Final Evaluation Report

Your Details	
Full Name	Bipana Maiya Sadadev
Project Title	Conservation of Hog deer (*Axis porcinus*) via community outreach programs and field surveys in Shuklaphanta National Park, Nepal
Application ID	39474-1
Date of this Report	15 May 2024

1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Comparing density estimate				We conducted distance sampling in 17 line transects of 1 km long twice during the study period and installed 30 camera traps following random encounter model (REM) in the grasslands of Shuklaphanta national park to estimate density of Hog deer. It took us around 40 days to conduct both methods. We dropped the pellet count method because of the unusual weather conditions and consultation with park staff.
Habitat suitability mapping				Occurrence points of the hog deer were collected by the above mentioned methods. Later, 19 bioclimatic variables were downloaded from the World Clim (https://worldclim.org/) and loaded in MaxEnt for predicting the habitat suitability of hog deer in present climatic scenarios.
Understand the knowledge and attitudes of local people towards Hog deer and its conservation				30 local people residing in the buffer zone (Beldadi and Piparia) were interviewed using snowball sampling technique and their knowledge and attitudes on hog deer and its conservation were recorded.
Conduct conservation outreach programs				School teaching programme was conducted in 10 schools. Extension materials such as posters, brochure, t-shirts and

				caps were distributed to create mass awareness. Students were encouraged to participate in drawing, speech and essay competition with the theme of hog deer conservation. Best three students were awarded with prizes.

2. Describe the three most important outcomes of your project.

a) Comparing density estimates of Hog deer following distance sampling and camera trapping method

- **Distance sampling:** 17 line transect of 1 km were laid in the grassland habitat and surveyed from the back of the elephant. Distance and angle to each hog deer detected along the line transect were recorded with the help of the range finder and Silva compass. Later, analysis was conducted in R using "distance" package. After running couple of models, hazard rate with cosine adjustment best fitted our data giving density estimates of 33.58 individuals per km^2 (SE=8.48, CV=0.25).

Figure 1: Distance sampling along line transects in the back of elephant

- **Camera trapping (Random Encounter Model):** 30 camera traps were installed randomly in the grassland habitat at a height of 45 cm from the ground. Camera traps were kept for 40 days, and each camera was monitored once every 10 days to check the batteries and remove images. In front of each camera, five bamboo stick markers were placed in a straight line at fixed distance intervals (2.5, 5, 7.5, 10, 12.5 m) in such a way that each marker was visible on camera trap photos for measuring detection distance. Later all the analyses were conducted in R and density was estimated by bootstrapping.

