Engaging GLOBE Students in Research Across the Data Life Cycle

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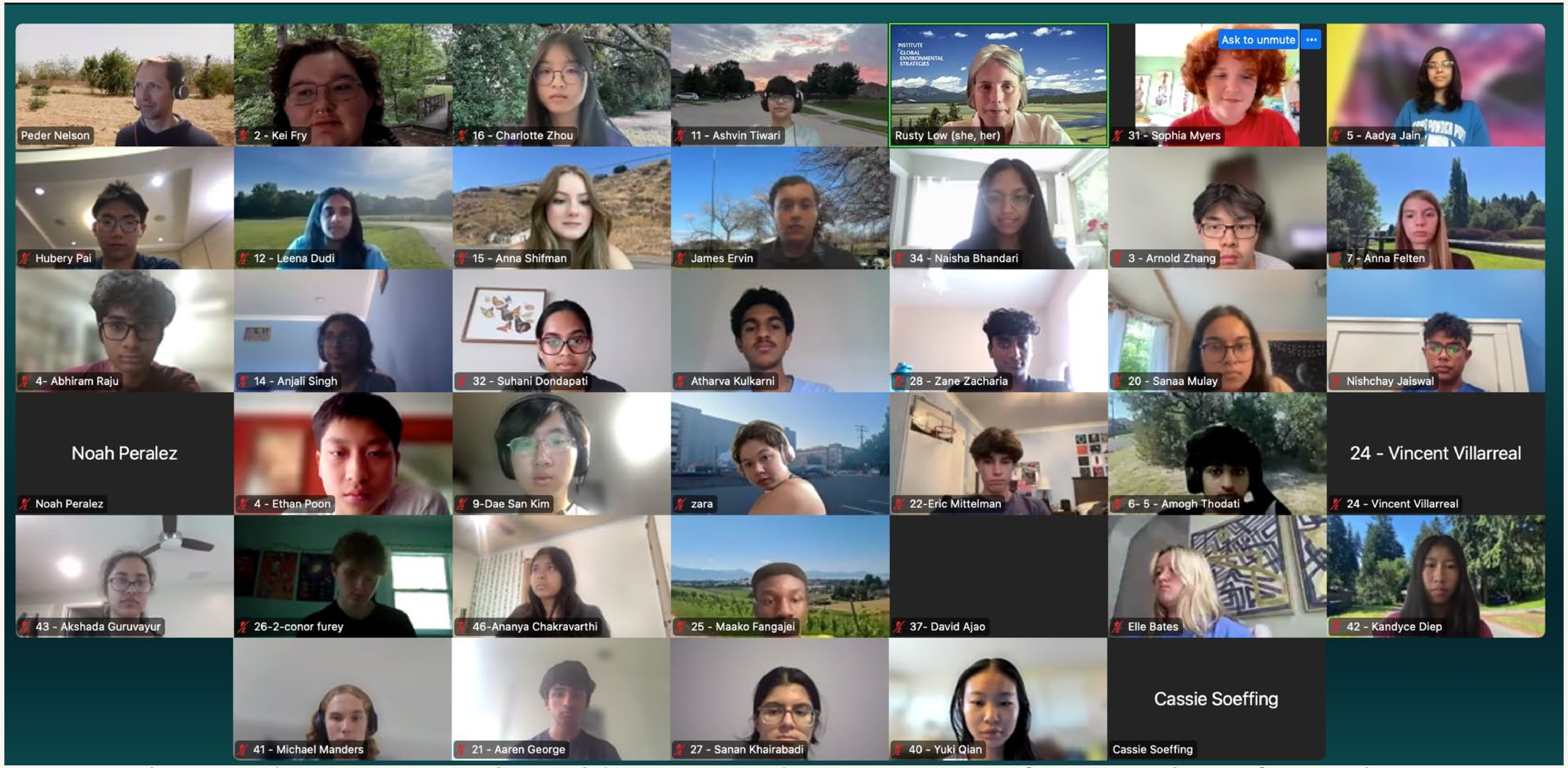
Earth System Explorers (ESE) 2024



GLOBE takes students on a real-world science adventure, transforming them from observers to active researchers. Our team will share how the SEES Earth System Explorers engaged students virtually across the entire data life cycle. We'll explore how students collected environmental data, analyzed it alongside scientists, visualized their findings, and contributed to GLOBE global datasets.

