Section I. Project Information

Project Title: "Khao Laem: Tiger Conservation Project, Phase 4"

Grantee Organisation: Freeland

Location of project: Khao Laem National Park, Kanchanaburi Province, Thailand
(15.059301 N, 98.608739 E)
Park HQ at UTM 47P 456814 1661080 (WGS84)

Size of project area	**Number of tigers in project area, giving evidence & source:**
Total area of PA: 1,497km^2 Total area of 2022/23 survey effort: 477km^2 (90km^2 via LTM ecological surveys 333km^2 via Phase 2.1 SECR grid survey and a further 54km^2 during HTC monitoring in Western Khao Laem)	Approximately 10-12 individuals. The focal site is part of a contiguous series of 17 PAs with a combined area of more than 18,000 km^2 that allows free movement of tigers throughout. Population estimates via (unpublished) camera trap data from the site over the previous 7 years. 8 tigers recorded in 2022-3

Partners:
Khao Laem National Park (KLNP); Department of National Parks Wildlife and Plant Conservation (DNP): Starting in 2016 Freeland was invited to conduct low intensity tiger ecological monitoring at Khao Laem. Since that time, the project has been on-going creating a valuable long term monitoring dataset. All data is shared by the park with the DNP's Protected Area Regional Office (PARO3) in Ban Pong and tiger specific data with the DNP's Wildlife Conservation Division Tiger Research Centre at Khao Nam Ram in Huai Kha Kheng WS. This process ensures all tiger records are cross-referenced against a national tiger identification database.

During 2020-22 Freeland received a 2-year grant from IUCN under their programme 'Accelerating Tiger Recovery along the Thailand-Myanmar Border'. These additional resources permitted an increase of Khao Laem tiger survey efforts, which during that period encompassed almost all terrestrial area of the park. Specifically, the grant from IUCN supported three Spatially Explicit Capture, Recapture (SECR) surveys which concluded in March 2022. Freeland is a member of the IUCN Thailand National Committee (NC), which helps synchronise conservation efforts with other domestic partner organisations, including the DNP (As NC chair).

Further partnerships include FFI Myanmar and Wildlife Asia (Australia). FFI supports our work in Southern Thailand along the Myanmar border and the latter supports the Karen Wildlife Conservation Initiative (KWCI) works in neighbouring Myanmar and northwest Thailand. These partnerships bring specialist abilities to our projects, provide foundations for scientifically rigorous surveys and successive data analysis. We participate in the Dawna Tenasserim Landscape Alliance meetings to enhance transboundary conservation cooperation and improve the understanding of tiger dispersal across the international border with Myanmar. These broad partnerships are improving collaborative efforts to protect and conserve tigers.

Consultant senior biologist Saifon Sittimongkol PhD from Thailand's Prince of Songkhla University worked analysing project survey data, oversaw the SECR surveys and joined survey teams during implementation. We are discussing ways to include Thai undergraduate students from her university in Khao Laem activities.

Consultant biologist Jonathan Moore also helped analyse survey data and joined surveys teams during SECR survey implementation

Freeland advisor field staff, Eric Ash completed a DPhil (Zoology) concerning large carnivores in Thailand with WildCRU, University of Oxford. Currently, he is completing a further two years post-doctoral studies with WildCRU. He assisted this project by advising and directing students cataloguing Khao Laem survey data. A collaboration with WildCRU facilitates sharing of technical expertise to ensure surveys are conducted to appropriate scientific standards.

Project Contact Name:
Tim Redford, Surviving Together Programme Director

Email: tim@freeland.org

Actual start date of project: 1st February 2022

Section II. Project Results

Long Term Impact:

The long-term impact sought by this project is to contribute towards doubling the national tiger population in Thailand by the conclusion of the next Thai Tiger National Action Plan (T-TAP) likely to conclude in 2034. This impact will represent significant progress toward our vision of **'ensuring the persistence of Indochinese tigers'.** Evidence from key source sites within WEFCOM landscape indicate tiger conservation measures are succeeding and the tiger population is slowly increasing and dispersing into adjacent PAs where they are vulnerable to a myriad of threats. Recovery and persistence of tigers within this landscape therefore requires the bolstering of protection, especially in edge and transboundary habitats, managing both prey and tigers as a contiguous meta-population with improved coordination between agencies sharing best practices. This project has been focussing attention on activities aimed at increasing capacity of officials and rangers at one key tiger habitat named Khao Laem National Park.

Conservation Outcome:

Activities have led to a concise understanding of the tiger population (and threats) within Khao Laem and the function of this protected area facilitating tiger recovery across sections of southern WEFCOM. Tiger conservation measures have improved at the site - augmented by increased capacity among officials now able to conduct tiger population surveys, implement adaptive protection measures and mitigate human-tiger conflict. Now within this safer environment - Khao Laem NP is experiencing a tiger (and certain prey species) recovery. This outcome is validated by the continued persistence of tigers at the site throughout the last six years.

Until mid-2022, surveys were documenting an increase in key prey species essential to create a situation conducive for tiger breeding and successful rearing of cubs. Unfortunately, surveys recently revealed the emergence of African Swine Fever (ASF) at the site and a likely connected decline in a major prey species - Wild Boar. It appears threats to tigers are not simply concerned with poaching and habitat, but environmental and health related too. Surveillance for such emerging threats is critical if mitigation measures are to be introduced in a timely manner.

Summary of activities and achievements:

During 2022-23, tiger monitoring at Khao Laem integrated two distinct formats. Regular long term ecological monitoring (LTM) was supplemented with one final Spatially Explicit Capture, Recapture (SECR) survey and an extraordinary additional survey following human-tiger conflict (HTC) events.

In total, ten 3 x 3 km grids across Khao Laem were surveyed continuously throughout the year during LTM encompassing 90km^2. Utilising 95 cameras, a combined total of **7,467 survey nights** was achieved (Trips KL29 to KL33). In all, 39 mammal species were identified, with felines detected during 101 distinct occasions with more than 440 images. Specifically, tigers were recorded during 34 independent captures (IC) within 325 total captures (TC)

During Phase 2.1, the third 90-day SECR survey which ran from November 2021 to March 2022 covered almost the entirety of eastern Khao Laem. A total of 74 camera traps were deployed in pairs over 3 x 3 km grids at 37 locations covering 333km^2 for a combined total of **7,448 survey nights** (average of 98 days per camera) obtaining 23,816 images. From this there were 1,832 independent captures of 46 wildlife species, one domestic dog and three human categories (poacher, ranger, and villager). Poachers are defined as people carrying a weapon, or other type of illegal device.