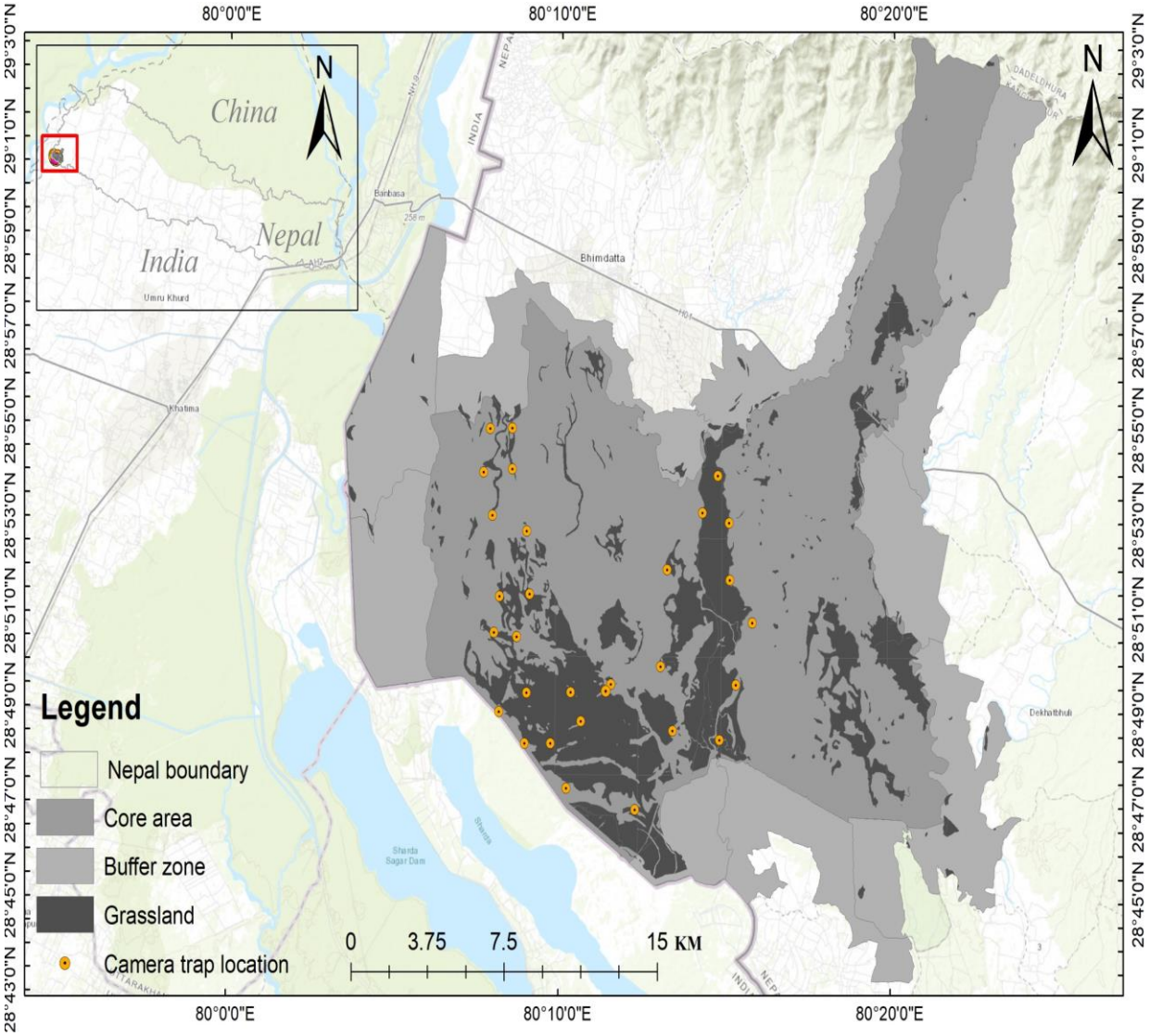

Figure 2: Camera trap locations in the study sites

Figure 3: Setting up camera traps and in front of camera traps, sticks were set up at consecutive distance of 2.5m. A Hog deer crossing the midline recorded at camera trap in the study area

Parameter	Value
Independent photographic encounters with midline crossing (N)	294
Survey effort (24 h-trap days)	1170
Estimated average daily movement ($km24h^{-1}$)	4.805
Effective detection distance (EDD) (km)	0.00784
Average group size	1.22

Table 1: Parameters used in the REM formula for hog deer density estimation

Density of hog deer using camera traps following random encounter model was estimated to be 15.9 individuals/km^2 (SE = 0.04).