GLOBE and NASA data support critical thinking, open science, and open data.

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Earth System Explorers framework

Individual Identity

Interns enter with varying interests, skills and knowledge

Team Identity

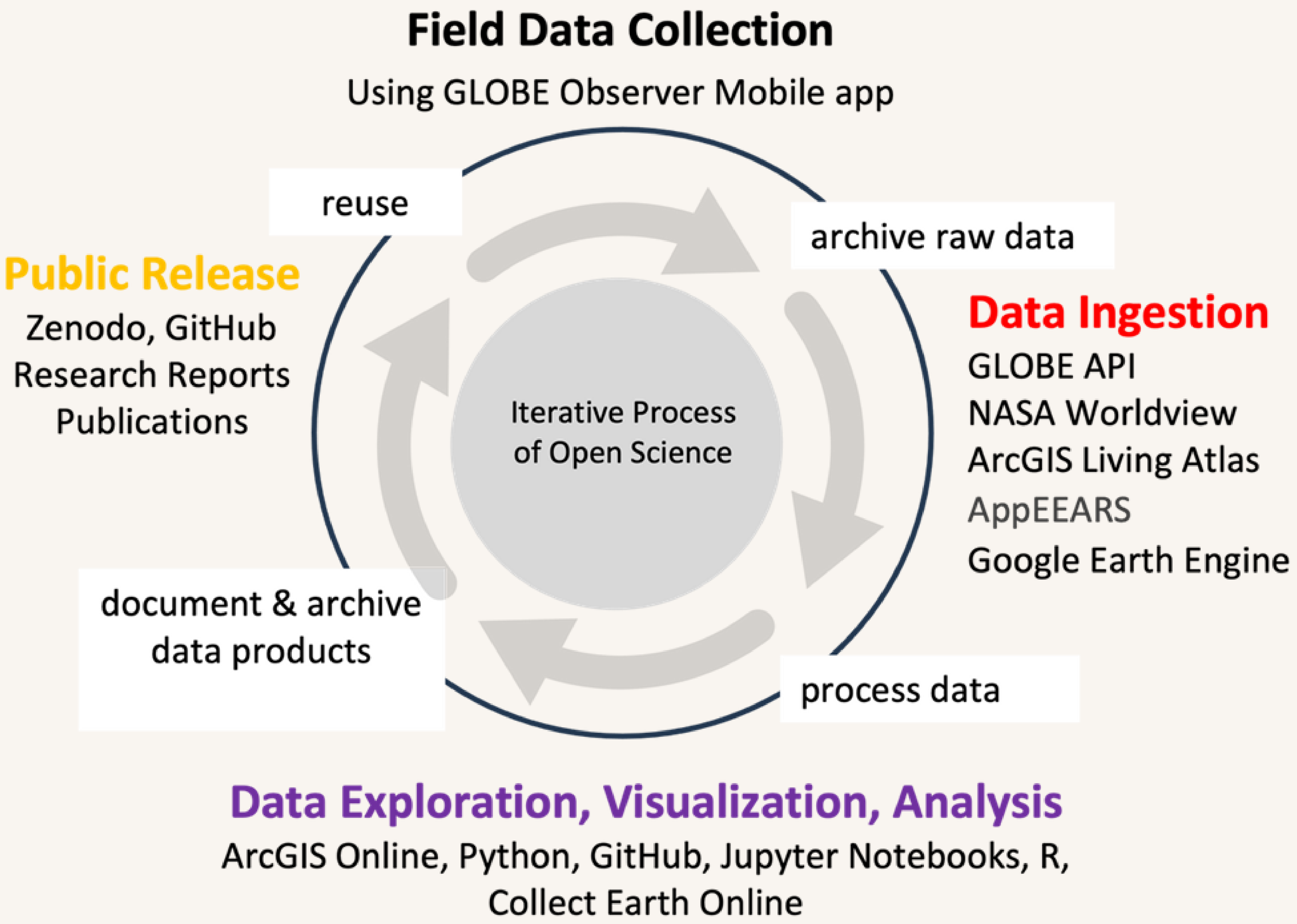
Team Science and Leadership: foster an ethos of science through intentional design

Science Identity

Open Science: learn about and practice open science (FAIR data)

Community Identity

Exit internship with expanded skills, knowledge, and community involvement



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Growth of the Earth System Explorers

Mosquito Mappers

2018

- Cross-collaboration by two SciAct Teams: SEES (UT Texas Austin), and NESEC
- A citizen science data collection experience for highly-qualified SEES candidates.

