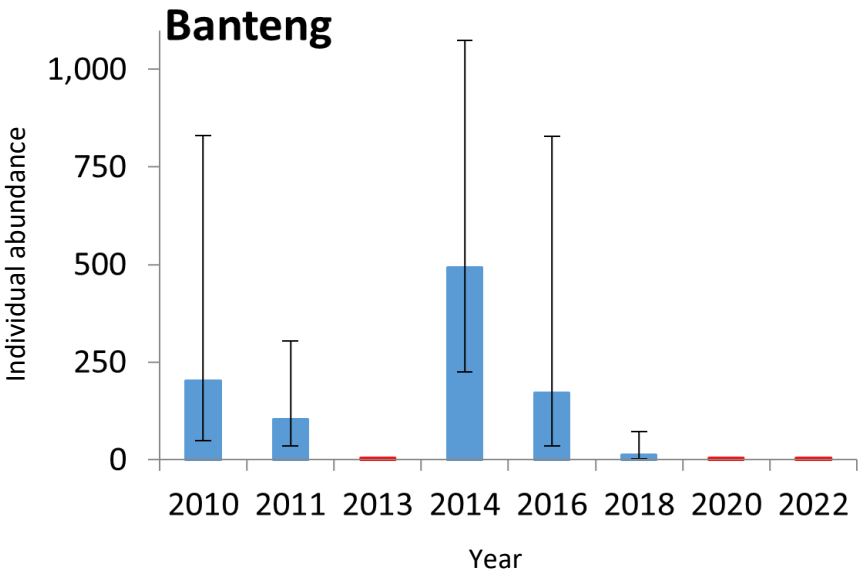


Figure 22. Annual population estimates of banteng in KSWS. Blue bars represent the number of individuals estimated by conventional distance sampling, and black vertical lines denote standard error estimates. Red bars show years in which sufficient amounts of data were not collected to estimate population size.

Figure 23. The most recent camera trap images taken of banteng in KSWS.

GAUR (*Bos gaurus*)

VU

Gaur were last formally sighted during transect observations in 2020. The most recent camera trap image was taken in April 2021, showing two females (Fig 24; Fig 25). Records of the species have not been made since this time and it is unclear whether the species remains present in KSWS.

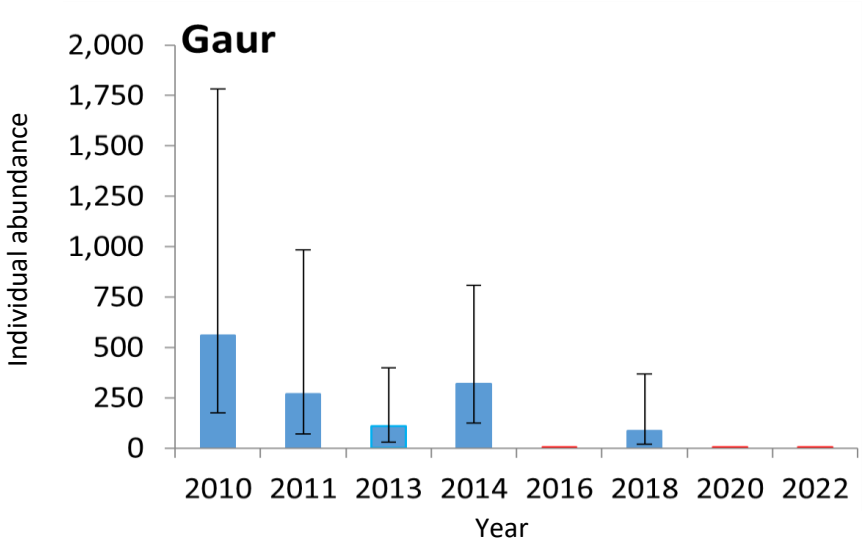


Figure 24. Annual population estimates of gaur in KSWS. Blue bars represent number of individuals estimated by conventional distance sampling, and black vertical lines denote standard error estimates. Red bars show years in which sufficient amounts of data were not collected to estimate population size.

Figure 25. The most recent camera trap image taken of gaur in KSWS. The left most image shows one individual clearly visible, with the other individual covered by vegetation in the back right of the image.