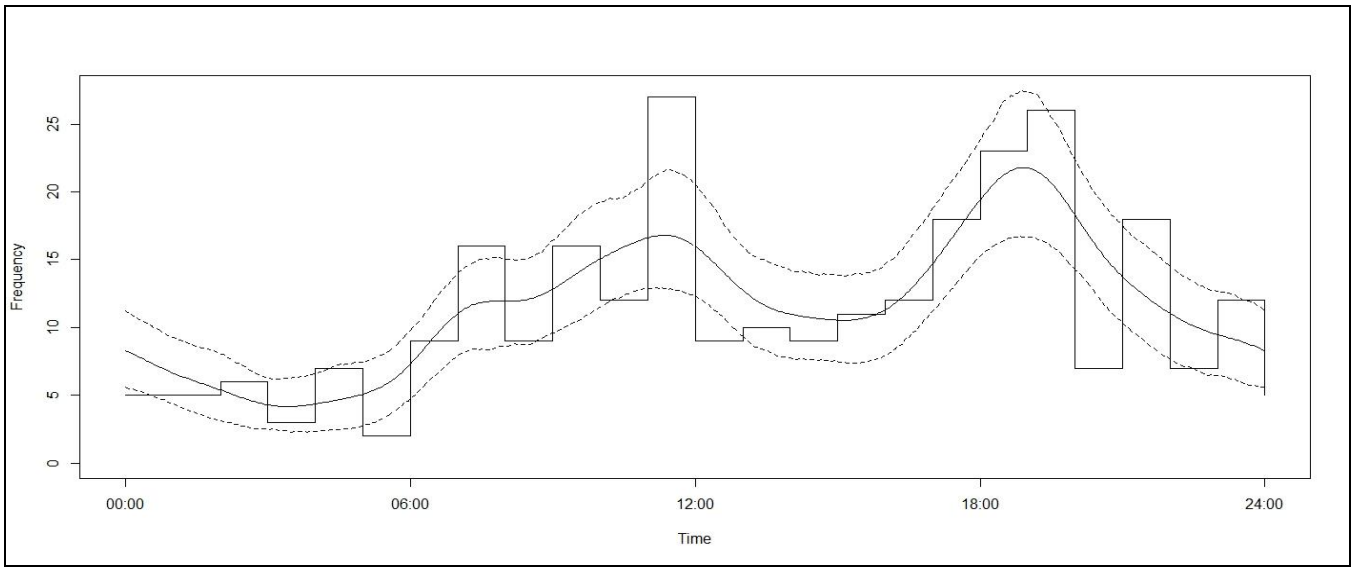

Figure 4: Hog deer activity patterns (kernel density estimation) derived from all stations in the grassland habitat. The x-axis represents time of the day (24 h), and the y-axis represent relative activity levels.

b) Modelling habitat suitability of Hog deer using MaxEnt

A total of 83 presence points of hog deer and bioclimatic variables downloaded from World Clim were fed into the MaxEnt software after checking the mutlicollinearity among the variables using "ENMTools" package in R. Later, best-fit model was selected using Akaike Information Criterion (AIC) and 10% training omission rate (OR10) alongside the difference between AUC values after getting

candidate model using ENMeval package in R. Later reclassification was done in ArcGIS to find the predicted high potential to low potential area.

- ✓ No potential area = 397.14 sq.km
- ✓ Least potential area= 163.27 sq. km
- ✓ Moderate potential area = 39.78 sq.km
- ✓ Good potential area = 34.12 sq.km
- ✓ High potential area = 28.44 sq.km