Due to a series of human-tiger conflict issues in western Khao Laem, additional cameras were placed around a community called Pilok Kee for 7 months during February to August 2022. A small-scale grid survey was also conducted over six 3 x 3 km grids to understand more about tigers, prey and especially the threats occurring in that area. Over this survey, **4,782 survey nights** recorded 11 mammal species including tiger, clouded leopard, Asian golden cat and leopard cat. At Pilok Kee, a female tiger (F7) was photographed during 15 independent captures over 257 total captures.

Several small scale enforcement ranger training activities were conducted in support of GSM cameras used for antipoaching operations. This proved successful and led to the arrest of several poachers.

Field equipment supported by this project was donated and included; Ranger patrol equipment, water filters, VHF walkie talkies, GPS, GSM Cameras, and a water pump. Complementary support included; a boat, provision for a temporary checkpoint, camping gas stoves, a solar charger and monthly SMART patrol support.

As previously mentioned, the tiger monitoring revealed the presence of African Swine Fever (ASF) among the park's wild boar population. This is a serious development for the park's carnivores as the favoured prey for tigers, namely sambar deer were already at very low abundances. A parallel decline in red muntjak occurred during this year and is likely related to carnivores switching to alternative prey following the loss of the wild boar.

A small number of local schools and communities were visited in early 2023 for community outreach training activities.

Details of activities and results: (Please give detailed narrative of the results of each objective & output. Please include measures for example patrol numbers and distances covered, #people trained or #people attending meetings/workshops or refer to figures in your tables below)

Objective 1. Improving knowledge of tigers, prey and threats in KLNP.

This section firstly describes proposed activities with *predicted* outputs. Following that is a description of actual outputs.

Predicted output 1a. For the period February 2022 to January 2023 opportunistic ecological monitoring (LTM) will be conducted utilising a minimum of 20 cameras in Eastern Khao Laem. Specifically, ***at least*** 90km^2 (or ten grids of 9km^2 each) of previously surveyed tiger habitat in eastern Khao Laem will be re-surveyed using trail cameras, which will be moved every 2 months (as resources allow) during both the dry season (October to April) and wet season (May-September).

Baseline: 63km^2 (surveyed in 2021) ecological survey coverage.
Minimum target: 90km^2 to be surveyed.

Actual Results of long-term monitoring:
Cameras were deployed in ten 3 x 3 km grids covering 90km^2 over Khao Laem. A combined total of **7,467 survey nights** was achieved (Trips 29 to 33 inclusive) using 95 cameras. Due to a tiger poaching and human-tiger-conflict situation in Thong Pha Phum National Park near Western Khao Laem in January 2022, additional survey grids and rapid monitoring was implemented to record tigers and threats in the affected area (using matching funding).

In the central sector of eastern Khao Laem at San Nok Wua Mountain during February 2022 to December 2022, 65 camera traps were deployed for long term monitoring, with an operational period of 5,249 nights.

This year, there was an increase in human disturbance in the eastern sector as the annual tourist trekking season was extended from January into May 2022. This is problematic for resident carnivores as there is a clear correlation between the tourists, their associated disturbance and the lack of large carnivore presence. Usually, during the rainy season, this trekking area is closed to the public during which time the presence of carnivores measurably increases, but this was not the case in 2022.

The tourists introduce two related issues for carnivores; firstly, the general disturbance created by visitors (including their porters carrying camping gear) and secondly the numerous tourists who all pose in front of survey cameras which reduces camera battery life and SD card space (as well as creating olfactory influences which more sensitive wildlife species choose to avoid).

At San Nok Wua in survey grids D44, D45, E59, three tigers were recorded during sixteen independent captures (IC) times with a total of 63 images. These tigers were identified as M4 (HKT276) and two previously unrecorded tigers, one now designated as F6 and another still listed as unknown as only one flank was recorded.

During early 2022 in Western Khao Laem's Pilok Kee area, 30 Camera traps were deployed for 2,218 nights to monitor human-tiger conflict[1] (HTC) as tigers had predated domestic cattle. Images of a previously unrecorded female tiger (designated F7) with a damaged, or missing back leg were obtained. This tiger was suspected of predating villagers' cattle being illegally grazed in the forest. The loss of cattle was the reason five apprehended poaching suspects gave as the reason their reprisal killing of a female tiger and cub in late January 2022. However, given the lack of mobility of the three-legged tiger (recorded in videos) it is highly unlikely this disabled female tiger was the actual tiger that predated the cattle. The three-legged tiger was only recorded for a short period before disappearing. It is suspected that local militia may have poached it, but there is no tangible evidence to verify this. According to local residents, there were a further three tigers in the area, possibly offspring of the female killed during the poaching case. No sign of the three tigers was recorded during this additional survey.

Information from the surveys is shared with the park and highlights presented during each monthly SMART patrol review and planning meetings. We encourage the wildlife survey information to be integrated into the parks SMART reporting system, as it clearly identifies which wildlife-rich areas require additional patrolling.

Objective 2. Mentoring capacity in DNP Khao Laem staff to manage and analyse data to foster greater understanding of threats.

Activities under this objective include mentoring officials in collating and managing camera-trap information and encouraging the use of standard practices for storing images and categories of information required for summarizing results.

Output 2a. KLNP Officials mentored on camera-trap database standard practices and types of information required for summarizing results. Unfortunately, during 2022, a key Khao Laem official responsible for wildlife data management resigned. At the same time, Khao Laem lost their hard drive with their entire wildlife survey library. Investigations at the park were not able to identify if the hard drive was stolen, borrowed or lost. Therefore, we purchased, populated and donated a new 4TB HDD. In May 2022, Freeland employed a new staff member to be based at Khao Laem to assist the park with their data management and SMART. This staff member - Ms. Waleerut Meechai - recently graduated from Mae Jo University and is a local resident. She helps collate all wildlife data and assists the park-based SMART technician.

Since in-situ mentoring for the new Khao Laem computer technician started, there has been an improvement in data management and SMART program use as can be seen by the more detailed monthly SMART reports. As mentoring is informal and the Khao Laem official is new to their data and SMART management role - we have not yet quantified this apparent improvement.

