CITIZEN SCIENCE GIS: COLLABORATING WITH COMMUNITIES TO INVESTIGATE MARINE DEBRIS IN HOPKINS, BELIZE

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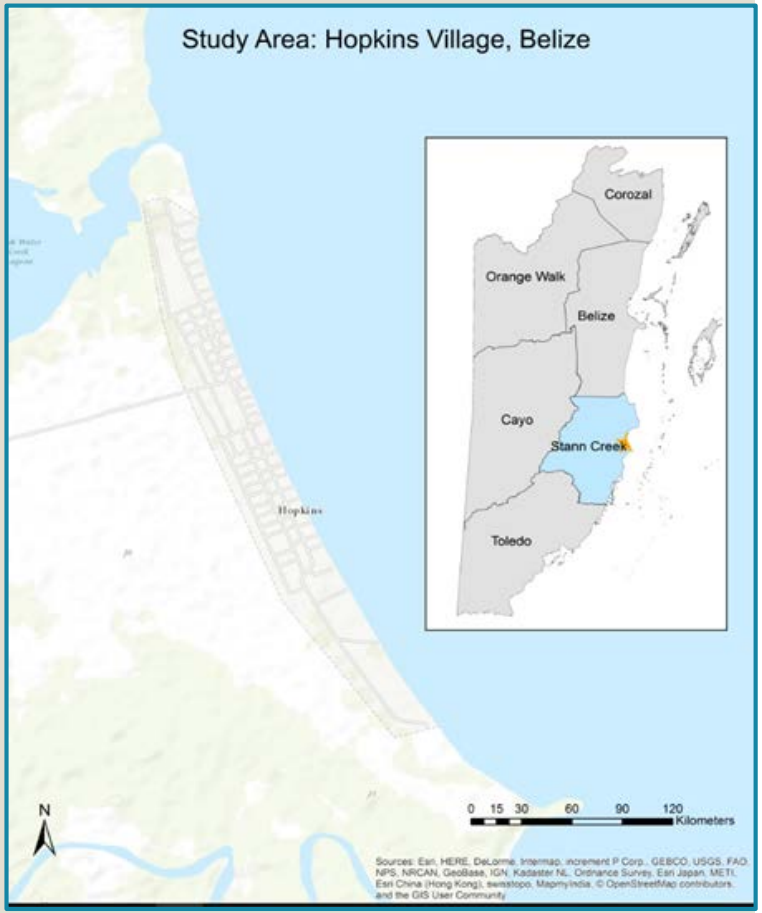
Hopkins Village, Belize

- Garifuna village
- Around 1200 residents
- Importance of marine debris
  - Health and safety concerns
  - Impact on tourism and fishing



Our Goal: Including **local knowledge** from community members along with **field data** to improve the understanding of **marine debris** in Hopkins

The REU Model

- National Science Foundation Research Experience for Undergraduates Site
- Collaboration between eight American students, two students from the University of Belize, staff from the University of Central Florida and Georgia State University

Week 1

- Orlando
- Research Design

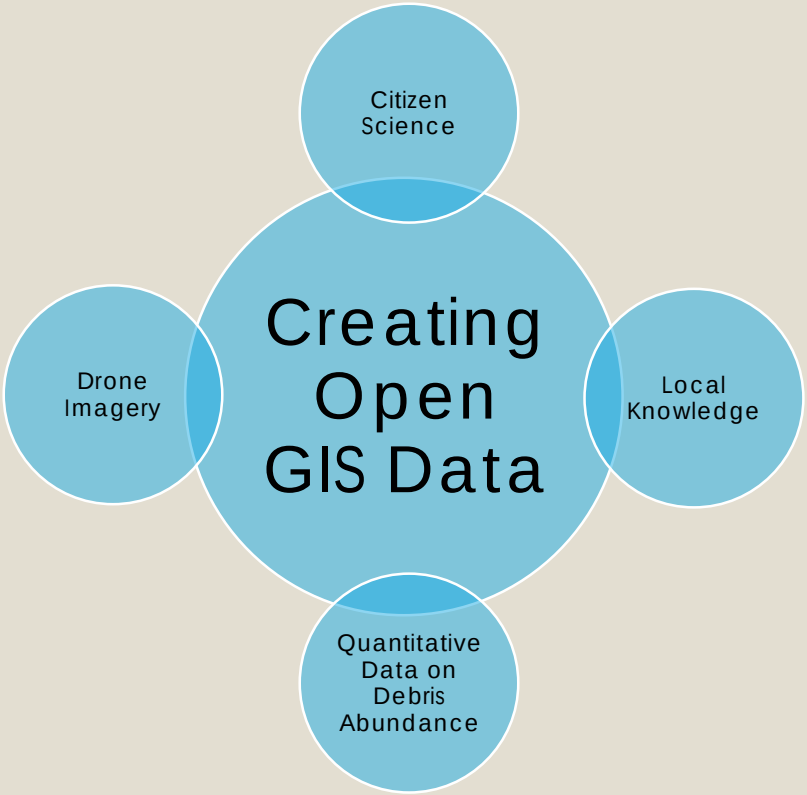
Weeks 2-6

- Belize
- Fieldwork

Week 7

- Back to Orlando
- Research Analysis

Focus of our Study



Research Questions

1. **Beach Survey*:*** What is the distribution, type, and abundance of marine debris along the coast of Hopkins considering the land use of the area?

