Baseline Data and Education at the Natural Resource Center in Butte Falls, Oregon

Sara Evans and Teia Knoll

May 17, 2019

Environmental Science and Policy

Southern Oregon University

Abstract

This project highlights the need for data collection regarding the land and hydrology at a Natural Resource Center in Butte Falls, Oregon. In order to maintain this hub for science and education, we are the first students from Southern Oregon University to acquire baseline data about natural systems on a plot of land recently granted to the Butte Falls School District. Outdoor education for students is essential and using our observational data and analyses, we can aid high schoolers in seeing the value in field science and nature.

Table of Contents

Introduction

Our project involves working with Natalie Wilson who had reached out to Southern Oregon University in hopes of taking on students interested in science and education. Natalie studied Field Biology at SOU and graduated in 2012. She worked on several organic farms for a few years and went back to SOU for the MAT program and graduated in 2016. Natalie is currently the only high school science teacher at Butte Falls Charter School.

The Butte Falls School District recently acquired a plot of land at a site that used to be a fish hatchery 11 years ago. This area is located on Fish Lake road, approximately ½ mile East of Butte Falls, Oregon in Jackson County. This area is 13 acres and is located on a forested alluvial fan which is near Ginger Creek, a creek that flows into the South Fork of Big Butte Creek. The study area is in the Upper Rogue Watershed where summer months are generally warm and dry, while winter months are cool with moderate rainfall. When the property was decommissioned in 2011, 10 acres was deeded to the school by the ODFW. The remaining 3 acres reverted back to the control of the Department of the Interior. After the General Services Administration did some preliminary listing of the property, it was turned over to the U.S. Department of Education to dispose of. In September 2016 Chris Mathas, Butte Falls Charter School's engineer, submitted an application to acquire the 3 acres for the school. The first application was denied because they felt it did not show that the purpose was purely for education. The third application outlined in detail specific education programs and projects to be conducted in each structure on the property and it was ultimately accepted allowing the claim of the additional 3 acres.

Anticipating a favorable judgement by the federal government, in 2016, Chris consulted with the Jackson County Planning Department about the zoning of the property. With the intention of using the property as an outdoor learning center open to the public he requested that the property be zoned as a Forest Management and Research Experimentation Facility, which would need to have a higher education partner and an approved riparian landscape plan. He worked with the ODFW and the students to create the riparian landscape plan.

In December 2016, Chris and Natalie met with professors and administrators at SOU to present the idea. Last Spring, SOU staff agreed to be their partners. There is an understanding that both the Science and Business Departments at SOU will have the Natural Resource Center Site for student research projects and business development and planning. In spring of 2019, they will have one of the houses on the site available for students to use as a classroom and for overnight accommodations. In 2020, they will have another house on the site renovated and available for the exclusive use by SOU students only.

We are the first students to take advantage of this landscape for the purpose that was

described in the agreement. The only data gathered about the site comes from a wetland delineation that was performed in 2016. We are also helping to justify the zoning specification of the learning center. While they do not have a deadline to meet with the county in regards to how immediately SOU must be doing research on the property, they feel that our project is an important first step in discovering how the two entities (SOU and the Butte Falls Charter School) will have a working relationship.

Natalie's goal is to develop the site into an outdoor educational facility. The objective is for the property to be used as an extension of the Butte Falls Charter School campus; a natural environment for students to conduct projects, hands-on lessons, and have an addition of classrooms and resources. She also hopes for the property to become a community hub and potentially serve as a site for economic development, whether it be a student mushroom production business or outdoor adventure gear rentals. There is so much potential for this site to feed and support, not only the charter school's mission, but the health of the Butte Falls community itself. The more research conducted at the site, the more power we have to support its importance and to advocate for its growth and protection.

Our goal is to help the Butte Falls school district with their science program by collecting data on the behavior of the on-site wetland and stream morphology over the winter months. There has been some concern over forest management practices above the NRC. Gathering baseline data about Ginger Creek could be of use in case of any clear cutting events.

Lastly, we will construct a lesson plans using data we gathered to teach the high school students at BFCS. We want to involve high school students in the process by taking them to the site so they can see where we collected our data and the methods and tools we used to do so. Our goal is for them to understand the importance of our natural systems and how it is possible to show those importances through observation.

