

# *Engaged Scholars Academy*

## **Project Information Report**

- 1. PROJECT TITLE: Teaching remote sensing and tropical forest**
- 2. PROJECT DESCRIPTION**

This project is part of a New Investigator in Earth Science grant funded by NASA, titled “Estimation of tropical forest structure using multiple remote sensing platforms and field based data.” One third of the project involves an educational component. Tropical forests hold a sense of awe and wonder, inspiring exploration amongst researchers, students, and the general population. In addition, remote sensing and use of satellite imagery have become common in popular culture, such as Google Earth. However, the connections between these ubiquitous technologies and ecological research are less clear to the general population. High resolution image data (1m) provide a wonderful opportunity to create a bridge because there are obvious parallels between what one sees in an image, and how that image is represented statistically, allowing for opportunities and avenues for education and public outreach. It is my intention to direct the educational component of this project to follow many of the tenants involved with engaged scholarship. Because this is a collaborative project involving many people, for the rest of this project description I will use the plural first person pronoun “we.”

- 3. BACKGROUND INFORMATION/STATEMENT OF THE ISSUES/PROBLEM**

Although fundamentally simple in concept, the use of remote imaging techniques to collect a wide range of data relating to forest structure and ecosystem response requires a cognitive jump that needs to be nurtured in K-12 students. For example, the notion that an image can be represented as an array of numbers, and thus a type of measurement, may not be obvious to many people. To support this goal, we will develop a scaffolded approach to improve understanding of the underlying concepts and potential of ecosystem imaging, from remote sensed platforms and their application to understand forests, specifically tropical forests, which hold a sense of interest based on their complexity, diversity, and unique flora and fauna.

- 4. PROJECT DETAILS**

### **Goals and Objectives**

Our research section employs an automated pattern recognition algorithm.

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Though this concept appears complicated it is rather simple when described as a series of steps, providing a valuable tool for explaining a complex series of decisions for pattern recognition. Understanding an algorithm is vital for scientific inquiry and is rarely presented to students and teachers in an understandable way. We plan to incorporate remote sensing, analytical techniques, and forest dynamics in an exploratory and adventurous study module.

Our education and public outreach will be guided by the following questions:

- A. Why are tropical forests of interest to both biologists and earth system scientists?
- B. What type of data is available from remote sensing?
- C. How does one analyze remote sensing data?
- D. What is an algorithm and how is this used in science, and specifically in remote sensing?
- E. How does our advancing knowledge of remote sensing, tropical forests, and algorithm development impact our lives in other ways?

### **Target Population/Audience**

Students K-12

### **Methods**

Earth observation techniques are one of the key components to furthering our understanding of global climate change, land use change, and ecosystem dynamics. Our work will engage students directly in NASA's supported" remote sensing research techniques pioneered by members of our team. This project will provide middle and high school teachers and students with a hands-on experience and context that will inform their understanding of how scientists use imaging as a research tool in Earth System Science and on the effects of a changing climate on terrestrial ecosystems.

### **Evidence of External Collaboration and Partnership:**

One of the primary challenges in establishing effective education/outreach components for a primarily research-focused project is in focusing as many resources on the development of new material/approaches rather than on creating an infrastructure for dissemination. At the same time, ignoring the need to effectively engage a targeted audience can lead to educational websites that sit idly, or one-off workshops that don't effectively bring one's material into the classroom. We address these potential pitfalls by partnering with the Joan and James Leitzel Center for Mathematics, Science, and Engineering Education here at UNH. Specifically, we will be supporting Mr. Erik Froburg, an Education Specialist at the Leitzel Center, to collaborate on the development, dissemination and long-term sustainability of our education plan. The Leitzel Center was created

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to enhance UNH's institutional commitment to the integration of research, teaching and engagement. The partnership with the Leitzel Center will provide, not only expertise in K-12 STEM education, but also an existing relational infrastructure for working with schools in our region. The Center also provides an infrastructure for administrative support to continue project activities after the NASA award period.

### **Expected Impact:**

We approach the sustainability of this exploratory project in two different ways. Ultimately, it is our hope to extend the scope of our Educational Component to the national scale, and would hope to be positioned to take the step to the next level at the end of this funding period. Additionally, however, our educational project will continue as a piece of the ESS offerings of the Leitzel Center. This becomes mutually beneficial, as the Leitzel Center is looking to expand its offerings in the ESS realm. The Leitzel Center facilitates training and professional development in a variety of formats. The Advancing Science program ensures that, regardless of long-term funding prospective, any instrumentation, training and protocols that are developed through our research project involving tropical forests will be utilized by regional schools into the future.

### **Scholarly Connection:**

A scholarly connection is made by working with Erik Froburg and the Leitzel Center. Their involvement in the project allows for the possible publication in educational and outreach journals based on an analysis of this engaged scholarship project. In addition, by teaching such a topic to teachers and students in the K-12 levels, I hope to become more versed in teaching at the college level. In addition, this project has a multitude of collaborators that are fundamental in the completion of the scientific research component of the project. Networking and long term collaborations proves vital in development of scholarship, future funding, and publication of research results.

## **5. EVALUATION PLAN**

Formal evaluation of an education component is important in understanding and assessing its impact to an educational environment. We will be performing some formative evaluation (questionnaires and focus groups) and collecting participant metrics in order to guide the project development and to better position this component for long-term sustainability.