MAGIP Scholarship and Grant Awards, 2022

The MAGIP Grants and Scholarship Committee is pleased to announce the 2022 awards for Higher Education Scholarships. Despite the ongoing pandemic and challenges of online learning and living, MAGIP was fortunate to receive high quality applications from undergraduate and graduate students alike. While we would like to support all submitted projects, we identified two exceptional Higher Education Scholarship proposals that we are delighted to fund this year. These scholarships will be distributed to one highly motivated undergraduate student, and one Master's degree student. Furthermore, we are excited to distribute these awards across the Continental Divide and support one student at the University of Montana, W.A. Franke College of Forestry and Conservation, and one student at Montana State University, Department of Earth Sciences.

MAGIP Higher Education Scholarships

Madison Vastine, Undergraduate
W.A. Franke College of Forestry and Conservation
Wildlife Biology Program
University of Montana
"Spatio-temporal variation in black bear activity patterns"

Montana is rich with wildlife in all forms and sizes. However, unless they are game animals, highly charismatic, or possess other socially acclaimed values, we tend to know little about them. Madison's research at MPG Ranch should help us better understand the movements and behaviors of the balck bears that are a response to risks and challenges they face. It will be especially interesting to shed light on the notion that the work we do to study these animals can negatively impact their ability to sustain themselves. Hopefully other researchers can use the information Madison will provide as a guide to designing studies that are compatible with the long term survival of the species being observed.

For more information, Madison's project project abstract is available here:

Abstract:
The goals of this study are to: 1) evaluate whether black bear activity patterns are influenced by spatio-temporal dynamics associated with human disturbance, 2) determine if black bears on MPG Ranch are diurnal or nocturnal, 3) evaluate possible temporal shifts in black bear activity patterns due to the introduction of summer black bear trapping during 2020-2021, and 4) evaluate whether activity patterns varied by bear sex or age class. This knowledge will be useful to determine our impact while conducting research on the landscape.

Hayden Yates, Master's Candidate
Department of Earth Sciences
Montana State University
"UAS thermal infrared and machine learning to identify surficial and structural parameters diagnostic of surface thermal anomalies near Norris Hot Springs, Montana"

Montana has a long history of mining and geological exploration. The project Hayden is working on proposes a new and potentially efficient method for better understanding the factors that control the outer expression of geothermal resources in particular. Furthermore, the use of UAS to identify, quantify, and monitor resources of all kinds is rapidly increasing. What we do not yet know is how effective some of the UAS-based assessment and monitoring projects can be. Hayden's research at Norris Hot Springs should help us get a better sense of whether remote data collection is an effective companion for ground-based measurements, and what level of detail along with changes in those details can be detected. There will be many challenges in Haden's project and we look forward to learning along with her.

To learn more about Hayden's project her abstract is available here:

Abstract:
Geothermal development is an increasingly attractive option for low-carbon energy, but current exploration methodologies are labor intensive and financially prohibitive. Therefore, nontraditional methods such as Uncrewed Aerial System (UAS) thermal mapping may improve geothermal resource assessment. This project will apply UAS (drone) optical and thermal imagery capture, imagery and surface analysis, photogrammetry, geologic field mapping and data collection, and machine learning to establish which geologic, surficial, and/or climatic factors lead to hot spots in drone thermal imagery. Norris Hot Springs in southwest Montana will serve as a case study for this technique development. The basin and range extensional tectonics of this region provide an ideal setting for the anomalously high heat flow and permeability required of geothermal systems, but geothermal resources remain underexplored and underdeveloped in this area. For this case study, we will use thermal infrared (TIR) imagery captured from UASs to identify thermal anomalies and Structure-from-Motion (SfM) photogrammetry to derive terrain data. In situ ground measurements such as thermal conductivity will serve as training samples in a Random Forest machine learning algorithm to identify diagnostic surface parameters of geothermal systems. A comparative analysis of modeled results and field-mapped geologic structure will also indicate whether structural controls influence thermal anomalies. By establishing which surficial and structural parameters influence anomalous heat signatures in the Norris Hot Springs area, we can potentially apply this improved methodology to characterize geothermal resources in areas of unknown potential across Montana and the western United States. Beyond the purposes of exploration, this work will also enhance our knowledge of the utility of drones for geothermal resource assessment, especially inventory and monitoring. Implementing novel tools and technologies such as drones

and machine learning may improve our understanding of the factors that influence surface thermal anomalies, providing insight into the structural and surficial signatures of geothermal Systems. Geothermal development is an increasingly attractive option for low-carbon energy, but current exploration methodologies are labor intensive and financially prohibitive. Therefore, nontraditional methods such as Uncrewed Aerial System (UAS) thermal mapping may improve geothermal resource assessment. This project will apply UAS (drone) optical and thermal imagery capture, imagery and surface analysis, photogrammetry, geologic field mapping and data collection, and machine learning to establish which geologic, surficial, and/or climatic factors lead to hot spots in drone thermal imagery. Norris Hot Springs in southwest Montana will serve as a case study for this technique development. The basin and range extensional tectonics of this region provide an ideal setting for the anomalously high heat flow and permeability required of geothermal systems, but geothermal resources remain underexplored and underdeveloped in this area. For this case study, we will use thermal infrared (TIR) imagery captured from UASs to identify thermal anomalies and Structure-from-Motion (SfM) photogrammetry to derive terrain data. In situ ground measurements such as thermal conductivity will serve as training samples in a Random Forest machine learning algorithm to identify diagnostic surface parameters of geothermal systems. A comparative analysis of modeled results and field-mapped geologic structure will also indicate whether structural controls influence thermal anomalies. By establishing which surficial and structural parameters influence anomalous heat signatures in the Norris Hot Springs area, we can potentially apply this improved methodology to characterize geothermal resources in areas of unknown potential across Montana and the western United States. Beyond the purposes of exploration, this work will also enhance our knowledge of the utility of drones for geothermal resource assessment, especially inventory and monitoring. Implementing novel tools and technologies such as drones and machine learning may improve our understanding of the factors that influence surface thermal anomalies, providing insight into the structural and surficial signatures of geothermal systems.