Review of the literature

Wetland Delineation

Scott English, a Principal Restoration Biologist and a member of Northwest Biological Consulting, determined whether there were wetlands and/or other waters on the property. The study was done from July-August 2016 and determined that there is one PEMC wetland about 0.04 acres on the property. English and his team concluded that water flows into the wetland from a small path off of Ginger Creek and it exits the pond flowing back to the path, joining the main branch of Ginger Creek further downstream. Non-wetland waters were found on the property in small and disconnected "emergent and forested wetland vegetation" areas within the riparian ecosystem of Ginger Creek (English, 2016).

A PEMC wetland is described as: System Palustrine, Class Emergent, with a water regime described as seasonally flooded. The Palustrine system includes nontidal wetlands which are controlled by trees, shrubs, emergents, mosses or lichens (Cowardin et al, 1979). Class Emergent is determined by having "erect, rooted, herbaceous hydrophytes, excluding mosses and lichens" and active year round vegetation (National Wetlands Inventory, 2010). Seasonally Flooded water regime describes how surface water is present during the growing season, but gone by the end (National Wetlands Inventory, 2010).

Sedimentation Affecting Wetland Soils and Vegetation Study

This study by Hugh Dowling looked at how sedimentation has affected wetland soils and native species in the Dog River Watershed, Alabama . This study observed how downstream sedimentation can cause disturbances to vegetation, soils, and water quality. Downstream flows carry sediment as well as seeds from invasive species that will produce more invasive species downstream, pushing the native vegetation out and taking control over the area. Sedimentation affects the soil profiles by accumulating in the wetlands which will decrease wetland volume, change plant community structure, and decrease the wetlands ability to retain water.

Socioeconomics of Butte Falls

Butte Falls is a very small town with a population of about 444 people (US Census Bureau, 2017). It is an old logging town with an estimated male median income of $29,286 and female income of $16,538 (US Census Bureau, 2016). The charter school has deemed "the loggers" as their school mascot. Generally, science isn't well supported in the town and many students do not have the support they need at home. The students struggle with classroom learning, but thrive on learning outdoors.

Project Design

We worked in collaboration with Hydrologist Dr. Charles Lane. We surveyed topography by assembling transects across the delineated wetland and two sections of Ginger Creek to discover how the stream morphology changes as a result of winter flows. Concrete structures from the previous fish hatchery have modified the stream into two channels that converge at the bottom. The first section of Ginger creek is upstream from the wetland and is a double channel. The second section is downstream from the wetland and is a single channel.

We conducted a total of three Laser Level tests for all three transected areas. Using a long measuring tape and a tall measuring rod, we measured the distance from point A on our tape to the next point and the rod height. We added the ground level elevation to the height of the laser and then subtracted the rod height elevation. We then mapped out a profile of the topography and

compared them for morphological changes. We have a GPS unit in order to take notes regarding specific locations to mimic the transects.

After a major precipitation event we drove to Butte Falls to survey and collect data. Finally, we designed effective lesson plans on basic principles of environmental science, including fluvial geomorphology, ecosystem services, and geographic information systems and delivered these lessons to sophomore high schoolers at BFCS..

Results

Our project is an applied project with some baseline data that we collected. Therefore we decided to have our results encompass the baseline data we gathered and our discussion to encompass how the lessons went.

The initial wetland transect data was collected on November 18, 2018. There was no precipitation that occurred on the preceding 3 days before or during the data collection of the first wetland transect and it appears to have the highest elevation profile of the three profiles (Figure 1).

The second time that data was collected was December 4th, 2018 at our two other transect locations, but not the wetland. The first is the downstream transect and the second is the upstream transect. It rained a total of 1.26 inches on the preceding 3 days before data collection.

The third date was on January 13, 2019 where data was collected for all three of the transects; the wetland transect, the downstream transect, and the upstream transect. It rained a total of 0.10 inches on the preceding 3 days or during our data collection. Transect two for the wetland appears to have the lowest elevation profile (Figure 1), while transect two in both of the stream locations appear to have the highest (Figure 2 and 3).