73 interns

2019

- A month-long webinar series
- Continued mosquito-focused research component.

65 interns

2020

- Optional pre-internship modules offered by SEES (Python Coding & Remote Sensing)
- Added Land Cover and changed from 4-8 weeks.
- **Added GLOBE Observer Land Cover scientist to the core team to incorporate Adopt a Pixel and a strong Land Cover research focus in fieldwork and intern research.**

Our new nested sampling framework enables the practical application of quantitative and statistical analysis of GLOBE Observer-obtained data. This framework links remote sensing land cover imagery with field-based observations, providing a comprehensive and practical approach to data analysis.

74 interns
40 IVSS submissions
13 earned 4 Badges

Earth System Explorers

2021

Reflect interdisciplinary focus: mosquitoes, land cover, NASA Earth observations.

107 interns
28 IVSS submissions
14 earned 4 Badges

2022

- Pilot Team Science module
- All interns are required to participate in team projects.
- Used Mighty Networks community engagement platform
- Interns were encouraged to submit blogs posted on GLOBE Mission Mosquito.
- Created badges for completing internship components

98 interns
23 IVSS submissions
21 earned 4 Badges

2023

- Added Open Science concentration
- Added Data Scientist to core mentor team
- Peer Mentor training developed.
- Internship activities are connected to badges earned over the course of the summer: Adopt-a-Pixel, Mosquito Habitat Mapper, Science of Team Science, and Earth System Explorer

47 interns
11 IVSS submissions
7 earned 4 Badges

2024

Past research teams have presented at GLOBE Observer Connect and Trees Around the GLOBE Student Research Campaign.

SEES
earth system EXPLORERS team
2024

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Various Research Project Titles

2023
Comparing **AI** Algorithms and Their Classification Abilities
Utilizing **CNN** to Identify the Environment Where Each Mosquito Genera Thrives
Enhancing Citizen Science Building a **Web-Based** Platform for Optimizing the Area of Interest Data Collection Project
Case Study of Hurricane Harvey (2017)
Analyzing the Correlation Between Terrain and the Characteristics of Wildfires
Uniting Deep Learning and Citizen Science for Automatic Land Cover Classification
Analyzing the Effects of Urbanization on Mosquito Population Dynamics Using Citizen Science Data
Exploring the Relationship Between Land Cover Classifications and Urban Heat Island Intensity
A **Random Forest Analysis** of Remote Sensing Driven Mosquito Habitat Prediction In West Africa
Influence of Tree Density Upon the Spatiotemporal Distribution of Mosquito Populations
Urbanization in Rural Towns - A Case Study of West Columbia, TX

2022
Region-Based **Modeling** of Atmospheric and GLOBE Data to predict Mosquito Hotspots
Analyzing the Effect of Hurricanes on Mosquito Population Patterns.
Forecasting West Nile Virus Infections: A **Machine-Learning** Approach to Epidemiological Monitoring_
Using Forest Fire Data to Improve **Machine Learning Modeling** of Mosquito Abundance
Predicting Culex Mosquito Habitat and Breeding Patterns in Washington D.C. Using **Machine Learning Models**
Predicting Mosquito Peaks in Chicago Summer using **Remote Sensing** Climate Data and Machine Learning
West Nile Virus: Relation to Land Cover and Population Density
The Effects of Roof Design on Mosquito Activity
The **Correlation** Between Annual Precipitation and West Nile Virus in the United States
A comparative analysis of different **Convolutional Neural Network Architectures** for Mosquito Genera Classification
Predicting the Volume of Mosquito-Borne Diseases Via the A.M.E.A. **Radio Network**.
Land Cover Verification and Error Analysis for Citizen Science Applications
Do mosquitoes have a desired choice of host determined by socioeconomic factors?
How does air pollution, humidity, precipitation, and temperature influence mosquito-borne vectors in the United States?
Method for Effective Mosquito Data Classification to Identify Potential Hosts of Malaria with **AI Implications**
MASC AI: A Novel Method for Effective **Mosquito Data Classification and Mapping**
Predictive Model for West Nile Virus Surveillance by Detecting Inland Water Eutrophication Using **Sentinel-2 Imagery**
A Mosquito is Worth 16x16 Larvae: Evaluation of **Deep Learning Architectures** for Mosquito Larvae Classification.