STUMP-TAILED MACAQUE (*Macaca arctoides*)

Stump-tailed macaque were last formally observed during transect observations in 2020, but before this had not been observed since 2016. One group containing 27 individuals was sighted by the Biodiversity Monitoring Team during scheduled anti-snaring patrolling in May 2022. Below are images taken from that encounter. It is likely this species is still present but in greatly reduced population sizes (Fig 26; Fig 27).

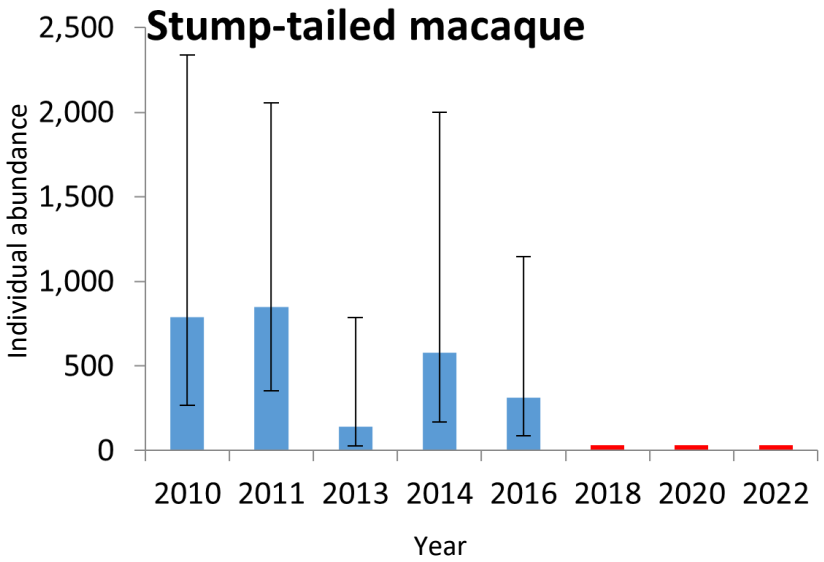


Figure 26. Annual population estimates of stump-tailed macaque in Keo Seima Wildlife Sanctuary. Blue bars represent conventional distance sampling individual annual estimates, adjoined black vertical lines present annual standard error estimates. Red bars show years where sufficient data was not collected to estimate population size

Figure 27. Images taken during the most recent sighting of Stump-tailed macaque by WCS Biodiversity Monitoring Team staff in Keo Seima Wildlife Sanctuary

ELD'S DEER (*Rucervus eldii*)

EN

This elusive species has historically been present in low densities, but was reliably observed during transect sampling until 2018. The first camera trap images of Eld's deer within KSWS were taken in May 2022 (Fig 28). Eld's deer is likely present in very small populations. Annual population estimates are not available due to historically low populations.

Figure 28. The most recent camera trap image taken of Eld's deer in KSWS, showing two grazing females.

SAMBAR DEER (*Rusa unicolor*)

VU

Sambar deer was last formally sighted during transect observations in 2018. Camera trap images containing this species were last taken in July 2022 (Fig 29). It is likely that this species is still present in greatly reduced population sizes. Annual population estimates are not available due to historically small populations.

Figure 29. The most recent camera trap image taken of Sambar deer in Keo Seima Wildlife sanctuary. This individual is a male.

DISCUSSION

The broad trend identified by the 2020 assessment of arboreal species (those spending most of their time in trees) remaining stable or increasing while terrestrial species (those spending most of their time on the ground) decline has persisted into 2022. Contrasting the trends in 2020 to those of the 2022 survey, it is clear the drivers of population declines remain present. Trends of six species have been reclassified in 2022, with five population trends worsening and one improving compared to the 2010-2020 assessment.

Although KSWS is able to mitigate some threats the PA continues to experience significant pressure on its wildlife. Considering these circumstances, maintaining stable populations of a species, especially within the context of declining global populations, is a triumph of the KSWS. The black-shanked douc, southern yellow-cheeked crested gibbon, and northern pig-tailed macaque all have stable populations, demonstrating that KSWS forests can still support some healthy wildlife populations that are globally threatened. Furthermore, the population trend of the Germain's silvered langur has improved, progressing from declining to stable, despite having a restricted range in KSWS.