Baseline: 1 - ***Target: 2 officials mentored.*** Currently, only one Khao Laem official is available for database mentoring and so we have not been able to meet the predicted target. We will discuss this with the new park superintendent and request a second person be assigned to this role in the event of any succession.

Output 2b.
Investigating the Khao Chang Puek reserved forest wildlife corridor. This activity remains suspended due to resource limitations. Therefore, there is nothing to report at this time.

Output 2c.
DNP officials demonstrate increased capacity in survey, monitoring and data collection skills trained during the project life.

Output 2c.a. Capacity development during this component will be informal on-job-training and mentoring in decision-making processes mostly involving best practices during tiger surveys.

The target under this component was 10 team leaders trained. During the long-term monitoring surveys (5 east and 2 west), all thirteen team leaders received survey mentoring (names available). One ranger

[1] Two tigers poached and one attack on a cattle grazer https://tinyurl.com/4wn7t9j9

independently led a team twice without Freeland assistance during the most recent surveys. There is a wide range of interest and motivation among the rangers, with some fully understanding the purpose and value of wildlife monitoring but some still consider it consequently low importance and since no additional recompense is received (other than survey food and expendables), they sometimes lack enthusiasm.

Output 2c.b. Number of rangers able to use trail cameras, knowledge of where to place them for best results.
Target: 50. During the last SECR survey, 6 teams of 5 rangers received guidance in using the survey equipment and were taught best practices of how to effectively place the survey cameras. Later, during long-term monitoring, a further 30 rangers participated, giving a total of 60 rangers mentored. The rangers' ability is not formally tested and so the effectiveness of our mentoring is not measured. Nevertheless, a few enthusiastic individuals are becoming noticeably eager in participating and becoming proficient in finding prime locations for the cameras while collecting wildlife data along the way. This is a very successful aspect of the project considering the park is lacking a scientific officer at this time.

Output 2.c.c. Number of data entry officials mentored in higher level SMART software use
Target 2. This is a similar activity to 2.a. and consequently results are the same as the Khao Laem official is new to the data and SMART management role.

Objective 3. Reducing specific threats to tigers including cattle grazing in the park

Throughout this period, we had several consultations with residents of the Pilok Kee forest community where tigers (allegedly) predated cattle and the subsequent reprisal killings occurred. Although tigers were clearly poached and the suspects apprehended, tried and convicted in the local court, there is some doubt over their claim that tigers really predated their domestic cattle. Some indigenous rangers live in this community too and although the villages said twenty cattle were predated which was reported to park officials – the rangers deny this and say they had not heard of any loss of cattle. Furthermore, no officials at the park headquarters ever received reports of cattle predation.

Immediately following the poaching incident, the DNP ordered villagers from this area within Khao Laem to remove the free-roaming cattle as it is illegal to graze them in the protected area. A concerted effort was made by the Khao Laem management to reduce cattle in the area as this was the catalyst that caused the retaliatory tiger killings. An estimated 4 to 5,000 cattle were removed over two weeks as grazers acknowledged such free roaming stock was illegal. However, there still remains an estimated 400 cattle and 300 goats in the area around the four villages in Pilok Kee district, which grazers still continue to allow to roam freely. This is not only ecologically damaging, but places the grazers at risk if tigers are still present, as the grazers venture alone into the forest at all hours to follow their cattle (and poach).

During time spent with the Pilok Kee community it became very apparent that poaching remains a common and severe issue. Community members are not in the least deterred by the arrest and conviction of the five poachers involved the February 2022 tiger poaching case. We are currently reviewing the situation and prepared a (Thai language) report for Khao Laem and PARO3 regional DNP management office about the poaching, cattle grazing and wildlife recorded during additional monitoring.

There was one semi-formal workshop conducted by IUCN with Pilok Kee residents (no data available about number of participants) to invite their input into resolving the human-tiger conflict issue. This was likely useful, but may not lead to improvements due to the tough nature of these people and their lack of respect for park regulations. Many are allegedly serving Karen National Union army who regularly engage in cross-border clashes with the Burmese military and then retreat across the border into the safety of Thailand.

Key achievements of this project:

- LTM encompassed 90km^2. Utilising 95 cameras a combined total of **7,467 survey nights** was achieved (Trips KL29 to KL33). 39 mammal species identified, with felines detected during 101 distinct occasions with more than 440 images.

- SECR Phase 2.1 covering 333km^2 when 74 camera traps were deployed at 37 locations for a combined total of **7,448 survey nights** 46 wildlife species, one domestic dog and three human categories (poacher, ranger, and villager) were recorded.

- HTC related grid survey at Pilok Kee covered 54km^2 Over this survey **4,782 survey nights** recorded a female tiger (F7) was photographed during 15 independent captures over 257 total captures. Also, 11 further mammal species were recorded including; clouded leopard, Asian golden Cat and leopard cat.

- Tiger images/identified;
  2022. Tigers identified: 6 individuals recorded (M2, M3, M4, F2, F3, F7) from 34 independent captures over 325 total captures (LTM only). In 2023 (to Feb) two further individual tigers recorded (F6 and one unknown male - Unk M)

- SMART support:
  One SMART data technician mentored in data management.

- 20 Rangers were taught navigation (Use of map, compass and GPS), weapons safety, data collection for SMART, rapid response patrol tactics, arrest techniques and use of NCAP-GSM cameras.

- 75 rangers mentored in survey techniques and SMART data collection during surveys.

- During 2022, Khao Laem's nine patrol teams conducted 414 patrols over a period of 1,518 days.

- These patrols covered a total distance of 13,834 kilometres.

- Wildlife data reported by SMART patrols from 650 different locations.

- Patrols covered an area of 1,229.34 Km^2, representing approximately 82.12% of Khao Laem National Park (1,497Km^2)

- Violations entered into SMART during 2022 (Jan-Dec) include; 1 x encroachment cases, 2 x logging cases, 37 x illegal fishing cases, 97 x illegal collection of forest products and 5 x wildlife poaching cases**.**

- 188 'cold' violations were recorded. These involve pieces of evidence, sign, poacher camps, or other poaching related items without a perpetrator present.

- Only two cases were sent to the police for prosecution as the park superintendent tried a softer approach to win the support of the communities.

- In early 2023, Freeland was able to conduct community outreach training activity for park officials, and then outreach was conducted to 3 local schools (374 students reached) and a village on Khao Laem's eastern boundary – Ban Tee Pu Ye where 67 villagers were reached. This is the village close to a location where two poachers were observed on the NCAP-GSM cameras in use at Khao Laem, who were later interdicted.