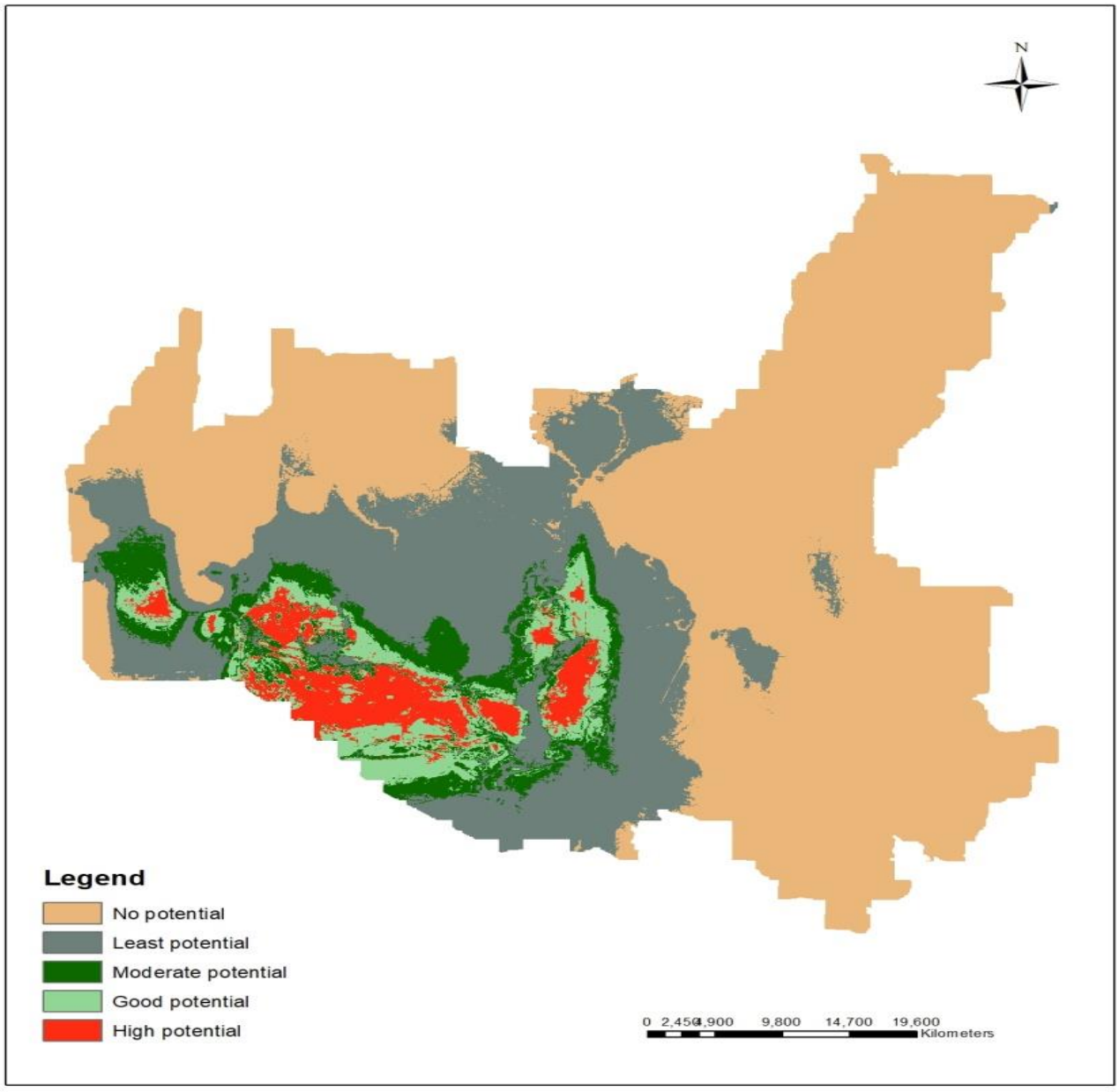

Figure 5: Habitat suitability of Hog deer in Shuklaphanta National Park in present

c) Understand the knowledge and attitudes of local people towards Hog deer and its conservation

We interviewed the local people residing in the buffer zone (i.e. Beldadi and Piparia) of the Shuklaphanta National Park (N=30). Most of the respondents were unable to recognise the hog deer through photographs and responded as a deer to all the interview questions. Most of the respondents mentioned they would prefer to chase away deer by making noise when they see them in the farmland. Most of the respondents strongly like the statement to conserve hog deer. Most of the respondents reacted by saying "Conservation of hog deer means increase tourist number and employment opportunities for us" when asked with what does the conservation of hog deer mean to you while some replied "nothing".

Figure 6: Field assistants interviewing local people of Beldadi Buffer Zone

d) Conservation outreach programs

We conducted the school teaching programmes in 10 schools as a part of our conservation outreach programmes. The students were given information about hog deer and its role in the ecosystem. Different competition such as drawing, speech and essay were organised and the best of them was awarded with prizes. T-shirts, posters and brochures were used as a means of extension materials.