The fourth time data was collected was on February 3rd, 2019, precipitation that occurred on the preceding 3 days as well as during our data collection was 0.41 inches inches. Transect three for both of the stream locations appear to have the lowest elevation profiles (Figure 2 and 3).

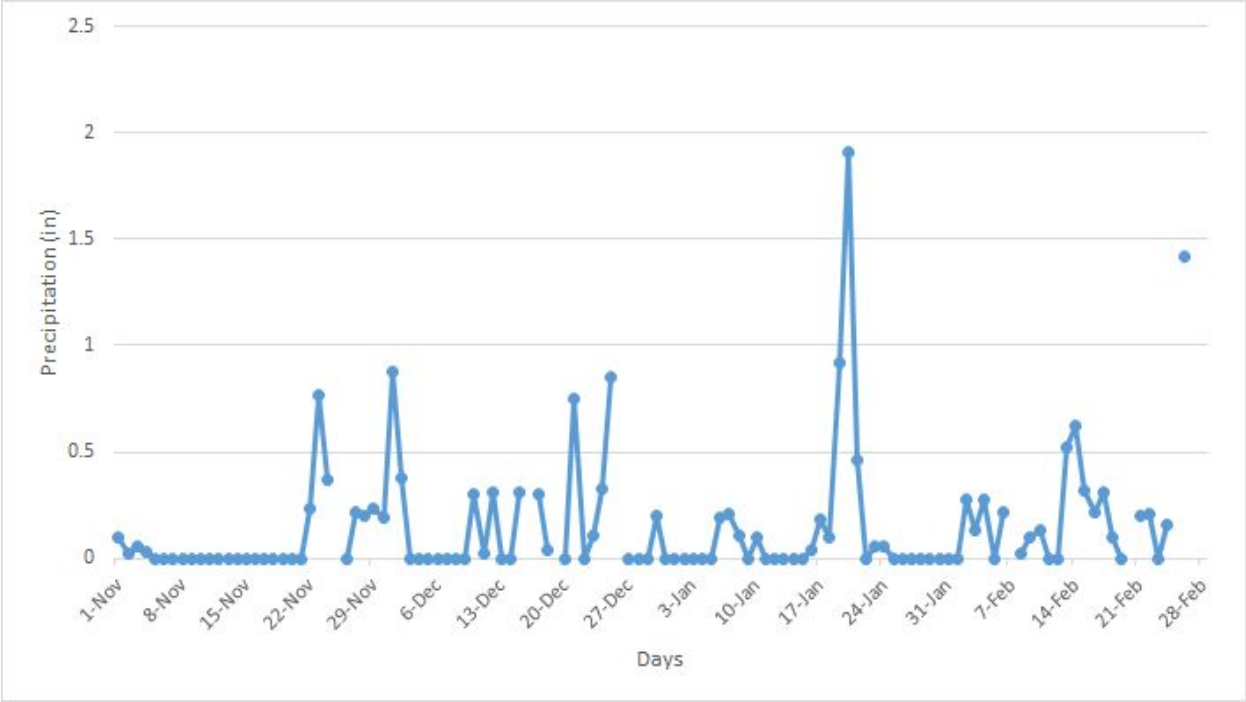

Figure 1. Total precipitation at the end of a 24 hour day in Butte Falls over the course of time we conducted our profiles. Missing data points are blank.