Obstacles to success:

Although much progress has been achieved in 2022, many challenges remained;

1. **DNP budget reductions and staff changes.** Khao Laem and almost all protected areas in Thailand were subject to financial challenges due to an alleged corruption case involving the DNP's Director General[2]. By early 2023, this situation was almost resolved with the appointment of a new Director General and senior supporting officers. It will still take time for the next budget allocation to reach the park, likely in October 2023, and so finances will remain a challenging issue for Khao Laem until that time.
2. **Death of the Khao Laem Superintendent.** During October 2022, sadly the Khao Laem Superintendent Mr. Kamalas Issard died of natural causes at the park. Aged 52 this was very unexpected and likely resulted from long term health issues. Just three weeks earlier, the deputy park director retired and so for a period Khao Laem lacked leadership. A replacement chief and deputy have since been appointed.
3. **Insufficient resources (staff and funds)** As activities have grown, it has put increased strain on available project resources, the park has been requesting further assistance to resolve staffing and human-tiger conflict issues. We have been able to assist to a limited level, but further funds are required to support the outreach efforts in mitigating Human-Tiger Conflict (HTC).
4. **Poaching.** Poaching remains a serious issue at Khao Laem. The SECR monitoring clearly identified major problem areas where armed poachers, snares, and illegal collection of NTFPs occurs. To resolve these issues, more training, patrol support and enthusiastic management is required beyond those we conducted in 2022-3.
5. **Lack of outreach.** It is possible local language outreach may help resolve issues with the communities, therefore we are looking for Karen (the local indigenous group) partners to join the outreach efforts.
6. **Human tiger conflict and related cattle issues.** Human-tiger conflict emerged as a serious issue in early 2022 when two tigers were poached in adjoining Thong Pha Phum National Park. Such illicit cattle grazing remains an issue as HTC will likely re-occur if grazers still free-roam cattle despite warnings.
7. **Illegal cattle grazing.** An estimated 4-5,000 cattle were removed in 2022 as the grazers acknowledged that such free roaming stock was illegal. However, in 2023, there remains an estimated 400 cattle and 300 goats within the park around four villages in Pilok Kee district, which grazers still allow to roam freely. There is a secondary related issue with the possibility of cattle diseases crossing over into wild bovines, which will impact the tigers' food source.
8. **Continuing military operations** in Myanmar are leading to more migrant workers and refugees entering Thailand through the forests in Thong Pha Phum NP. This adjoins Khao Laem where survey cameras have photographed groups of migrants being led through the forest. Related subsistence poaching by armed refugees (or military) is occurring.

In previous years, dry weather conditions were a considerable problem at Khao Laem. However, starting in February 2022, an unexpected tropical depression lay over Southeast Asia for several months bringing early rain to the parched areas of Kanchanaburi. Consequently, there were very few fires this year. The same rains also ensured streams were running and water was abundant. This respite in forest fires allowed a recovery of previously damaged areas and made patrolling easier as water was readily available.

Monitoring and Evaluation: (Describe the methods used to monitor and evaluate the progress of the project)

The main outcome we are endeavouring to reach is 'Improved management and evidence-led protection strategies facilitating safer tiger dispersal within WEFCOM'.

Three main objectives are helping foster this above outcome, namely;

Objective 1. Improving knowledge of tigers, prey and threats in KLNP and adjacent areas,

[2] https://news.mongabay.com/2023/01/corruption-scandal-in-thai-parks-agency-has-far-reaching-impacts-activists-say/

Objective 2. Mentoring capacity in DNP staff to manage and analyse data to foster greater understanding of threats and forest connectivity *and;*

Objective 3. Reducing specific threats to tigers, including cattle grazing in the park.

During 2021-22, Freeland sourced additional cost-share support that expanded wildlife surveys, SMART patrolling and our input interpreting effectiveness of patrolling results. We still have additional cost share from two US-based philanthropists, but this is limited. Nevertheless, it does help with unforeseen costs and additional salaries such as the one supporting the Freeland Khao Laem based SMART technician and the balance of the project biologist's time. Both staff are involved in data collection for SMART and wildlife surveys which produce baseline figures for tigers and prey. These also provide insight into the threat situation and assist evaluate changes within the ecosystem, for example the decline in wild boar and muntjak. Previously, identifying such changes would not have been possible as no data was available for comparative evaluation purposes. Now we have 5 years of data, easily enough to evaluate trends and emergence of new threats.

The LTM is providing clear insight into changes within the large carnivore guild, which certainly appears quite dynamic among the tigers, far more than would be expected in a well-protected environment. We are now able to discuss and evaluate such changes base on a fairly clear understanding of tiger status.

Threats at Khao Laem are a combination of both natural and manmade issues including; fires, poaching, illegal and unmanaged NTFP collection, free roaming stock and feral animals (cattle and dogs), habitat loss though encroachment and land grabbing. These threats have increased recently with the emergence of at least two domestic stock diseases, namely African Swine Fever (ASF) in suids and Lumpy Skin Disease (LSD) in bovines. Both have the potential to impact tiger prey, and cause cascading pressure on less desirable e.g., smaller prey species.

For regular management, a simple work plan and the logframe (from the project proposal) guides implementation and provides indicators for project evaluation (See appendix). As we have established targets including dates, as per the work plan, we are able to fairly accurately monitor if we remain on track.

Regular meetings are held with park management and less frequent ones with regional protected area management office (PARO3) allow discussions that review if predicted targets have been met. During the last year, the various challenges previously highlighted did pose some issues, but these were mitigated and being adaptive in our collaborations ensured work still proceeded. One previous park superintendent from Khao Laem has now joined the Freeland team following his retirement.

A major tool for monitoring patrols and associated data is SMART. We participate in each SMART meeting and have a good cross flow of information from SMART and back to the park concerning the status of wildlife and the threats we have recorded.

Shared learning:

All information from this project is immediately shared with the site custodians, the DNP. Thereby contributing to the enhanced understanding of tiger ecology across this section of the WEFCOM landscape. We are still debating if we will write any scientific papers about the Khao Laem tigers and other carnivores. One scientist at the DNP was encouraging us to publish the information from the project, but staff resources prevent little time to write such papers. Over the last year we shared information about ungulates with a Thai student. We shared information concerning tiger prey species with Smithsonian as they are preparing a paper about prey abundance along the Thai/Myanmar border. Something that is becoming clear is the very low densities of sambar deer in most areas of WEFCOM. This is something that needs addressing if the tiger recovery is to continue. Data is being shared with Matthew Luskin, PhD from the University of Queensland, Australia and some analysis reruns of the SECR data are currently being conducted by MSc student Ms. Sophie Beekenkamp from Leiden University in the Netherlands.