Figure 7: Field assistant along with local people holding banner on conservation of Hog deer and its habitat

Figure 8: School teaching program and the winner of drawing competition on hog deer

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

We conducted each and every activity mentioned in the project within the given period of time however there were some unforeseen difficulties that arouse during the project. After abstract presentation with the park staff, we came to know that the national park is conducting controlled forest fire for regeneration growth. Thus, they suggested not to keep the camera traps in the forest areas because of chance of camera traps being burnt and we also restricted our field survey which involves comparing density estimates by distance sampling and camera trapping methods only to grassland habitat.

Another challenge we encountered during monitoring was unusual rainfall. Because of unexpected rainfall, the roads in the grassland used to be muddy and slippery however we did our best to monitor the camera traps within the same day. To conduct the social survey, we had to have the permission from Research Ethics Board (REB) of University of Northern British Columbia (UNBC) for involving human participants, this took me around 4-5 months to get the permission after getting grant. Also, while performing social survey, it was hard to get the local people during the daytime. Thus, we used to conduct the surveys either in the morning or in the evening. Moreover, due to the limited study area, the assessment of habitat suitability for hog deer under future climatic scenarios was deemed unrealistic and impractical. We decided not to pursue future projections for hog deer rather we thought of covering large areas in future.

4. Describe the involvement of local communities and how they have benefitted from the project.

There was an active involvement of local people during the questionnaire survey. Before starting the survey, they were asked for the consent to participate. Local people were excited to learn about the new species and they were shown the photographs of different deer species. Our posters, t-shirts and brochures also benefited local people for understanding hog deer. In return, they provided valuable insights and knowledge on hog deer and its conservation. They also helped in making coordination with the schools while conducting school teaching programmes.

5. Are there any plans to continue this work?

Yes. At first, we plan to cover the other habitat types of Shuklaphanta National Park. And after years of experience, we would love to cover all Terai protected areas and conduct both the field survey and conservation activities to ensure hog deer conservation. Thus, we hope to cover protected areas falling in Terai Arc landscape of Nepal in future.

6. How do you plan to share the results of your work with others?

The final report of this project will be made available to the concerned authorities like Department of National Park and Wildlife Conservation (DNPWC), Shuklaphanta National Park (SNP), National Trust for Nature Conservation (NTNC)-Shuklaphanta and other governmental and non-governmental organisations. The results from this research will also be published as part of my MSc Thesis at the University of Northern British Columbia, Prince George, Canada.We also hope to participate in upcoming wildlife conferences and give oral talks or poster presentation highlighting our achievements. Social media platforms such as Facebook, LinkedIn, research gate will be used to cover the outcomes of the project. Moreover, we are planning to publish a manuscript based on our findings and submit it in a peer reviewed journals for publication.

7. Looking ahead, what do you feel are the important next steps?

As this project compared the density estimates of hog deer only in grassland habitat, it would be great to cover the other habitat types such as forest, wetlands in future focusing on hog deer and other ungulate species. Regular monitoring of the hog deer in all terai protected areas of Nepal using appropriate field methods is an essential need. Effective awareness programs among local people to make them aware about hog deer and its conservation should also be taken into consideration.

8. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?

Yes, we used the logo of The Rufford Foundation in all extension materials such as posters, brochures, t-shirts and caps. We have also acknowledged The Rufford Foundation while giving oral talks and guest lecture on hog deer project in the University of Northern British Columbia (UNBC) and in a recent publication entitled "First Sighting of Sloth Bear in a decade in Shuklaphanta National Park, Nepal". We also provided a brief description of The Rufford Foundation to park staff, local people and school children and have introduced it as our funding organisation, thus The Rufford Foundation received good publicity in the study area. We also used the logo of The Rufford Foundation while conducting poster presentation in Active Joint Conference by the Alberta Chapter of The Wildlife Society and Canadian Section of the Wildlife Society held from March 8-10 2024 in Jasper, Canada.