Badges and Blogs

Osemeren, SEES Earth System Explorer 2023

29 Nov - 1766 Views

Adopt-a-Pixel | Where does water meet land in my community? Scanning the Area As our first assignment as part of the Earth System Explorers team, we've been tasked with making our first observations using the GLOBE Observer App. The goal was to make 12 total observations (6 Potential Mosquito Habitat & 6 Land Cover). To be more efficient, I decided to make all of my observations...

Ryan C, SEES Earth System Explorer 2023

29 Nov - 1641 Views

I built my mosquito traps on June 20th and ran the experiment until July 15th. I collected a total of 15 observations during this period. To construct the traps I used three identical pots to hold water. The goal of my experiment was to find which type of mosquito bait would be the most effective at attracting and sheltering mosquitos. For the three baits I used dried leaves, grass clippings,...

Hugo, SEES Earth System Explorer 2023

28 Nov - 1704 Views

AOI Fieldwork At first, collecting land cover data for 37 points within my area of interest felt like a daunting task. However, after only a few "expeditions" in the past week, I was able to complete all 37 observations. To make my work easier and more accurate, I intentionally choose an AOI that would contain as many points as possible within a nearby park. This was to ensure that I could...

https://bit.ly/GMM-blogs

SCAN ME

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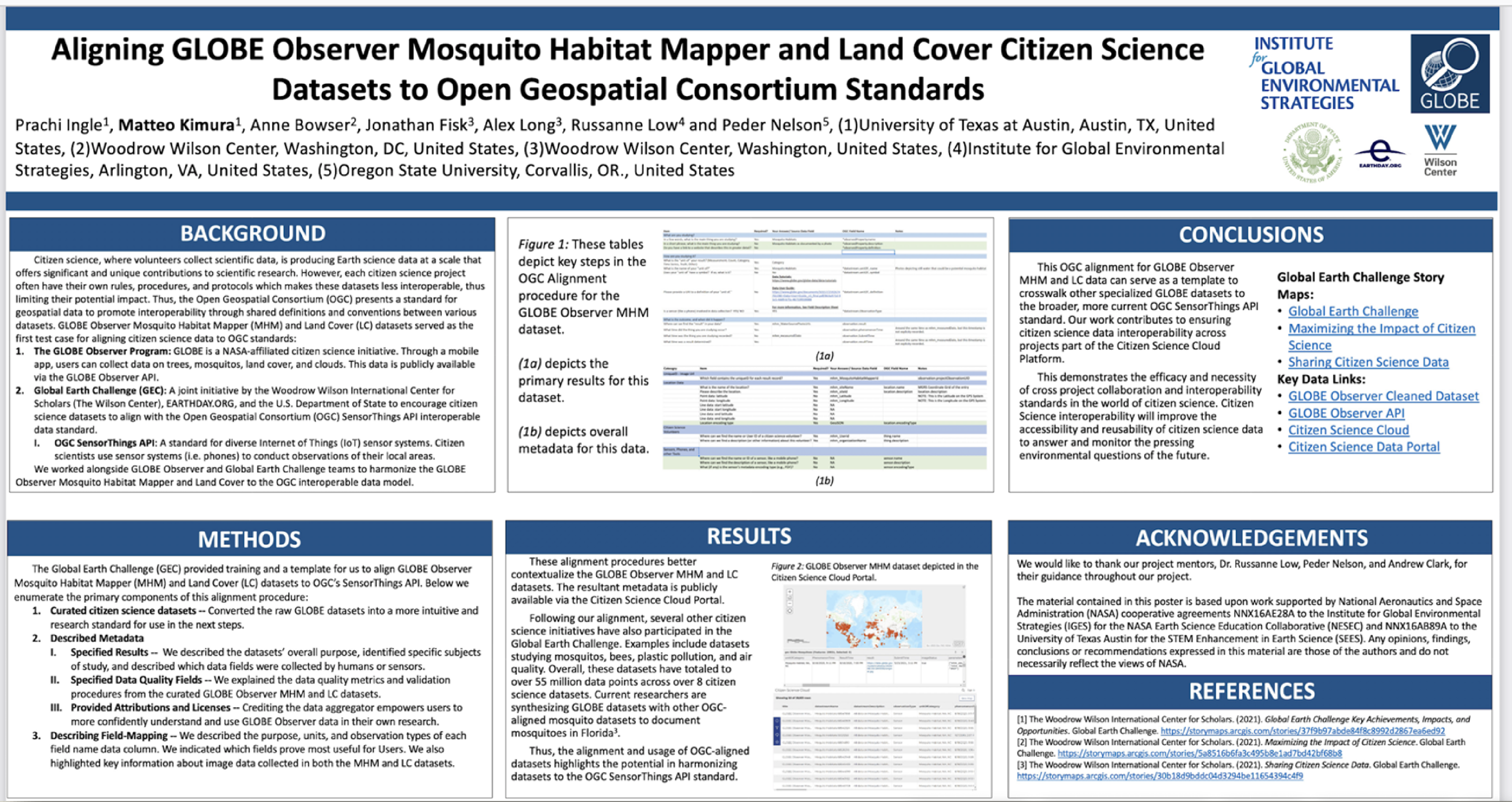
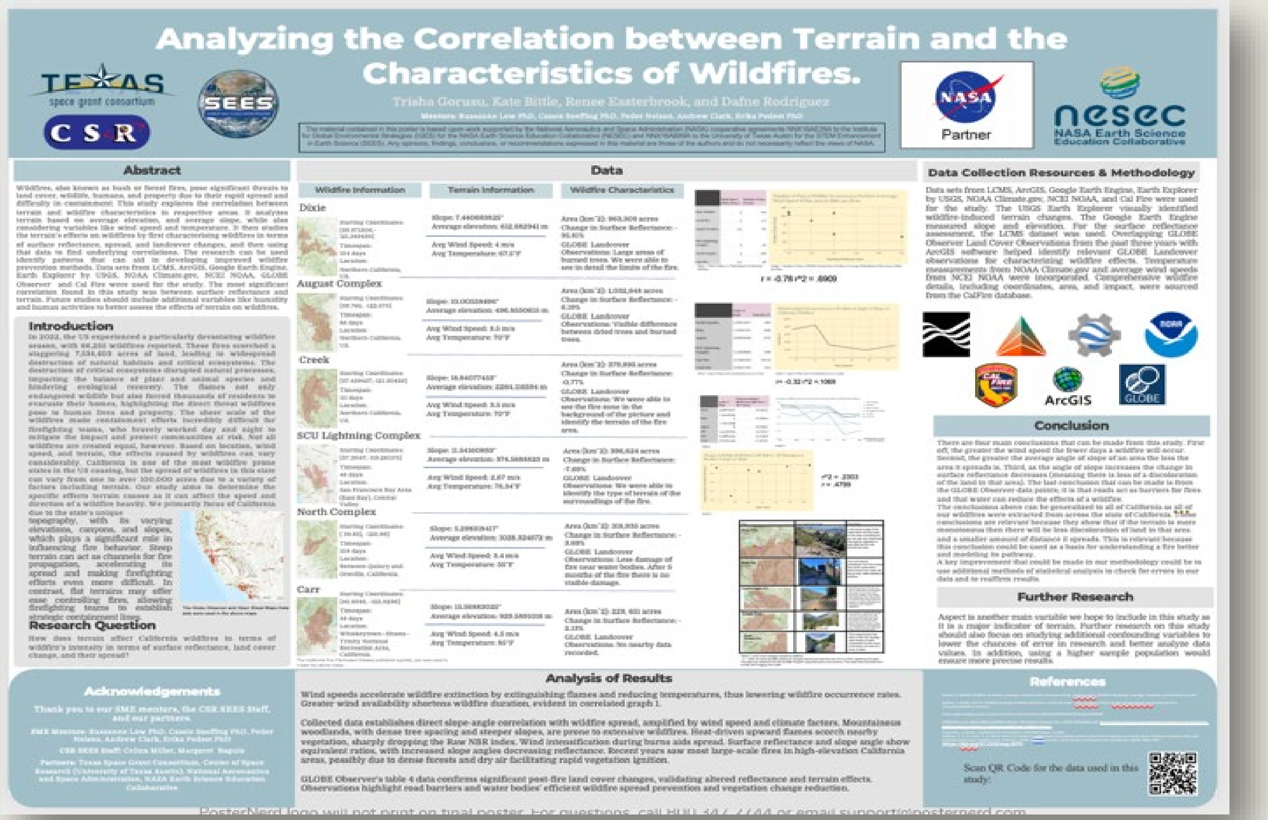
Awards and Recognition