To date though, nothing formal has been published in the public arena.

National media during 2022:

Concerning the tiger poaching case in Thong Pha Phum, tiger attack on cattle grazer, the three-legged tiger and Thong Pha Phum tiger skin trafficking case there are many media links. All are available on request.

Here are just four examples (one from each incident);
Tiger poaching
https://www.bangkokpost.com/thailand/general/2246431/bengal-tiger-pelts-weapons-seized-in-forest-5-suspects-escape
Attack on cattle grazer
https://www.bangkokpost.com/thailand/general/2255571/man-injured-two-dogs-killed-in-tiger-attack
Three-legged tiger
https://www.bangkokpost.com/thailand/general/2260951/tiger-with-missing-leg-caught-by-camera-trap
Thong Pha Phum tiger skin trafficking case
https://www.bangkokpost.com/thailand/general/2265207/3-members-of-wildlife-trade-gang-caught-3-baby-leopard-cats-rescued

Tiger poaching sentencing news:
The links below are to the tiger poaching case in Thong Pha Phum National Park which adjoins Khao Laem. All convicted poachers resided in Ban Pilok Kee within Khao Laem National Park.

English language media:

https://www.bangkokpost.com/thailand/general/2521796/court-jails-5-hunters-for-killing-tigers
https://thethaiger.com/hot-news/crime/five-poachers-jailed-for-killing-and-skinning-bengal-tigers-in-thailand
https://www.khaosodenglish.com/news/2023/03/06/court-jails-5-poachers-who-killed-bengal-tigers-in-a-national-park/
https://edition.cnn.com/2023/03/07/asia/thailand-poachers-jail-killing-tigers-intl-hnk/index.html
https://abc17news.com/news/2023/03/07/thailand-jails-five-poachers-for-killing-tiger-and-her-cub/
https://www.erienewsnow.com/story/48504026/thailand-jails-five-poachers-for-killing-tiger-and-her-cub
https://thethaiger.com/hot-news/crime/thai-netizens-call-out-sentence-for-tiger-killers-as-too-lenient

Other interesting news:

Relating to a 2018 poaching case involving a black leopard in Thung Yai Naresuan Wildlife Sanctuary (adjoining Khao Laem National Park) suspect **Premchai Karnasuta** aged 69 and billionaire president of the Italian-Thai Development Plc was sentenced on19/03/22 to 6 months jail at Thong Pha Phum.
https://www.bangkokpost.com/thailand/general/1647308/premchai-jailed-for-16-months-not-guilty-of-leopard-charge

With several major health issues his condition declined while under incarceration and on 31/12/22 he was moved to Nakorn Pathom hospital, where he later died.

https://www.bangkokpost.com/thailand/general/2381056/jailed-hunter-in-premchai-poaching-case-dies-of-cancer

Section III. Appendix

Did you carry out camera trapping as part of this project? Yes

If yes: Total camera trap nights/days: LTM. 95 cameras produced a combined total of **7,467 survey days** SECR Phase 2.1. - 74 camera traps were deployed in pairs over 3 x 3 km grids at 37 locations covering 333km^2 for a combined total of **7,448 survey days** Additional grids at Pilok Kee Approximately 20 cameras - **4,782 survey days** **Combined total: 19,679 days surveyed**	**Total area surveyed:** LTM (East) - Ten 3 x 3 km grids totalling 90km^2. SECR Phase 2.1 – 333km^2 Additional 6 grids at Pilok Kee - 54 km^2 **Total: 477km^2**
Numbers of tiger/leopard/prey recorded Eight individual tigers were recorded during twenty-nine independent captures over 325 total captures during LTM. Captures under the SECR survey are described in the accompanying report. Leopard (both colour morphs) 16 independent captures with 29 images recorded an underdetermined number of individuals. Five prey species were recorded during LTM over 494 independent captures (this demonstrates a considerable decline in prey, especially wild boar since 2021).	**Please include data on other species recorded** Totally, 46 mammal species were recorded – see list in appendix Felines included; Clouded leopards 7 IC & 13 TC Golden Cats 3 IC & 5 TC Marbled Cat 1 IC & 6 TC Leopard cats 43 IC & 66 TC

Are numbers of tigers/leopards/prey increasing or decreasing in your project area? Please show trends
Tigers (individuals recorded)

2018	2019	2020	2021	2022	2023 (1 month)
2	5	4	4	8	3

See comparative tables/graphs in appendix for leopard and prey records

Did you carry out other surveys? Yes.

If yes:
1 x SECR survey in eastern Khao Laem – see details above in area surveyed and accompanying report to IUCN

Did you carry out patrolling as part of this project? Yes (as a cost share)

If yes: Total distance patrolled: 13,834 km	Total area patrolled: 1,229.34 $Km^{2,}$
Do you use Patrol Monitoring software such as SMART? Yes	
If yes: **Total distance patrolled using patrol monitoring software?** As above	**How do you collect data? Handheld devices/paper/other? Please give details?** Hand-held Garmin GPS and paper reporting to SMART technician.

Please provide comparison data on from your patrolling over time

See tables in accompanying report

Type of crime	2018	2019	2020	2021	2022
Encroachment	1	3	8	6	2
Wildlife Poaching	25	215	65	83	5
Illegal fishing	0	54	38	15	37
Illegal logging	7	56	44	26	2
Illegal NTFP collection	0	61	41	64	97

Was the data you collected analysed by a SMART specialist? **Collated but not analysed**

Please provide data on violations recorded/arrests/successful prosecutions

	2018	2019	2020	2021	2022
Cases (combined all types)	33	389	196	194	186
Prosecutions (Court)	0	4	4	12	10	2

The judicial process in Thailand is very prolonged and cases may take up to 4 years to reach conclusion. We do not have any information about how many of the above cases successfully concluded with a sentence involving incarceration, or other penalties such as fines and compensation. For small scale offenses administrative fines are imposed within the judgement of the park superintendent.