2. **Perception Mapping:** Which places in Hopkins are valued by community members and why are these places valued? Which areas are perceived as abundant in debris?

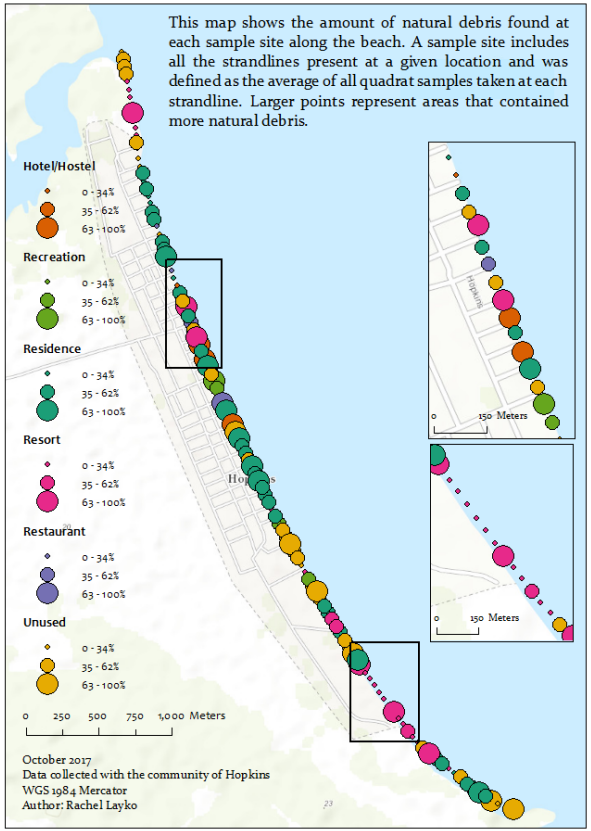
Beach Survey: Data Collection

- Start at lagoon in the north and finish by mangrove forest in the south
- Sample sites taken every 50 meters at every strandline along 3 miles of coast
- Utilized ArcCollector App offline

Beach Characteristics

Quadrat and Type Count

Natural Debris and Land Development in Hopkins, Belize



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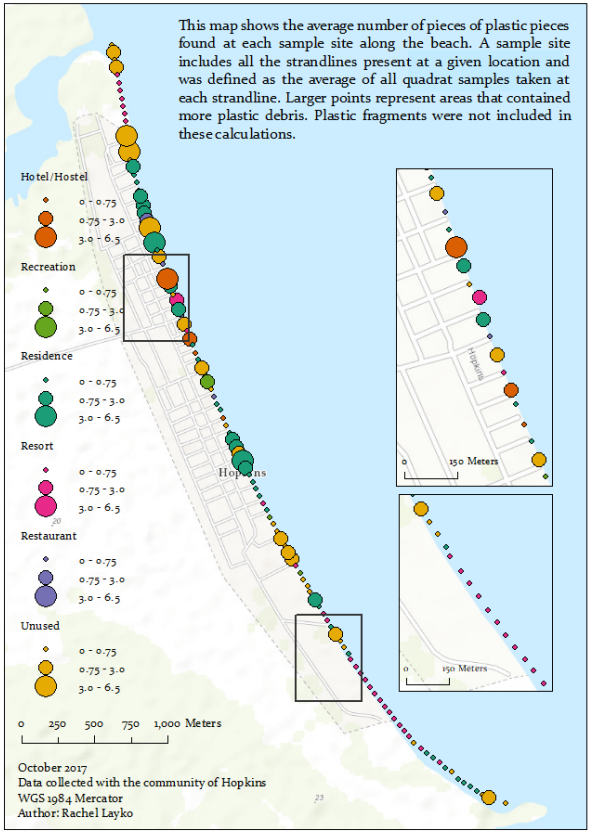
Plastic Debris Abundance and Land Development in Hopkins, Belize



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Beach Survey Results

- Difference between land development and amount of plastic and natural debris
- High accumulations of both plastic and natural debris on the north side of the village near the pier and the old school grounds
- Low accumulations of debris in front of resorts where debris is raked daily