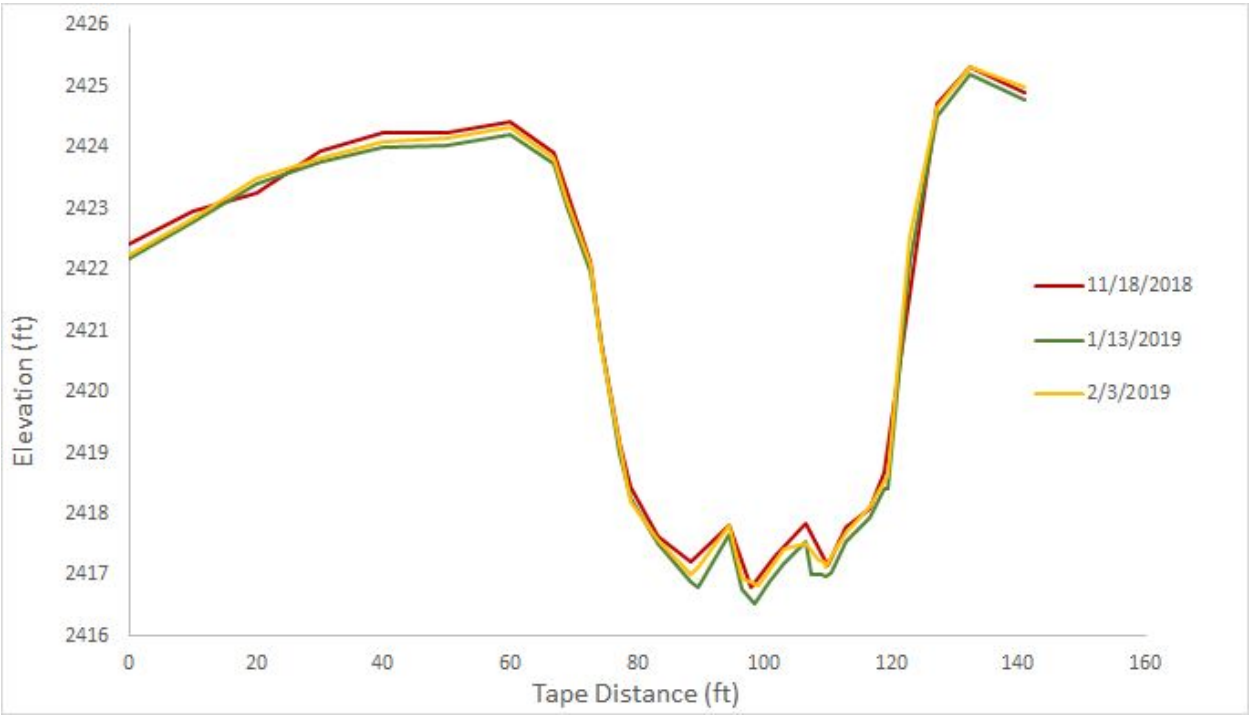

Figure 2. Topographic profiles of a transect across the wetland on three different days.