Does your project work with local communities? Yes, but very low level due to financial resources and local language issues (Karen Skor)

If yes: (please be as specific as possible and include gender split) **Who? See table below** 67 people (31M:36F)	**What did you do? Was it successful?** Activities involved; A one-day outreach workshop for officials	How many people did you reach? 67 adults (mostly Karen indigenous people)

How do you measure the success of this activity?

As community participation is purely voluntary and that most recipients cannot read and write Thai, no formal evaluation of immediate uptake was conducted.

Did you carry out educational activities with adults or children? Yes – see below

If yes: (please be as specific as possible and include gender and numbers)

Activity date	PA	Location (schools)	Location (district)	Level	Students		Teachers	Staff	Total students
					Male	Female			
1-Feb-23	KLNP	Border Patrol Police, Ban Radar, Khao Laem	Sangkhlaburi	Grade 4 - 6	49	48	4	9	97
1-Feb-23		Ban Kreong Krawia, Khao Laem	Thong Pha Phum	Grade 4 - 6	101	107	5	9	208
2-Feb-23		Ban Yang Kaw, Khao Laem	Thong Pha Phum	Grade 3 - 6	35	34	4	9	69
					185	189	13	27	374

Activity date	PA	Location (village)	Location (district)	n/a	Villager			Staff	Total
					Male	Female			
2-Feb-23	KLNP	Ban Thip hu ye	Thong Phaphum		31	36	67	9	67

Activities involved;

Three school visits over two days.

How many people reached?

374 students.

Have you seen behaviour change from these activities? (Please give details of your results and of how this is measured)

Pre/post evaluations were conducted to register immediate uptake of topics discussed. We will conduct follow-up activities with the schools within the next six months which will involve meeting some of the previous outreach recipients. A questionnaire will identify if content of topics were retained.

Did you carry out training activities for any staff/community member on the project? Yes

If yes: (please be as specific as possible and include gender split)

40 rangers trained (40M:0F)

Who? Khao Laem enforcement rangers.

What did you do? Was it effective?

Feedback from ranger team leaders and the new park superintendent suggested the training was useful and directly resulted in an increase of interdictions**.**

How many staff trained?

40 park officials were trained

How do you measure the effectiveness of this training? If resources allow, a follow-up training validation will be held in May 2023

Did you carry out conflict mitigation activities with community members? Yes		
If yes: **Who?** During community meetings with village head person and villagers from Pilok Kee where more than 20 cattle were (allegedly) predated by tigers. This led to related retaliatory tiger poaching and one villager was attacked by tigers.	**What?** The intervention Involved discussions about what transpired before the cattle predation, why this may have occurred, why villagers decided to break the law and kill the tigers, informing villagers about park regulations and helping mitigate further problems. We have upcoming plans to expand activities, especially in alternative livelihoods for villagers ceasing grazing cattle illegally inside the park.	**How many people did this include?** <30 in Pilok Kee

Have you seen behaviour change from these activities? (Please give details of your results and how this is measured)

After our staff spent time in the community and conducted discussions - the villagers seem more friendly towards the rangers and better understand the problems they caused by illegally grazing cattle in the park. Some are receptive to collaborative interactions and more open to discussions about the previously illegalities (tiger poaching). They appear to want to cooperate and participate in conservation. Note, their continued occupation within land assigned to the village is dependent on them not breaking park regulations and further criminality could see the guilty individuals being evicted from their houses which are in the park.

As this was a short-term immediate response based on the series of serious HTC events - no indicators for behaviour change resulting from the intervention were established. A temporary check point with two ranger teams has been established in the Ban Pilok Kee village and to date the villagers have been well behaved and cooperative.

However, some villagers from the four communities which lie within Pilok Kee sub-district in Western Khao Laem NP regularly participate in wildlife poaching and are blatant in their disregard for park and national laws. Much more is required in the form of greater enforcement, outreach and liaison with these communities. There are several communities adjacent to Eastern Khao Laem which are also actively involved in many types of illegal activities, including logging, poaching, guiding migrants and allegedly human and narcotic trafficking. Many community members themselves are illegal migrants and are likely soldiers of the KNU National army. The Karen in this area move in and out of Myanmar at will and although they should conform with immigration regulations – they rarely do so.

Were any scientific papers/articles published because of your project? No

If so, please give details or provide copies. N/A

Work plan

Below is the final work plan beginning in February 2022 and concluding at the end of January 2023. Most activities were implemented as predicted and outputs achieved. Due to lack of resources and other more urgent issues the planned survey of Khao Chang Peuk wildlife corridor was not conducted.

The main challenge of cattle grazing within the park was not tackled beyond the removal of many cattle owned by outside investors over the following two weeks after the tiger poaching and HTC incidents. Changes in park management and their priorities also prevented the proposed cattle documentation process. It is agreed with park management that cattle monitoring activities can restart in May 2023. Work will continue on this and other community outreach during 2022.

		2022											2023	Post
	Survey / Month	1	2	3	4	5	6	7	8	9	10	11	12	13
Objective	Activity	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb
Objective 0. Planning, preparation and project management														
0	Preparing and buying technical equipment, cameras, gps, field equipment	√	√											
0	Planning exercise to synchronise survey's with park management	√			√			√			√			
0	Quarterly meetings with project steering group (frequency TBC) and/or meetings with DNP		√			X			X			√		
0	Participating in Khao Laem's monthly SMART meetings	√	√	√	√	√	√	√	√	√	√	√	√	√
Objective 1. Improving knowledge of tigers, prey and threats in KLNP														
1a	Tiger surveys - LTM ecological monitoring - East Khao Laem	√		√		√		√		√		√		√
Objective 2. Mentoring capacity in DNP staff to manage and analyse data to foster greater understanding of threats and forest connectivity														
2a	Mentoring in survey data cataloguing and data management	X		X		√	√	√	√	√	√	√	√	
2b	Investigating the Khao Chang Puek wildlife corridor.			X	X	X	X	X	X					
2.c.a	On job training for rangers in data collection and other patrol skills (cost share)	√		√		√				√		√		√
2.c.b	Rangers able to use trail cameras, know where to place them for best results	√		√		√				√		√		√
2.c.c	SMART Data entry officials mentored	√	√	√	√	√	√	√	√	√	√	√	√	√
Objective 3. Reducing specific threats to tigers including cattle grazing in the park														
3a	Documenting cattle areas, stakeholder meeting and removal of domestic cattle from the park			X	X	X	X	X						
3b	Supporting use of GSM cellular cameras to monitor for poachers (cost share)	X	X	X	X	X	√	√	√	√	√	√	√	√
3c	Enforcement ranger training for select senior rangers (as rapid response)		X					X			√		√	
Others.														
	Reporting and debrief with PA (including midterm review)							√						X

