Threatened Paradise: Mapping an Invasive Fern Using Machine Leaning
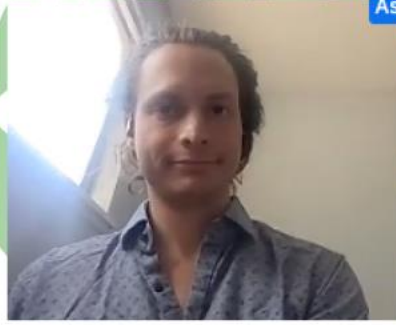
TEAM HAWAI'I

ISGEO 2022

MEET OUR TEAM
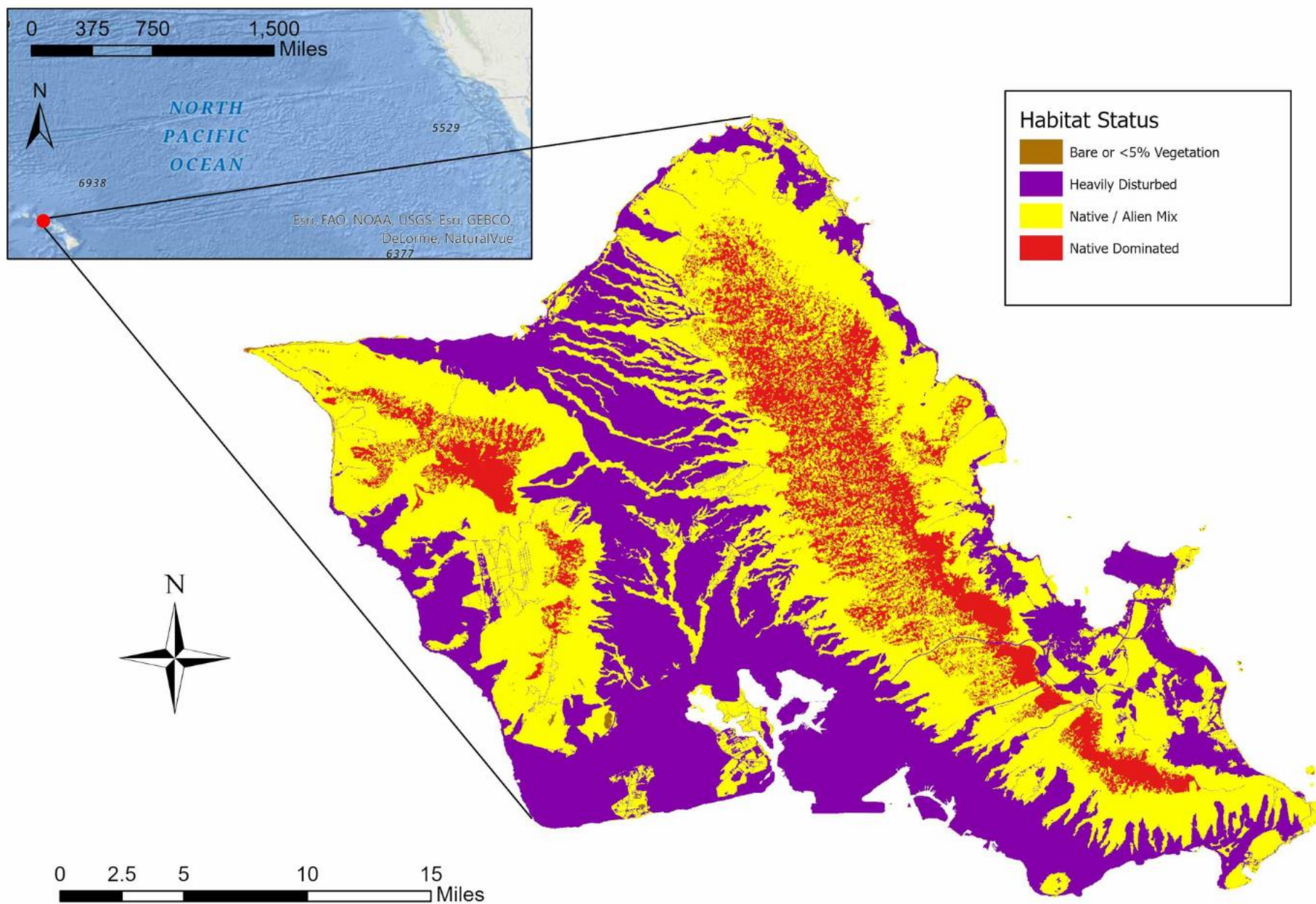

YOKO

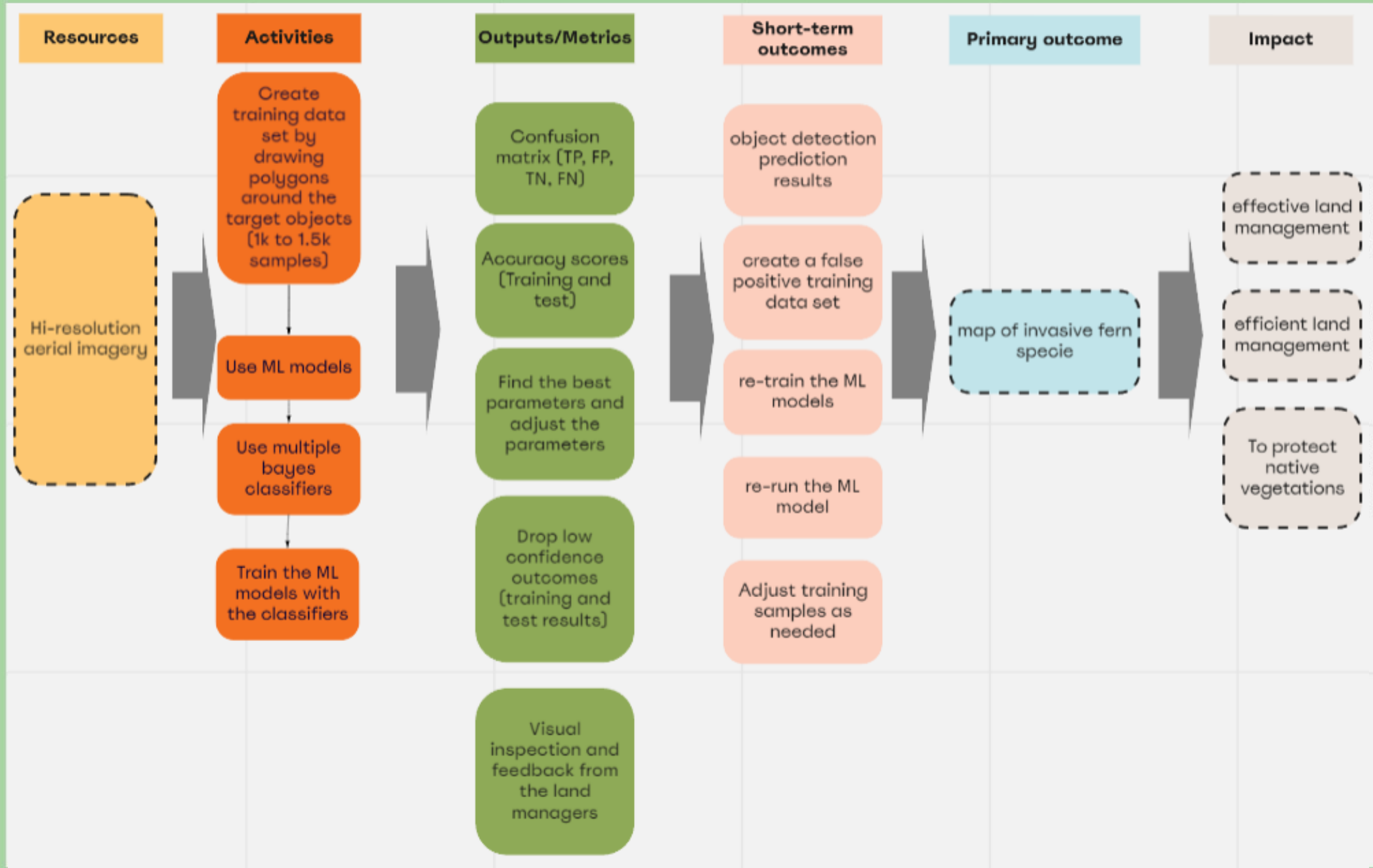DANIEL

LISSA

JOE

- **Problem: Invasive fern**
  - Growing fast
  - Aggressively outcompetes
  - Extending dense canopies over vegetations
  - Native ferns and other native plants to be displaced

Goal: To map the invasive fern using Machine Learning object detection technique to assist land managers to combat against the invasive fern effectively and efficiently.

Study Site

Habitat Status
- Bare or <5% Vegetation
- Heavily Disturbed
- Native / Alien Mix
- Native Dominated

NORTH PACIFIC OCEAN

Esri, FAO, NOAA, USGS, Esri, GEBCO, DeLorme, NaturalVue

Data: https://www.sciencebase.gov/catalog/item/592dee75e4b092b266efeb6e

PROJECT LOGIC MODEL

Resources	Activities	Outputs/Metrics	Short-term outcomes	Primary outcome	Impact
Hi-resolution aerial imagery	Create training data set by drawing polygons around the target objects (1k to 1.5k samples)	Confusion matrix (TP, FP, TN, FN)	object detection prediction results	map of invasive fern specie	effective land management
	Use ML models	Accuracy scores (Training and test)	create a false positive training data set		efficient land management
	Use multiple bayes classifiers	Find the best parameters and adjust the parameters	re-train the ML models		To protect native vegetations
	Train the ML models with the classifiers	Drop low confidence outcomes (training and test results)	re-run the ML model		
		Visual inspection and feedback from the land managers	Adjust training samples as needed		

PROJECT TIMELINE

Task	Status
Obtain High Resolution Aerial Imagery: raster files	Completed
Manually draw a polygon around the target invasive fern	Completed
Write a python code to crop raster files by each polygon	**Completed during ISGEO-22**
Create training data set using the python code	by August 31, 2022
Machine Learning (ML) model selection (find research papers)	October 2022
Create a formal proposal using research papers	November 2022
Set up an environment in High Performance Computer	October, 2022
Run ML models including tune-up, re-train, re-test, accuracy assessment using confidence scores and a visual inspection, and obtaining the feedback from stakeholders.	November, 2022 to March, 2023
Generate a final invasive fern map	April, 2023

Thank you!