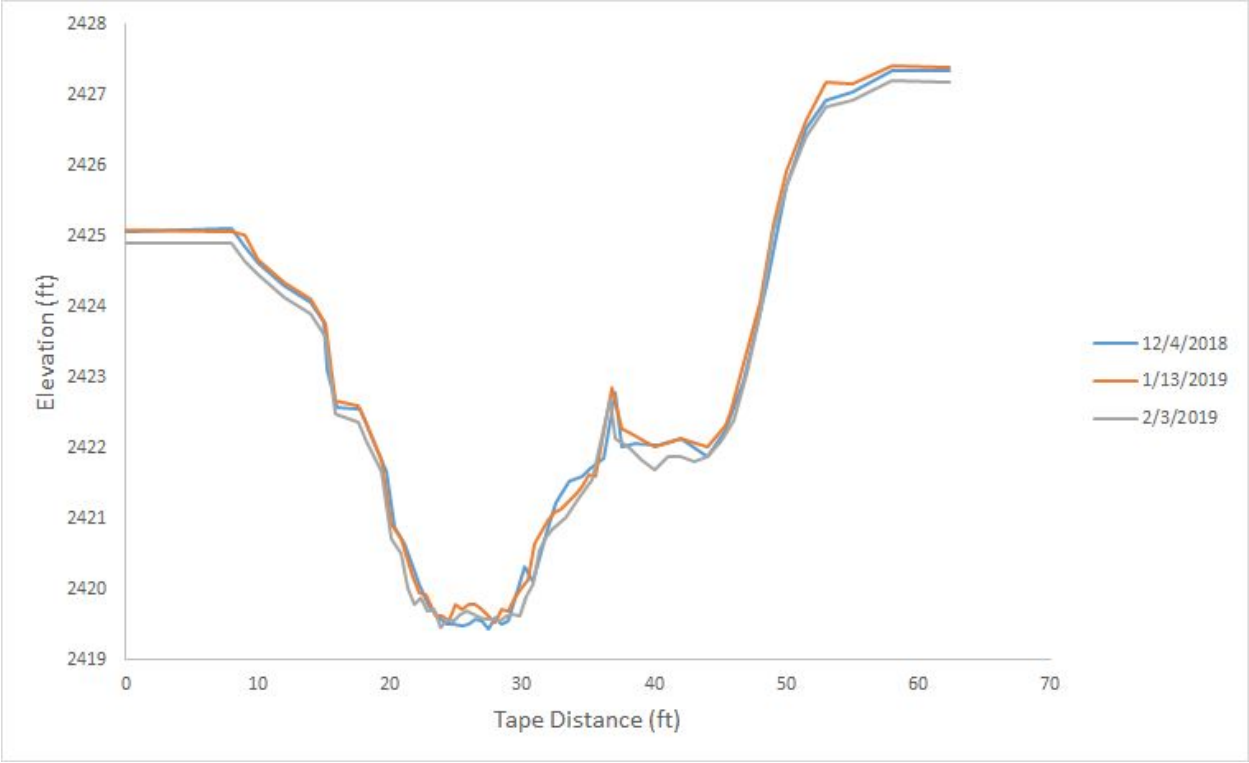

Figure 3. Topographic profiles of a transect across Ginger Creek downstream of the wetland on three different days.

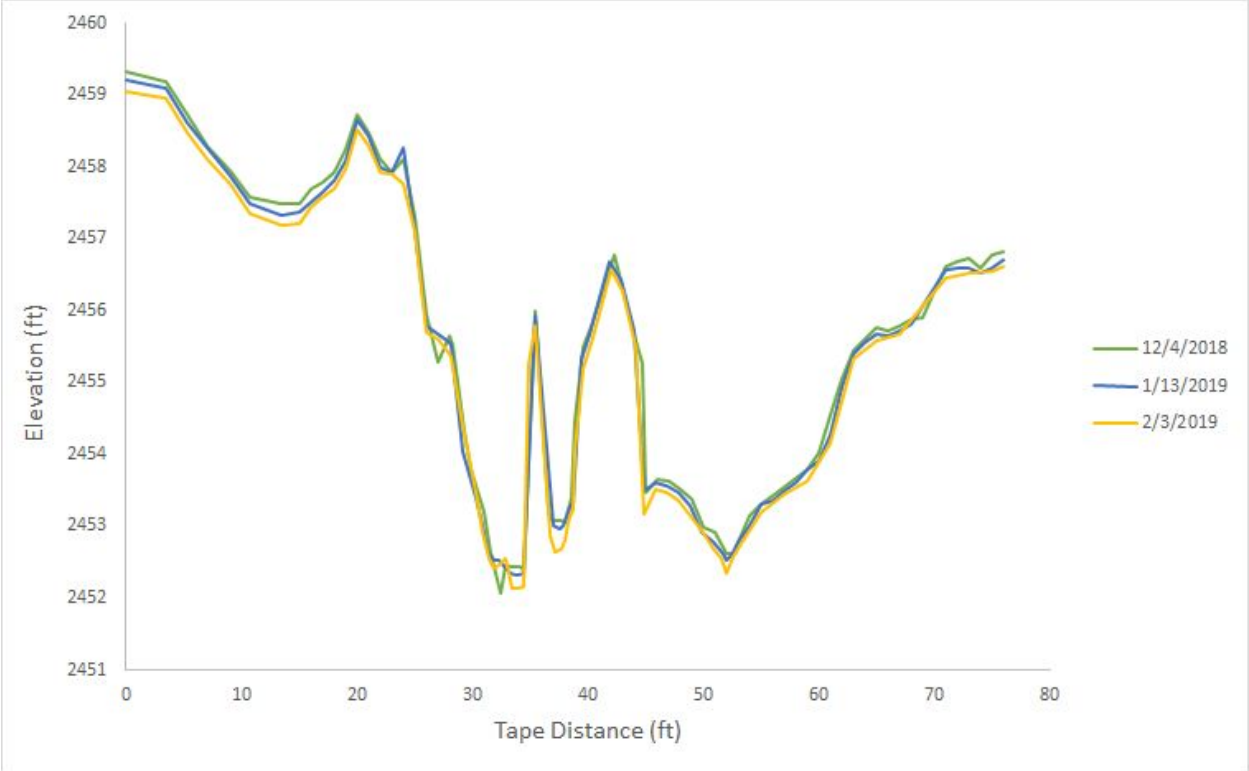

Figure 4. Topographic profiles of a transect across Ginger Creek downstream of the wetland on three different days.