2022

Outstanding Student Presentation Award (OSPA) winner for the American Geophysical Union's (AGU's) Earth and Space Informatics Division, (in competition with undergrad and graduate students)





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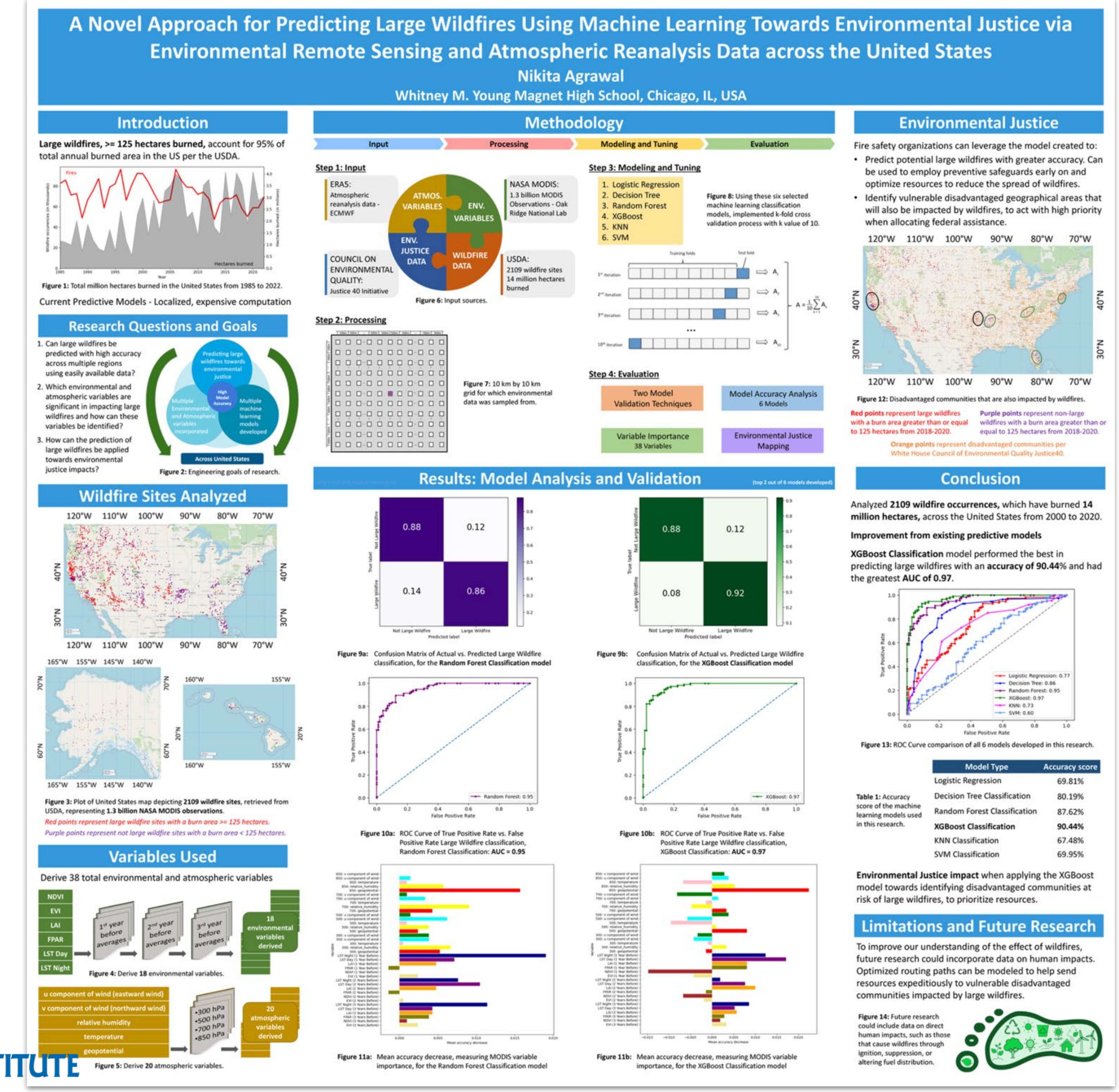
SEES Earth System Explorers Intern Recognition