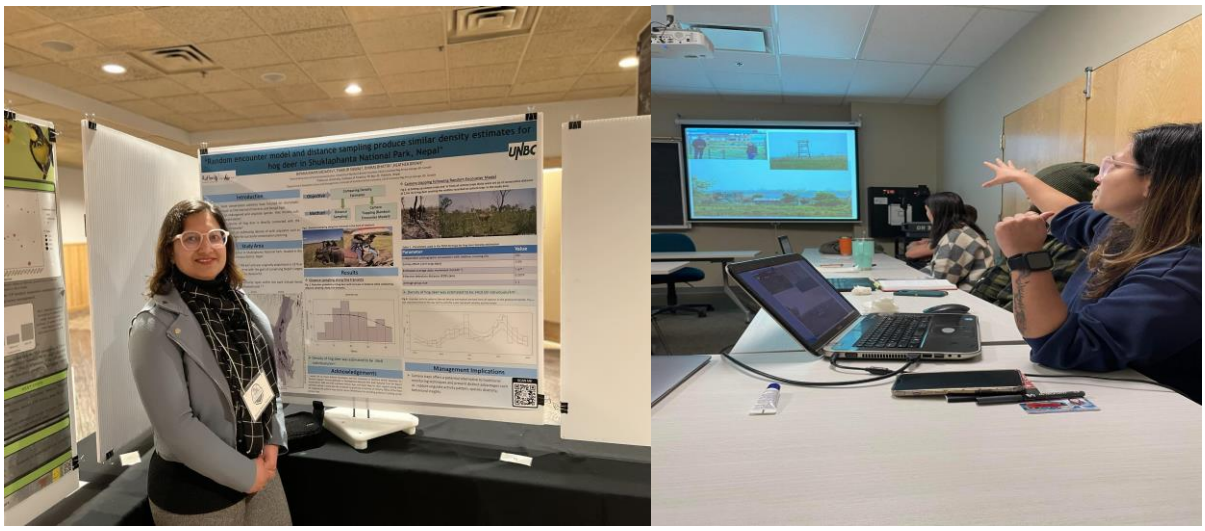

Figure 9: Principal researcher presenting project results in the conference and lab meetings

9. Provide a full list of all the members of your team and their role in the project.

Bipana Maiya Sadadev (Team Leader): Responsible for overall planning, coordination and implementation of the project

Dhiraj Bhatta (Activities coordinator): Responsible for the setting up and monitoring the camera traps, conducting distance sampling, questionnaire surveys and school teaching programs, designing the posters

Keshav Ayer (Research Assistant): Responsible for setting up and monitoring the camera traps and conducting distance sampling

Bimala Awasti (Volunteer) : Assisted while conducting distance sampling

Gauri Negi (Volunteer): Assisted in setting up camera traps

Hemanta Joshi (Volunteer): Assisted in monitoring the camera traps

Sushma Paudel (Volunteer): Assisted in designing the brochures and conducting the questionnaire survey

Anisha Bista (Volunteer): Assisted in designing and printing the t-shirts and caps

10. Any other comments?

We would like to thank The Rufford Foundation for providing the financial support to conduct this project for the hog deer conservation in Nepal. This project was very crucial to compare the density estimates from distance sampling and camera trapping following random encounter model and perform the habitat modelling of hog deer using MaxEnt. This project can provide a new insight to adopt a new approach for calculating the density of other ungulates. Our team members tried their best to fulfil all the objectivities of the project however there are lots of things we need to do for the conservation of Hog deer. We look forward to continuing this conservation work on hog deer keeping in mind the lessons learned from this project and we hope to get similar kind of financial support from The Rufford Foundation in days to come.