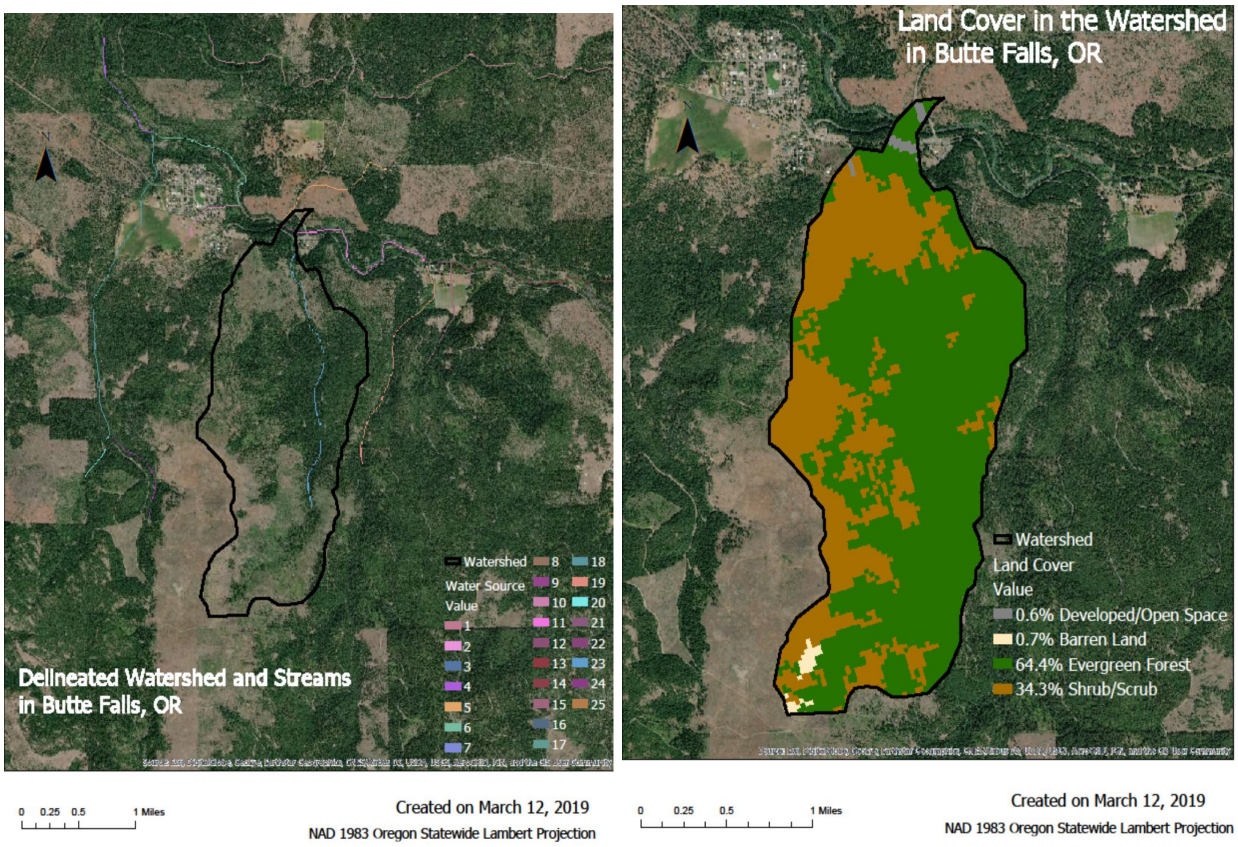

Figure 5 and 6. Delineated watershed for Ginger Creek and the land cover within the watershed.

Discussion

Overall, looking at all of the profiles of the different transect locations over time, there wasn't much change. This could give us a potential baseline of how much rain needs to fall to create a dramatic change in the profile. Perhaps more than our highest daily total (1.91 inches) needs to fall in order to make a larger change, or at least in the state that the land is in now, which is partially clear cut. Perhaps, if more is clear cut, then this amount of rainfall could dramatically change the morphology of the stream. We hoped that we could gather data about the rate in which the rain fell, but NOAA only had the daily precipitation data available. Hopefully, moving forward, the rate at which the rain fell can be tracked to give us a better consensus as to rather than the amount, the velocity at which rain has to fall in order to makes changes. This would be much more accurate for a baseline.