For other species, the last two years have compounded population reductions. For the four declining species for which population size can still be evaluated (wild pig, northern red muntjac, long-tailed macaque and green peafowl), declines have been significant. The severity of range contractions in these species illustrates the consequences of these declines. Threats associated with spending significant time on the ground combined with pervasive threats that affect all species, such as land clearance and degradation from logging, have caused continued declines. It is concerning considering that species who that are not entirely restricted to dwelling on the ground, such as the long-tailed macaque and green peafowl are still declining.

Dog ownership and hunting remains widespread within the protected area. While concerted efforts have been made to curb snaring, it is still used as a way to protect farms and catch wildlife for consumption (Ibbett et al, 2020). The declines of red muntjac, long-tailed macaque and wild pig are alarming as these species are normally considered robust to hunting and habitat disturbances (O'Brien, Kinnaird and Wibisono, 2003; Keuling and Massei, 2021). With regards to wild pig, although the introduction of swine flu to southeast Asia has likely had an effect on wild pig populations in KSWS, its existence within wild populations in Cambodia has not been confirmed (Denstedt, 2021; FAO AnimalHealth, 2022). Nevertheless, anthropogenic pressures remain the principle reason for declines. With drastic action it is still possible to reverse the declines seen in wild pig, northern red muntjac, long-tailed macaque, and green peafowl populations.

It is likely that the population collapses of gaur, banteng, Eld's deer, sambar, and stump-tailed macaque are irreversible. If management strategies were to immediately abolish pressures on their populations, these species would almost certainly still be lost from KSWS. With no action to address threats, their local extinction is imminent. The KSWS REDD+ project has no doubt extended the duration for which these species remained present within KSWS, but despite the resulting protection and available resources, threat levels have been too high.

Due to their important ecological roles, losing KSWS's wild cattle, large deer, and stump-tailed macaque populations will both impact the structure and health of the forest, and trigger the local extinction of other species. This situation will worsen if the declines observed in other key species are allowed to continue. Losing wild cattle, large deer, and stump-tailed macaque would result in a KSWS of the biodiversity for which it is renowned. This would lead to a degraded landscape that

would be unlikely to recover and will eventually be unable to support the natural resources and ecosystem services on which many Cambodians rely on for their livelihoods.

MITIGATING FURTHER DECLINES

To tackle the rapid population declines revealed in this report, focus should be put on stopping:

- The use of snares and hunting with dogs and guns (Ibbett et al, 2020). Despite these activities being illegal, enforcement is rare. Focus should be shifted from reactive actions to understanding the underlying drivers pushing people to partake in these. This information should then be used to form proactive prevention strategies.
- Illegal forest clearance and species specific degradation logging. These activities reduce the quality and total availability of habitat.
- Commercial trafficking of wildlife for the pet trade and consumption. Professional networks drive the hunting of wildlife in KSWS for trade within Cambodia and on international black markets.
- The granting of tourism concessions, mining permits and infrastructure development projects without thorough, transparent environmental impact assessments and adequate damage mitigation strategies.

Capacity should be built within:

- Law enforcement strategy development. New strategies need to be trialled, such as situation crime approaches (Lemieux., 2020; Sosnowski et al., 2021), simple patrol-based law enforcement has thus far failed to prevent wildlife declines.
- Wildlife ranger force training. High standards of training must be maintained so rangers can act according to standard operating procedures and understand their responsibilities with respect to enforcing the law.
- Applied conservation knowledge within PDoE. A deeper understanding of KSWS' ecosystem will allow managers to plan and implement more effective interventions within the PA.
- Communication and cross-borders action. The Eastern Plains Landscape is a contiguous landscape and lessons learned in KSWS apply across its extent. This pertains to both NGOs and governmental management.

Applied projects to address population declines should be considered:

- Captive breeding programmes may be required to halt the extinction of Eld's deer within Cambodia. Their small population size makes natural recovery unlikely. Captive breeding should also be considered for banteng.
- Reforestation may be needed to restore areas of important habitat that have been cleared, such as the area around Sre Pleng trapeang.

