

PROGRESS REPORT

“Using UAV Imagery to Monitor Endangered Asian Elephants and their Habitat in the Khaling Duar Forest Reserve”

By Brenna Hatch

Purpose:

There has been a decline in the Asian elephant population due to the agricultural demand for tea production in northeast India. The main causes of the decline in Asian elephants are habitat fragmentation, expanding human populations, and growing resource demands (Sukumar, 1989). The increase of human-elephant conflicts and deaths are strongly connected to tea agricultural sites that border the wildlife habitats of Asian elephants on the India-Bhutan international boundary (Chartier et al. 2011).

In the past ten years, the Elephant Friendly Tea Certification program has shown a decline in conflicts and deaths in the Bhutan region and a sustainable environment between tea plantations and the conservation of Asian elephants. Lisa Mills formed a University of Montana partnership with the Wildlife Friendly Enterprise Network to develop the Elephant Friendly Tea Initiative. I will be working under Lisa Mills and joining her Elephant CREW (Citizen Research on Ecosystems and Wildlife). We will be monitoring the Asian elephant habitats with the aid of citizen science volunteers that are on-site in northeast India collecting data used for this project.

Progress:

This project will use UAV imagery to identify vegetation and the invasive weed (*Lantana Camera*), water resources, and elephant land-use patterns to understand how Asian elephants move across the region from wildlife areas into tea plantations. The invasive weed causes harm to the elephant's habitat. It takes over the forest floor and kills native plants that elephants rely on as a food source. The study area will be in the northeast India tea regions in the Khaling Duar Forest Reserve.

The study area has been approved by the Indian government to fly a drone. We are currently waiting new GPS points for a larger area of the forest. Once we have the GPS points,

we will send our drone pilot on May 3rd, 2021 to fly the area. This date was chosen because *Lantana Camera* blooms in late April and has a bright orange flower.

Additional Work:

The project's flight plan:

- Drone: DJI Phantom 3 Professional
- Flight Height: 50-70 meters
- Camera Angle: Nadir
- Image overlap: 80% Front and 70% Side overlap
- Flight Path: Cross Pattern
- Capture app: Pix4Dcapture
- The images will be processed in Pix4Dmapper pro.

ArcPro will be used to run the analysis. I will classify the landcover types using a maximum likelihood supervised classification based on the pixel's brightness values. I will be working with Lisa Mills who is familiar with this area when creating the training sites. There will also be ground truth data of the landcover types in the study area to run accuracy assessments.

Expected Outcomes:

I hope to discover the *Lantana Camera* coverage and its area size. This can create a plan for the removal of the invasive weed and begin conservation efforts. The goal is to reintroduce native plants that are growing in nurseries. If this is a success, the goal is to create more remote sensing maps of the Khaling Duar forest for *Lantana Camera* removal. This will aid in habitat conservation efforts for the Asian elephants. We want to show progress by having the same area mapped again in a few years by a new student. We hope that there will be a significant change with an increase in native plants and a decrease in *Lantana Camera*.

References

- Chartier, L., A. Zimmermann, and R. J. Ladle. 2011. Habitat loss and human-elephant conflict in Assam, India: does a critical threshold exist? *Oryx* 45:528-533.
- Sukumar, R. (1989). *The Asian elephant: ecology and management*. Cambridge studies in applied ecology and resource management. Cambridge: Cambridge University Press.