During the month of April, we went to Natalie Wilson's class and taught three different educational lessons to her high school sophomores. Not only did we want to provide Natalie and the Natural Resource Center with baseline data, but we wanted to educate her students on the

importance of collecting data and general topics in environmental science that involve the NRC and our data. During our first lesson, we met Natalie and her class at the site of the wetland and Ginger Creek, and where we collected our baseline data over the winter months. Our main topic for that lesson was fluvial geomorphology; defining that term, describing why it is important, and demonstrating the techniques we used to gather data. Our second lesson was on the importance of ecosystem services and the ecosystem services that wetlands, rivers, and streams provide us, using the on-site wetland and Ginger Creek as an example.

Our third lesson was in Natalie's classroom where we discussed geographic information system (GIS) and its importance to environmental science. We showed the class examples of maps we had created for the Natural Resource Center (Figure 5 and 6) and others we had created with broader implications, showing that GIS isn't just used for environmental science.

During our GIS lesson, we did an in-class activity to show the students how easy GIS can be. We separated the students into three groups giving each group some string. One group was assigned the state of Hawai'i, one group was assigned the state of Alaska, and one group was assigned the continental United States. With the string we provided, they outlined their assigned state(s), and by doing this, they created one of the basic concepts in GIS: polygons. Next, we gave each group some blue string to use as rivers in their state(s), to help them create lines. Finally, we had one student from each group stand somewhere in their assigned location and explain where they were, why they want to go there, or what they did in that location. This is called creating a point and query.

Once the group activity was concluded, we asked the students if they realized if they were doing GIS techniques or not, and they said no. We began to explain to them that they had done a basic GIS simulation without knowing it, and it showed on their faces that they were impressed with what they had created and took away from our group activity.

Finally, we passed out a survey to Natalie's class that consisted of three questions. One of the questions was "Are you interested in learning more?" Two of the students responses said, "I am interested in environmental science, it seems fun. I like the mapping" and "[Environmental Science] seems super important for our future and how [to] estimate how the future may be." We were very excited for these responses because it shows that the students were able to recognize their interests in environmental science and how it can help predict future implications.. Another question was, "Did you enjoy having us come talk about our senior project?" One of the students responses was, "Yes, because I think it is really cool what they have done with the NRC and I hope to continue from where they left off." We were very excited to hear this response from a student because they are interested in our research and want to continue what we started at the Natural Resource Center.

Conclusion

When we first took on this capstone project and met with Natalie, we were unsure of where it would go and if we would make a difference in the work we were doing. However, once we began collecting our data, doing research, and conversing with Natalie, we finally began to see the amazing potential of the Natural Resource Center. It is a great opportunity for other students at Southern Oregon University gain some field work experience and also experience with younger students in teaching. We learned how to use a laser level for our stream and wetland morphology data collection, as well as how to put the data we gathered into topographic profiles. We learned about the challenges of data collection, for example, predicting weather at a far out site or collecting data in the freezing cold rain. It also gave us an insight to how the "scientific method" works. A lot of revisions of methods and ideas for research questions are required in this process and it takes time to developed a good research project. We started with a research question, but switched to more of an applied project once we learned about what sort of different data we should have been collecting in order to answer our question. This is a very important lesson for young scientists to realize. It is okay to do an experiment and completely fail because revisions are what make experiments good and possibly with more time, we could have made those revisions.

One of the highlights of our capstone project was doing our three educational lessons with Natalie's class and seeing how excited her students were about environmental science. It also provided us with a chance to improve our teaching skills. It was very fulfilling to see some of the student's survey results and know that we had some sort of impact on their lives when we went and discussed our capstone project. Our overall experience was very rewarding and we hope that our project continues to benefit the Natural Resource Center in the future.

Appendix A: Map Figures

Aerial footage from Google Earth

Figure 4. Area of study outlined in red with respect to City of Butte Falls and Butte Falls Charter School.