យុទ្ធសាស្ត្រកាត់បន្ថយការថយចុះរបាយ និងចំនួនសត្វព្រៃបន្ថែមទៀត

ដើម្បីដោះស្រាយការថយចុះចំនួនរបាយសត្វព្រៃយ៉ាងឆាប់រហ័សដែលបានបង្ហាញនៅក្នុងរបាយការណ៍នេះយើងគួរតែផ្តោតលើការបញ្ឈប់នូវសកម្មភាពមួយចំនួនដូចខាងក្រោម៖

- ការប្រើប្រាស់អន្ទាក់ ការប្រម៉ាញ់ដោយសត្វឆ្កែ និងប្រម៉ាញ់ដោយកាំភ្លើង (Ibbett et al, 2020)។កន្លងមកទោះបីជាសកម្មភាពប្រម៉ាញ់ទាំងនេះខុសច្បាប់ក៏ដោយ ក៏ការអនុវត្តច្បាប់បង្ក្រាបបទល្មើស មានតិចតួចនៅឡើយ។ យើងគួរតែធ្វើការផ្លាស់ប្តូរនូវសកម្មភាពមួយចំនួន ដូចជាការផ្តោតអារម្មណ៍តែលើការអនុវត្តច្បាប់ទៅជាការស្វែងយល់ថាតើហេតុអ្វីបានពួកគេប្រព្រឹត្តបទល្មើសនេះបន្ទាប់មកព័ត៌មាននេះគួរតែត្រូវបានប្រើដើម្បីបង្កើតជាយុទ្ធសាស្ត្រដើម្បីទប់ស្កាត់បទល្មើសទាំងនេះ ព្រមទាំងណែនាំអោយប្រជាជនអោយចូលរួមក្នុងការទប់ស្កាត់បទល្មើសនេះផងដែរ។
- ការកាប់រានព្រៃឈើខុសច្បាប់ និងការកាប់បំផ្លាញប្រភេទឈើសម្រាប់ធ្វើអាជីវកម្ម។ សកម្មភាពទាំងនេះបានកាត់បន្ថយគុណភាព និងទីជម្រកសត្វព្រៃ។
- ការធ្វើពាណិជ្ជកម្មសត្វព្រៃដើម្បីចិញ្ចឹម និងធ្វើជាអាហារ។ បណ្តាញជួញដូរសត្វព្រៃបាន ជំរុញ អោយមានការបរបាញ់សត្វព្រៃនៅក្នុងដែនជម្រកសត្វព្រៃកែវសីមា សម្រាប់ពាណិជ្ជកម្មក្នុងប្រទេសកម្ពុជា និងនៅលើទីផ្សារងងឹតអន្តរជាតិ។
- ការផ្តល់ដីសម្បទានទេសចរណ៍ អាជ្ញាប័ណ្ណរុករ៉ែ និងគម្រោងអភិវឌ្ឍន៍ហេដ្ឋារចនាសម្ព័ន្ធ ដោយមិនមានការវាយតម្លៃផលប៉ះពាល់បរិស្ថានឱ្យបានហ្មត់ចត់ តម្លាភាព និងយុទ្ធសាស្ត្រកាត់ បន្ថយការខូចខាតគ្រប់គ្រាន់។

