Photosynthesis from Near and Remote Sensing from Far

Jeremy Hoyne Grosvenor, 2022

My Information and Technology Gibbons Summer Research Program Fellowship allowed me to be a part of a multidisciplinary National Science Foundation (NSF) funded research project that is working to connect photosynthetic seasonality in conifer forests with emerging techniques that observe landscapes at distances ranging from tens of meters to Earth-orbiting satellites. Traditional remote sensing techniques rely on the detection of green leaves to assess photosynthetic seasonality. This method has proven a valuable tool for evaluating deciduous forests but struggles with coniferous forests as they retain their green needles year-round. The research team, including Dr. Barry Logan, Professor of Biology at Bowdoin College, has demonstrated that seasonal physiological adjustments to photosynthetic capacity in conifers can be detected through color changes by a variety of remote sensing metrics derived from digital cameras and optical instruments mounted to towers and satellites. Two of this research projects' primary aims are to refine models of forest photosynthetic capacity with remote sensing data and to develop the tools to create a continental observation network capable of quantifying the photosynthetic response to climate change over the past 30-year data availability and into the future. Since photosynthesis is the primary mechanism through which the biosphere and atmosphere interact, understanding and predicting carbon-climate feedbacks will be crucial to understanding and future mitigation of human-influenced climate change.

I contributed to this project by assisting in research and conceptualizing teaching materials. This fellowship allowed me to participate in trips to conifer-dominated NEON (the National Ecological Observing Network) research sites in Alaska and Florida to characterize photosynthetic capacity at the needle scale. I was also heavily involved in processing year-round needle samples from both NEON locations to help characterize the different seasonal physiological adjustments in Alaska and Florida. While being heavily involved with the research side of the grant, I balanced the conceptualization and synthesis of teaching materials aimed at connecting plant physiologists and remote sensing scientists. The teaching materials goal is to bridge the inter-disciplinary gap to facilitate engagement with remote sensing data mapped onto seasonal plant physiology in a non-specialist friendly manner.

This project gave me the opportunity to further hone and showcase my science communication skills. Learning the ins and outs of plant physiology has changed the way I see our environment and cultivated a level of academic curiosity that I have never experienced. Receiving the Information and Technology Gibbons Summer Research Fellowship Program allowed me to continue pursuing my deepest academic passion while providing me with the opportunity to share my enthusiasm with others inside and outside the academic community. This funding offered me a transformational career development experience. This fellowship allowed me to gain crucial on-the-job experience and a peek into the scientific field in which I'm interested in pursuing a career.

Faculty Mentor: Barry Logan
Funded by the Information and Technology Gibbons Summer Research Program Fellowship