2022 **Logframe with results** **"Khao Laem: Tiger Conservation Project, Phase 4"**

Impact; **The long-term impact sought is 'securing the Thai tiger population through implementing sound conservation practices', with the aim of doubling its number**			
Project Summary	**Measurable Indicators**	**Means of Verification**	**Final outputs / situation status**
Outcome: **A precise understanding of the tiger and prey populations within Khao Laem National Park and the function of the park facilitating tiger dispersal and recovery across WEFCOM.**	**A. Nationally accepted standards are utilised to survey tigers and prey. Indicators to include;** **-** The measurable increase in survey effort **-** Formal resident tiger population figure is established **-** Documenting tigers which have previously been recorded in other parts of WEFCOM via sharing photographs with the Khao Nam Ram research station in Huai Kha Kheng WS **B. Rigorous scientific Data analysis delivers an accurate understanding of tiger density and produces comparative baseline figure for tigers at the site.** *- We continue to strive to attain a tiger density figure (tigers per 100km^2). Analysis of previous SECR data has not yet revealed this - due to insufficient tiger data.*	A1. Tabular data from surveys proves that the increased level of effort improved the number of images – as comparison with previous year(s) verifies this. A2. Utilising the existing tiger image database, individuals are positively identified. A3. By comparing tiger photos with National DNP tiger database, we will differentiate resident individuals from those dispersing from Thung Yai-Huai Kha Kheng source site. B1. Initial analysis of camera data using Camerasweet[3] and later during a data analysis workshop (date TBD) using R suites, will confirm tiger and prey abundance for Khao Laem NP B2. Compared prey density with other sites to understand if they are sufficient to support tigers and their recovery C1. Park SMART database will be utilised to compare the previous 4 years patrol coverage, violations and wildlife sign. As patrols become more efficient, we *expect* to eventually see a decline in violations and an increase in wildlife sign recorded. However, there are many factors that	A1. A measurable increase in survey effort was achieved and this increased the number of total capture (TC) images. Comparison of Level of effort - Long Term Monitoring (ecological surveys) **2022. 7,467 Camera trap days** 2021. 7,256 Camera trap days 2020. 7,083 Camera trap days 2019. 8,285 Camera trap days A2/A3. Results Tiger images/identified individuals' comparisons; **2022. 8 tigers recorded 34 independent captures (IC) from 325 total captures (TC). Only one tiger was in the national database**; **M4 (HKT-276)** 2021. Tigers identified: 4 individuals recorded from 7 independent captures over 24 images (LTM only). 2020. Tigers identified: 6 individuals from 122 images. 2019. Tigers identified: 2 individuals from 4 images.

	- Prey species richness figure is reconfirmed and density of prey sufficient level to support the local tiger population is established **C. Cost share: KLNP demonstrates dedication to continuing park-based wildlife and violation monitoring. SMART based metrics which will include:** *Number of potential threats, or disturbances, documented and compared for changes over five years starting with 2018 baseline figures (see previous project reports).* *Number of patrol reports (SMART) generated independently by the park (Baseline: 12 – remains at 12)* *Overall improvement in patrol effectiveness compared with the 2021 project period. Utilising SMART, we will compare 2018 baseline figures (see previous project reports).*	may influence variation either way, some of which require attention before SMART becomes totally reliable e.g., excessive patrol coverage is currently reducing interdictions. C2. We will validate official SMART data by conducting random comparisons with patrol data obtained directly from rangers. C3. Post-project debrief questionnaire with DNP officials with key focal indicators reviewed, including ranger efficiency, interdicted crimes, and news from confidential informants.	B1/B2. Species records analysed – see accompanying SECR survey report. C1/C2 SMART data has been compared with tables in the accompanying report. C3. Over the year, only two meetings were held with the regional management office in Ban Pong (PARO3). They were happy with the results and the input from Freeland. It is too soon to quantify changes in enforcement results as the new superintendent has only been at the park for a short period. His enforcement strategy appears more proactive than his predecessor.
Objective 1. Improving knowledge of tigers, prey and threats in KLNP			
Output 1a Between Feb' 2022 and Jan' 2023, opportunistic ecological monitoring utilising a minimum of 20 cameras in Eastern Khao Laem.	1a. At least 90km^2 of previously surveyed tiger habitat in eastern Khao Laem will be re-surveyed Baseline: 63km^2 (surveyed in 2021) ecological survey coverage **Target: 90km^2 surveyed** 1a. # tigers initially identified during survey Baseline: 7 - **Target: >10**	1a.1. Camera-trap survey results will lead to an immediate identification of individual tigers and prey species and a basic understanding of abundance of both using RAI. 1a.2. Following discussions and analysis during joint post-activity Data Management and analysis	Results: 1a. Predicted survey size achieved. This led to an increased quantity of total capture images and number of identified tigers. SECR analysis enabled RAI figures and abundance to be calculated, providing some comparative figures for future reference. 1a2. The Potana area in Eastern Khao Laem was identified as a site requiring immediate increased protection. Consequently, two