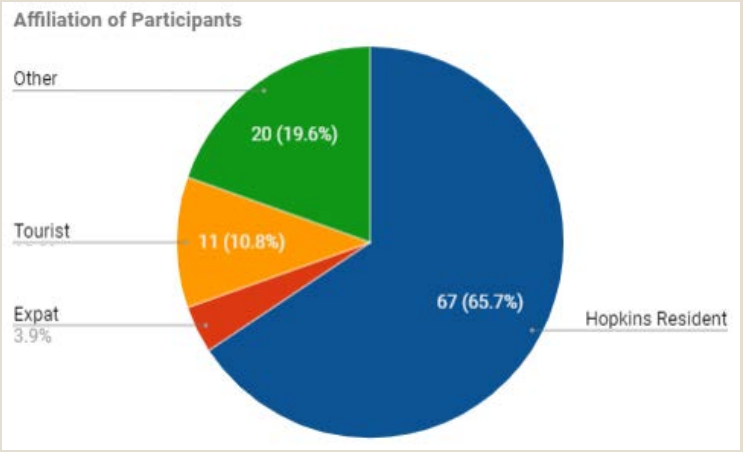
Research Questions

1. **Beach Survey:** What is the distribution, type, and abundance of marine debris along the coast of Hopkins considering the land use of the area?

2. **Perception Mapping:** Which places in Hopkins are valued by community members and why are these places valued? Which areas are perceived as abundant in debris?

Methods: Perception Mapping

- 101 participants
- Demographics
- Marine debris questions
- Mapping on tablets



Perception Mapping Data Collection

- “Are there areas of Hopkins that you particularly value? Where?”
  - Coded values (Clement and Cheng, 2006)
    - Aesthetic, biodiversity, cultural, economic, future, historic, intrinsic, learning, sustaining, recreation, spiritual, therapeutic

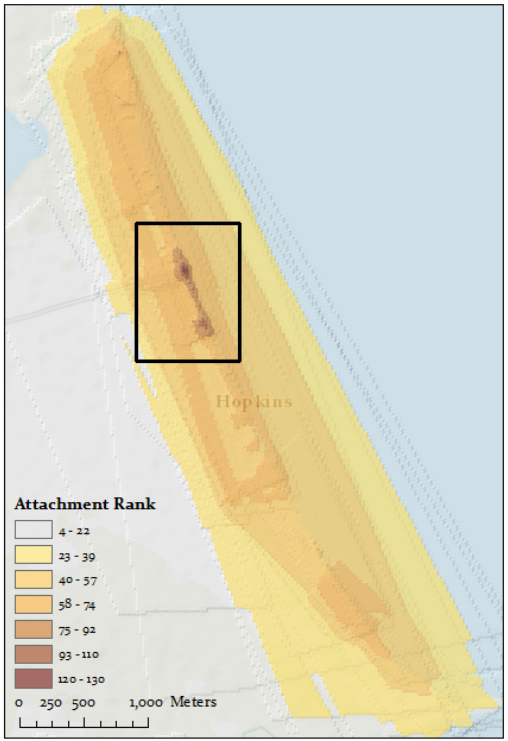
- “Are there areas of Hopkins with more marine debris than other places? Where?”
  - Primary and secondary debris
    - Plastic, natural, styrofoam, paper/wood, rubber

Perception Mapping Results

- Top reasons for valuing the pier and the old school grounds: **recreational** and **cultural**
  - Pier area: 34 polygons
    - Cultural: 21 polygons
    - Recreational: 18 polygons
  - Old School Grounds: 31 polygons
    - Cultural: 21 polygons
    - Recreational: 20 polygons

Emotional Attachment to Hopkins, Belize

This map displays the areas of Hopkins that community members identified as valuable. Community members were asked to rank the importance of the area they mapped from 1 - 5, with 5 being the most valued. The sum of these values is displayed below. Areas with the highest attachment rank represent the greatest importance as described by the community members interviewed.