Figure 5. Ginger Creek flowing through the area of study feeding Big Butte Creek.

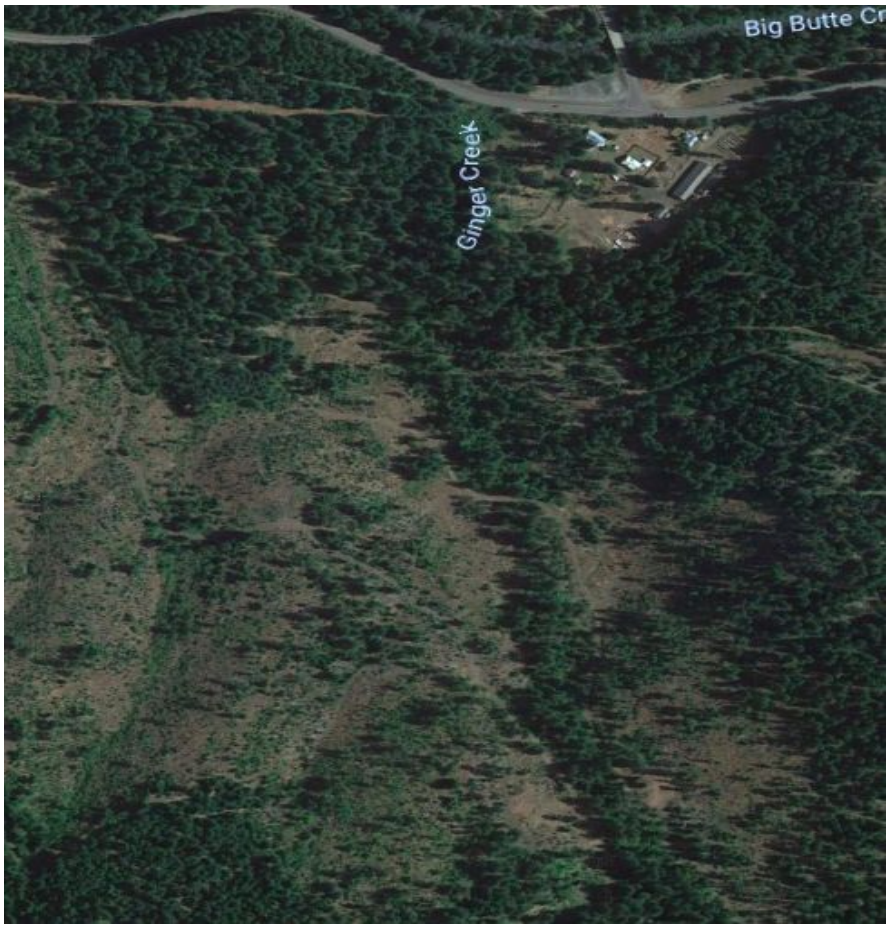

Figure 6. Area of study with respect to a clear cut south of the site.

Figure 7. Transect locations on the site.

Appendix B: References

Cowardin, L., Carter, V., Golet, F & LaRoe, E. (1979). Classification of wetlands and deepwater habitats of the United States. *U.S Department of the Interior, Fish and Wildlife Service.* https://www.fws.gov/wetlands/Documents/Classification-of-Wetlands-and-Deepwater-Habitats-of-the-United-States.pdf

Dowling, H. (n.d). Sedimentation affecting wetland soils and vegetation within the Dog River Watershed. *University of South Alabama.* www.southalabama.edu/geography/fearn/480page/2010/10Dowling.pdf

English, S., Koskella, S. & Skibinski, I. (2016). Wetland delineation technical report. *Northwest Biological Consulting*, 2-18.

U.S Census Bureau. (2017). Population demographics for Butte Falls. *American Community Survey 5 Year Estimates.* https://www.census.gov/search-results.html?q=butte+falls+oregon&page=1&stateGeo=none&searchtype=web&cssp=SERP&_charset_=UTF-8

U.S Fish and Wildlife Service. (2010). Wetlands. *National Wetlands Inventory Program*. https://www.co.kittitas.wa.us/uploads/cds/land-use/Administrative%20Segregations/SG-10-00021%20Harrel%20Farm/PEMC%20Wetlands%20Code%20Interpreter.pdf