ការកសាងសមត្ថភាពមន្ត្រីគួរតែត្រូវបានធ្វើឡើង៖

- រៀបចំផែនការយុទ្ធសាស្ត្រអនុវត្តច្បាប់។ យុទ្ធសាស្ត្រថ្មីចាំបាច់ត្រូវការកាត់ទោស ដូចជាវិធីសាស្ត្រឧក្រិដ្ឋកម្មតាមឯកសារបស់លោក Lemieux និង Sosnowski (Lemieux., 2020; Sosnowski et al., 2021) រហូតមកដល់ពេលនេះ ការអនុវត្តច្បាប់ដែលមានកន្លងមកបានបរាជ័យក្នុងការទប់ស្កាត់ការថយចុះនៃរបាយសត្វព្រៃ។
- ការបណ្តុះបណ្តាលកម្លាំងមន្ត្រីឧទ្យានុរក្សលើការទប់ស្កាត់បទល្មើសសត្វព្រៃ។ ស្តង់ដារខ្ពស់នៃការបណ្តុះបណ្តាលត្រូវតែផ្តល់ចំពោះមន្ត្រីឧទ្យានុរក្ស ដែលអាចអោយមន្ត្រីឧទ្យានុរក្ស អាចធ្វើសកម្មភាពស្របតាមនីតិវិធីប្រតិបត្តិការស្តង់ដារ និងយល់ពីទំនួលខុសត្រូវរបស់ពួក គេទាក់ទងនឹងការ អនុវត្តច្បាប់។
- ផ្តល់ចំណេះដឹងអំពីការអភិរក្សដល់មន្ត្រីនៃមន្ទីរបរិស្ថាន។ ការយល់ដឹងកាន់តែស៊ីជម្រៅអំពីប្រ ព័ន្ធអេកូឡូស៊ីរបស់ដែនជម្រកសត្វព្រៃកែវសីមា គឺអាចនឹងធ្វើឱ្យអ្នកគ្រប់គ្រងរៀបចំផែនការ និងអនុវត្តការ អន្តរាគមន៍ប្រកបដោយប្រសិទ្ធភាពបន្ថែមទៀតនៅក្នុងតំបន់ការពារ។
- សកម្មភាពទំនាក់ទំនងនិងការងារឆ្លងដែនរវាងសមត្ថកិច្ចនិងស្ថាប័នពាក់ព័ន្ធ។ តំបន់ខ្ពង់រាបខាងកើតគឺជាទេសភាពជាប់គ្នា ហើយក៏ជាការងារទំនាក់ទំនងគ្នារវាងដែនជម្រក សត្វព្រៃកែវសីមាដែលអនុវត្តលើវិសាលភាពទាំងនេះ។ដែលការងារទាំងនេះគឺមានការពាក់ព័ន្ធគ្នាទាំងអង្គការក្រៅរដ្ឋាភិបាលនិងការគ្រប់គ្រងរបស់រដ្ឋាភិបាល។

គម្រោងដែលបានអនុវត្តដើម្បីដោះស្រាយការថយចុះចំនួនរបាយសត្វព្រៃគួរតែត្រូវបានពិចារណា៖

- កម្មវិធីបង្កាត់ពូជសត្វព្រៃអាចនឹងជាតម្រូវការ ដើម្បីបញ្ឈប់ការផុតពូជរបស់ប្រភេទសត្វរមាំងក្នុងប្រទេសកម្ពុជា។ របាយនិងចំនួនដ៏តិចតួចរបស់ប្រភេទនេះអាចធ្វើឱ្យពិបាកក្នុងការស្តារឡើងវិញក្នុងព្រៃធម្មជាតិ។ កម្មវិធីបង្កាត់ពូជសត្វទន្សោងក៏គួរតែពិចារណាផងដែរ។
- ការដាំស្តារព្រៃឈើឡើងវិញ ដើម្បីស្តារតំបន់ទីជម្រកសំខាន់ៗ ដែលត្រូវបានកាប់រានឈូសឆាយដោយខុសច្បាប់ ដូចជាតំបន់ជុំវិញត្រពាំងស្រែផ្លែង។

CONCLUSIONS

Keo Seima Wildlife Sanctuary is a unique site of very high biodiversity value. KSWS contains a diversity of habitat types that remain broadly intact, with the PA holding the highest number of species of any Cambodian protected area.

Key species population trends are perform better than would be expected if KSWS was not protected, evidenced by the success of maintaining populations of four globally threatened primate species. This demonstrates the positive impact of KSWS in preserving the area's rich wildlife and the broader landscape's ecosystems. Despite this inherent value, KSWS has reached a critical moment.

The intensity of the threats to Cambodia's biodiversity and natural resources are severe, and even with the significant protection efforts brought by KSWS these threats continue to cause biodiversity and forest loss. Wild cattle, large deer, and the stump-tailed macaque are displaying such severe declines that their disappearance from KSWS is almost inevitable.

Although the last two years have compounded threats, urgent action at both national and local levels could reverse the declines seen in wild pig, long-tailed macaque, red muntjac, and green peafowl. Without this action, KSWS will become empty of medium and large sized mammals. This would severely degrade KSWS' ecosystems, accelerating further biodiversity loss and creating a landscape that lacks the variety KSWS is known for. Not only would Cambodia's natural heritage be lost, the natural resources upon which many Cambodians rely on for their livelihood, recreation, culture and religion would be destroyed.