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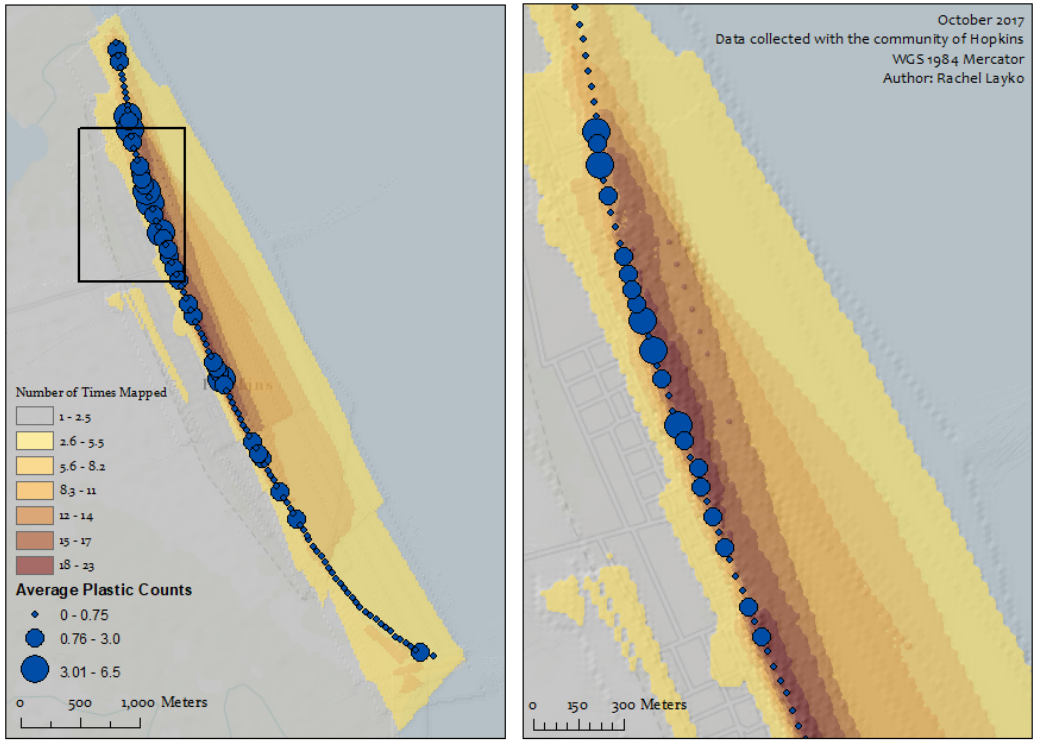
Plastic Debris in Hopkins: Data from Beach Surveys and Perception Mapping

This map compares community perception of debris abundance, displayed as polygons, with the amount of debris counted at each sample site, displayed as points. The different sized points represent the amount of plastic found at a given site. Larger points represent higher concentrations of plastic. The darker the polygon, the more community members described the area as having high accumulations of debris.



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Key Findings

Beach survey: What is the distribution, type, and abundance of marine debris along the coast of Hopkins considering the land use of the area?

- Debris abundance high along the northern coast of the village near the pier and the old school grounds
  - Indicated by quadrat data collection
- Relationship between land development and abundance of both plastic and natural debris

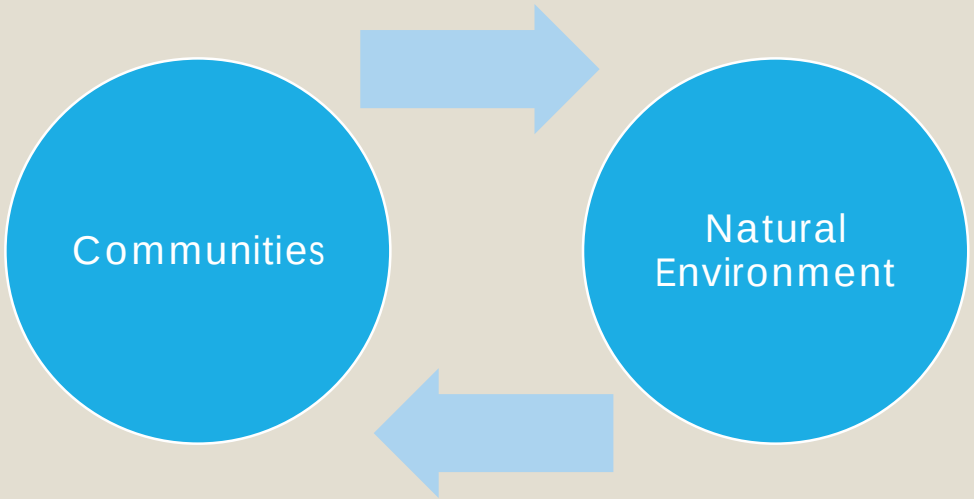
Key Findings

Perception Mapping: Which places in Hopkins are valued by community members and why are these places valued?

- Old school grounds and the pier were areas most valued
- Most named reasons for value of a place are cultural and recreation

Discussion of Results

- Combining perception mapping and quantiative data connects human-environment interactions
- Shows where debris is found and how communities utilize these areas



Our Goal: Including **local knowledge** from community members along with **field data** to improve the understanding of **marine debris** in Hopkins

Limitations

- Involvement of a wide range of community members
- Inaccessibility of sample points
- Coast only sampled during the summer

Future Research

- Trends of debris accumulation over time
- Increase community involvement in data collection
- Further analysis of interview responses in conjunction with perception mapped data and quadrat data

Acknowledgements

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- Hopkins Uncut
- Miss Bertie's Hopkins Community Library
- The Smithsonian Caribbean Coral Reef Ecosystems Program
- Hamanasi Adventure & Dive Resort

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Questions?