2023

Nikita Agrawal: Research on Predicting Large Wildfires Using Machine Learning

- **Regeneron Science Talent Search (STS) Scholar** - Society for Science
- **Third Place Grand Award**, National Geographic Society, Earth and Environmental Sciences Category
- **1st Place in Earth Science Category**, Illinois Junior Academy of Science
- **National Geographic Society: Excellence in Geography and Geospatial Science**
- **Plus 8 additional awards** for this student research project.

2024

- Three SEES ESE intern projects were in the Regeneron top 300 (in 2023, one was in the top 6)

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Research publications including SEES Interns (9)

2023 **Agrawal, N.,** Nelson, P.V. and Low, R.D., 2023. A Novel Approach for Predicting Large Wildfires Using Machine Learning towards Environmental Justice via Environmental Remote Sensing and Atmospheric Reanalysis Data across the United States. *Remote Sensing*, *15*(23), p.5501.*(SEES 2022)*

2022 **Sun, C., Nimbalkar, J., & Bedi, R.** (2022, September). Predicting Future Mosquito Larval Habitats Using Time Series Climate Forecasting and Deep Learning. In *2022 IEEE MIT Undergraduate Research Technology Conference (URTC)* (pp. 1-5). IEEE. *(SEES 2022)*

2022 **Xia, I., Singirikonda, N., Hellman, L., Watson, J., Hanna, M.** and Low, R., 2022. Using Machine Learning Regressors for the Discovery of Culex Mosquito Habitats and Breeding Patterns in Washington DC. Journal of Student Research, 11(4). ***(SEES 2022)***

2022 **Polineni, S., Shastri, O., Bagchi, A., Gnanakumar, G., Rasamsetti, S.,** & Sundaravadivel, P. MOSQUITO EDGE: An Edge-Intelligent Real-Time Mosquito Threat Prediction Using an IoT-Enabled Hardware System. *Sensors*, *22*(2), 695. *(SEES 2021)*

2022 Low, R.D., Schwerin, T.G., Boger, R.A., Soeffing, C., Nelson, P.V., Bartlett, D., **Ingle, P., Kimura, M.** and Clark, A. (2022). Building International Capacity for Citizen Scientist Engagement in Mosquito Surveillance and Mitigation: The GLOBE Program's GLOBE Observer Mosquito Habitat Mapper. Insects, 13(7), p.624. https://doi.org/10.3390/insects13070624. *(SEES 2020)*

2022 Low, R. D., Nelson, P.V., Soeffing, C., Clark, A., and **SEES 2020 Mosquito Mappers Summer Research Interns**. Adopt a Pixel 3 km: A multiscale data set linking remotely sensed land cover imagery with field-based citizen science observations. In Open Citizen Science Data and Methods, ed. Bowser, A.K. Schaed, S. and de Serbinin, A., Frontiers Research Topics https://www.frontiersin.org/research-topics/13843/open-citizen-science-data-and-methods.

2021 Low, R., Boger, R., Nelson, P. and **Kimura, M.** GLOBE Observer Mosquito Habitat Mapper citizen science data 2017-2020. Published August 19, GeoHealth. DOI: 10.1029/2021GH000436. URL: https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2021GH000436. *(SEES 2020)*

2021 **Kar, K.** and Low, R. The effect of poverty on mosquito-borne illness across the United States. J Emerg Investig. February 25. https://www.emerginginvestigators.org/articles/the-effect-of-poverty-on-mosquito-borne-illness-across-the-united-states. *(SEES 2020)*

2020 **Lin, D.W.** Land Cover Feature Analysis for Mosquito Habitats.IOSR Journal of Environmental Science, Toxicology and Food Technology.
e-ISSN: 2319-2402,p- ISSN: 2319-2399. Volume 14, Issue 12 Ser. II (December 2020), p 24-30.
https://www.academia.edu/44798039/Land_Cover_Feature_Analysis_for_Mosquito_Habitats?email_work_card=thumbnail *(SEES 2020)*

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