Goathead & Land Cover Classification

Presented by Teresa Fong with contributions from Richard Rachman & Trevor Caughlin

ABSTRACT

Goathead, Tribulus Terrestris, is an invasive plant species in Idaho. Previous research from Trevor Caughlin's Lab at BSU found bareground cover to consistently increase their abundance, emergence, and persistence. Additionally, low-valued properties were found to have a higher risk of goathead occurrence on peripheral plots along the road network (i.e. cul-de-sacs, dead-end streets). Through mentorship, work in QGIS and R programming we analyzed satellite imagery with segmentation and classification. The classification algorithm showed a higher Overall Accuracy value with Asphalt, BareGround, BuiltEnvironment, Herbaceous, Tree, and Water. Compared to doing classification with PavedGround as well. Results indicate a more accurate classification that can be used to generate an updated mapping of Goathead susceptibility in Boise. A version of the map is currently utilized for goathead elimination efforts by the public, including the City of Boise's Weed Warriors program and the non-profit, Boise Bicycle Project. At least yearly land cover analysis will need to be conducted to update goathead susceptibility mapping. Urban planning efforts can benefit from subsequent research with urban field scholars and ecologists to analyze the socio-ecological impacts on urban infrastructure. This research further demonstrates how urban infrastructure facilitates inequitable conditions for bicyclists, human traffic, and dog walkers. Ultimately, we found community collaboration can reconstruct a more resilient, equitable, and sustainable urban ecosystem.

INTRODUCTION

- **Bare ground cover increases abundance, emergence, & persistence of goatheads**
  - Poses environmental & social consequences near lower-valued properties
- Goathead fruits puncture bike tires
  - Are dispersed by human, animal traffic
  - Hurt dog paws

COMMUNITY COLLAB

Science helps the broader public!

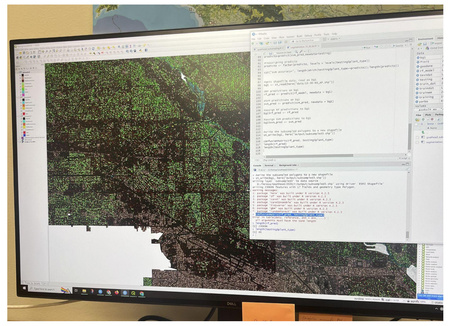
"Invasive species are a problem for everyone" -**Weed Warriors**

BOISE BICYCLE PROJECT

BOISE CITY OF TREES | PARKS AND RECREATION

METHODOLOGY

- Segmented 2020 PlanetLabs satellite imagery on QGIS based on pixel characteristics
- R Script programming to generate 2,000 training images
- Trained an image classification model to infer the identity by Classes:
  - Asphalt, BareGround, BuiltEnvironment, Herbaceous, Tree, and Water, and PavedGround



RESULTS

- **Balanced Accuracy BareGround: 0.8884%** average identified correctly of the whole image
- **Overall Accuracy: 0.704% of all classes correctly classified**
  - Almost 0.1% higher compared with having PaveGround classified

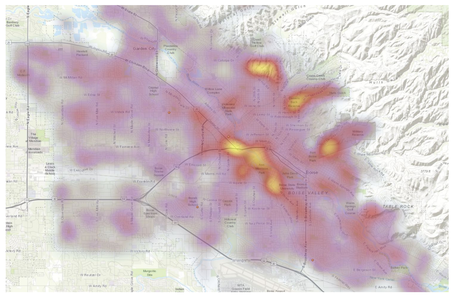
My personal Class identification from 2000 images (used for model training):

Asphalt	BareGround	BuiltEnvironment
455	656	391

Herbaceous	Tree	Water
314	160	24

NEXT STEPS

- To tackle goathead removals, frequent land cover analysis is needed to reflect goathead susceptibility on the hotspot/story map
- Further collaboration between urban field scholars & ecologists to explore urban socio-ecological impacts



MAIN TAKE-AWAYS

- Research, mentorship, & literature reviews on sprawl, urbanization, ecosystems, foraging, research methods, etc. has profoundly expanded my knowledge
- This experience can complement my work within the public service sector

Photos: Sean Evans, Boise State University, Murphy Woodhouse, Boise State Public Radio, & Wikimedia Commons

BOISE STATE UNIVERSITY

Caughlin Lab

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Story Map

Research Cited