	1a. # of potential prey species identified during surveys. Baseline: 5 - **Target: >5** # of key sites or corridors important for tiger dispersal identified Baseline: 0 **- Target: >2**	workshop, key dispersal sites for increased protection will be identified 1a.3 Feedback from external advisors/partners (e.g., DNP, Panthera, WildCRU wildlife researchers) will help understand the situation and guide next steps.	enforcement training courses were held for Potana sub-station rangers. Accompanied patrols were also implemented and use of NCAP GSM cameras supplemented protection monitoring in areas with a phone signal. 1a.3. We have received much feedback from the protection section of PARO3 and have been able to integrate their suggestions into the project e.g., training and use of NCAP GSM cameras. More training is certainly required.
Objective 2. Mentoring capacity in DNP staff to manage and analyse data to foster greater understanding of threats and forest connectivity			
Output 2a. Freeland will further mentor officials collating camera-trap information to utilise standard database practices for storing images and types of information required for summarizing results. Information will be concluded into a summary report on the tiger situation at the park. Results will be incorporated into the WEFCOM tiger survey database and provide guidance for discussion and included in the next Thailand Tiger Action Plan (due in 2022). **Output 2b** Investigating the Khao Chang Puek wildlife corridor. In early 2021, we will request permission to investigate the site and establish if wildlife is present by conducting low intensity ecological monitoring (May to September 2022).	2a. KLNP Officials mentored on standard practices of camera-trap database management and types of information required for summarizing results. *Baseline: 1 - **Target: 2*** 2b.a. Meet with estate manager of this reserved forest – the Royal Forest Department (RFD) and request permission to visit the Khao Chang Puek area. Baseline: 0 - **Target: 1** 2b.b. If initial investigation suggests surveys are warranted, plan and implement low intensity wildlife surveys (transect camera survey across intact forest areas in Khao Chang Puek). Baseline: 0 - **Target: >1** x 6-month survey	2a.1. Camera trap data analysed during joint post-survey activity. Officials' ability during this activity to be verified through review of each by supervising biologists from project staff. 2a.2. Data analysis figures verified during same post-activity data management. 2a.3. Finally, tiger and prey abundance figures are discussed and agreed with DNP at a national level. 2b.1. Information from the Khao Chang Puek site is verified with RFD and DNP officials. 2b.2. Permission is given in a letter from RFD to visit the site. 2b.3. Site assessment is conducted – short report. 2b.4. If wildlife survey is conducted – immediate camera trap results from the short survey – short report.	2a.1 The more organised SECR surveys provided solid data for analysis and the results are included in the accompanying SECR report which compares two similar SECR surveys in Eastern Khao Laem. The LTM data was catalogued, but not analysed. 2.a.2 No comparative data workshop or associated analysis was conducted. All raw and catalogued data was given to PARO3 and Khao Nam Ram Wildlife Research station. This can be assimilated into their landscape monitoring. 2a.3 The project did not receive any feedback from the DNP concerning the tiger and prey abundance figures. 2b.1, 2b.2, 2b.3, 2b.4. All Khao Chang Puek wildlife corridor investigations remain suspended and so no officials were integrated into planning or implementing activities. This activity remains paused until further notice.

Cost share activity: Supporting SMART patrolling and gauging effectiveness of results *(note as KLNP officials are already trained in use of SMART this last component is aimed more at supporting field based data collection and mentoring enhanced data entry and interpretation)*			
Output 2c. DNP officials have increased capacity in survey, monitoring and data collection skills trained during the project life.	2c.a. Capacity development during this component will be informal on-job-training and mentoring in decision-making processes mostly involving best practices in tiger surveys. Current Baseline: 8 **Target: 10 team leaders trained** 2c.b. #rangers able to use trail cameras, know where to place them for best results. Current baseline: 40 **Target: 50** 2.c.c. #SMART Data entry officials mentored in higher level SMART software use. Current baseline: 1 **Target: 2**	2c.1. Assessment of officials' skill retention will be gauged during on-job-training and more formal evaluation activities, with results concluded in a validation report. 2c.2 Feedback from park superintendent about staff performance will be canvassed during training validation and also included in this report. 2c.3. Park SMART database outputs demonstrate an increase in data entered (Over the last 4 years data has increased each year). 2.c.4. Post-project debrief with DNP officials	2c.1 Although the Khao Laem management does support the tiger surveys by providing rangers the various officials concerned with SMART and other data management appear very busy and not wishing to increase their responsibilities. Consequently, we continue to lead the survey planning and implementation. **All 9 team leaders were trained in wildlife survey and data collection. 75 rangers were trained in survey techniques. Only one SMART data entry official was mentored** *(as that is all the park has).* 2c2. As before, as the chief has only just been appointed, he is still learning the names and skills of his staff. 2c.3 SMART data has increased, but that may be partly due to the additional support Freeland has provided by seconding a full-time staff member to assist Khao Laem. In 2023, an evaluation of SMART at the park will be conducted to identify further weaknesses. This will be discussed during 2C.4 post project de-brief which has not yet occurred.
Objective 3. Reducing specific threats to tigers including cattle grazing in the park			
Output 3a There are three components to this objective;	3.a.a. Identify and map areas cattle are being grazed. *Baseline: 0 -* ***Target: the entire protected area***	3.a.1. Illegal cattle grazing areas are mapped – map for review. 3.a.2. Grazers and owners cooperate and honestly say how many cattle	**a. Removing Domestic Cattle** Due to various issues at Khao Laem, this component was not conducted apart from engaging the Pilok Kee community.

3a) Documenting and removal of domestic cattle from the park, 3b) supporting use of GSM cellular cameras to monitor for poachers (costs share) and 3c) enforcement ranger training for select senior rangers (as rapid response) to poacher monitoring using the GSM cameras.	3.a.b. An approximate figure of cattle in the park is reached. *Baseline: 0 -* ***Target: 5,000*** *(best guess)* 3.a.c. Further partnerships to solve this problem are forged. *Baseline: 0 -* ***Target: 4 agencies*** *(Livestock, DNP, 1 x university and Freeland)* 3.a.d. Workshops are held to increase awareness of the laws restricting cattle from being grazed in the park are held. *Baseline: 0 -* ***Target: 4*** 3.a.e. During workshops, owners are persuaded to sign contracts which agree with them removing the cattle over a 2-to-3-year period. *Baseline: 0 -* ***Target: All owners*** 3b.a. As a response to the poaching threat – GSM trail cameras are installed and working. *Baseline: 4 -* ***Target: 8*** (Note it is too early to predict a measurable indicator such as # of poachers interdicted using this system.) 3c.a. # of rangers receiving on-job-training in contemporary patrol procedures (dependent on further resources). Baseline: 12 – **Target: 20**	they have in the park (difficult to check and confirm). 3.a.3. Partnership between four agencies is reached – possible letter of agreement to certify this. 3.a.4. Meeting/workshops held with cattle owners – report with names/contacts of owners/#of cattle. 3.b.1 GSM Cameras are installed, working and reports for rapid action support are recorded. Output – photographs of poachers, arrests. 3.c.1 Law enforcement consultant reviews trainees' patrol and enforcement skills during a practical exercise – Thai language validation notes.	**b. GSM Cameras to monitor poaching.** This was achieved (but only 2 cameras due to resource limitations) and we have been supporting costs involved with several cameras. Their use has already proved successful in at least one arrest leading directly from photos received in ranger's phones. More equipment and budget required for this. **c. Enforcement rangers training 1.** Ranger training occurred on two occasions and **40 rangers trained.** More training has been requested.