សេចក្តីសន្និដ្ឋាន៖

ដែនជម្រកសត្វព្រៃកែវសីមា គឺជាទីតាំងតែមួយគត់ដែលមានតម្លៃជីវចម្រុះខ្ពស់។ ដែនជម្រកសត្វព្រៃកែវសីមាមានភាពចម្រុះនៃប្រភេទទីជម្រក តំបន់នេះមានប្រភេទសត្វព្រៃច្រើនជាងតំបន់ការពារដទៃទៀតរបស់កម្ពុជា។

ចំនួនរបាយសត្វព្រៃនៃប្រភេទសត្វសំខាន់ៗគឺយើងការពារបានល្អជាងការរំពឹងទុកប្រសើរជាងប្រសិនបើដែនជម្រកសត្វព្រៃកែវសីមាមិនត្រូវបានការពារនោះទេ ដែលទាំងនេះបង្ហាញឱ្យឃើញពីភាពជោគជ័យនៃការរក្សាបានចំនួនរបាយសត្វព្រៃនៃប្រភេទពានរំដែលរងការគំរាមកំហែងជាសាកលចំនួនបួនប្រភេទ។
នេះបង្ហាញពីផលប៉ះពាល់ជាវិជ្ជមានរបស់ដែនជម្រកសត្វព្រៃកែវសីមាក្នុងការអភិរក្សសត្វព្រៃដ៏សម្បូរបែបនៃតំបន់នេះ និងប្រព័ន្ធអេកូឡូស៊ីនៃទេសភាពដ៏ធំទូលាយ។ ថ្វីបើតំបន់ស្ថិតក្នុងតម្លៃនេះក៏ដោយ ដែនជម្រកសត្វព្រៃកែវសីមាបានឈានដល់ពេលដ៏សំខាន់មួយដែលត្រូវប្រុងប្រយ័ត្នខ្ពស់។

កំរិតនៃការគំរាមកំហែងដល់ដីរចម្រុះ និងធនធានធម្មជាតិរបស់កម្ពុជាគឺធ្ងន់ធ្ងរ ហើយសូម្បីតែកិច្ចខិតខំប្រឹងប្រែងការពារដ៏សំខាន់ដែលនាំមកដោយដែនជម្រកសត្វព្រៃកែវសីមា ក៏ការគំរាមកំហែងទាំងនេះនៅតែបន្តហានិភ័យដល់ដីរចម្រុះ និងការបាត់បង់ព្រៃឈើ។ ពពួកថនិកសត្វក្រចកជំពាម និងស្វាអង្គត់កំពុងបង្ហាញពីការថយចុះយ៉ាងខ្លាំង ដែលការបាត់ខ្លួនរបស់ពួកគេពីដែនជម្រកសត្វព្រៃកែវសីមាគឺស្ទើរតែជៀសមិនរួច។

ទោះបីជារយៈពេលពីរឆ្នាំចុងក្រោយនេះមានការគម្រាមកំហែងក៏ដោយ សកម្មភាពបន្ទាន់ទាំងថ្នាក់ជាតិ និងថ្នាក់មូល ដ្ឋានអាចផ្លាស់ប្តូរការធ្លាក់ចុះដែលឃើញមានដូចជា ជ្រូកព្រៃ ស្វាក្តាម ឈ្លូស និងក្ងោកជាដើម។ បើគ្មានសកម្មភាពនេះទេដែនជម្រកសត្វព្រៃកែវសីមានឹងបាត់បង់អស់ពពួកថនិកសត្វដែលមានមាឌមធ្យម និងមាឌធំ។ ដែលបញ្ហានេះនឹងធ្វើឱ្យខូចប្រព័ន្ធអេកូឡូស៊ីរបស់ដែនជម្រកសត្វព្រៃកែវសីមាយ៉ាងធ្ងន់ធ្ងរ ដោយបង្កើនល្បឿននៃការបាត់បង់ដីរចម្រុះ ហើយតំបន់នេះនឹងអាចក្លាយជាតំបន់ទេសភាពមួយផ្សេងទៀតដែលខ្វះដីរចម្រុះដែលត្រូវបានគេស្គាល់កន្លងមក។ មិនត្រឹមតែជាបេតិកភណ្ឌធម្មជាតិរបស់កម្ពុជានឹងត្រូវបាត់បង់ប៉ុណ្ណោះទេ
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