Habitat Restoration in the Elkhorn Slough Watershed

Prepared By:

Fabiola Larios

California State University, Monterey Bay

WRI Internship: October 2017 – October 2018

Advisor:

Christina E. Rodriguez

Internship Manager

CSU San Bernardino Water Resources Institute (WRI)

Table of Contents

Acknowledgements

I would like to thank the Water Resources Internship Program at CSU San Bernardino for granting me the opportunity of attaining this internship. I would also like to thank WRI's Internship Manager, Christina E. Rodriguez, for always taking the time to be of service with my inquiries. In addition, I would like to give my thanks to Katie Pofahl, Bree Candiloro, Ken Collins, and all Elkhorn Slough Foundation staff that have supported me throughout the duration of my internship and provided me an educational experience. This project was supported by Hispanic-Serving Institution's Education Program Grant no. 2015-38422- 24058 from the USDA National Institute of Food and Agriculture.

Executive Summary

The focus of this internship was in support of the Elkhorn Slough Foundation's mission of preserving and restoring the Elkhorn Slough watershed. By working as an intern for Elkhorn Slough Foundation, a diverse range of ongoing projects were tackled pertaining to habitat restoration of the Elkhorn Slough and restoration ecology. In addition, working as an intern included educating youth and supporting field trips at the Carneros Creek Outdoor Classroom and managing individual projects.

Project Objectives

Due to a variety of environmental stressors, such as development, unsustainable agricultural practices, and others, the vitality of the habitats in the Elkhorn Slough watershed are at risk due to alteration to fit human needs (Elkhorn Slough [date unknown a]; Silberstein 1989). In order to promote the preservation of the Elkhorn Slough, multiple organizations and agencies are collaborating to conserve and replenish native habitat. These entities include the Elkhorn Slough Foundation (ESF), the Elkhorn Slough National Estuarine Research Reserve (ESNERR), the California Department of Fish and Wildlife (CDFW), and the National Oceanic and Atmospheric Administration (NOAA). This internship often involved working alongside staff from these different organizations. Lands protected in the Elkhorn Slough watershed are owned by several different agencies and organizations, such as ESF, ESNERR, CDFW, The Nature Conservancy (TNC), among others (See Appendix A).

ESF is an accredited land trust that owns 2,538 acres of protected land and manages and extra 1,057 acres of land owned by TNC (Appendix A). The following are some of ESF's objectives: conserve key lands, manage protected properties—such as ranches and farms—to conserve their natural resources, aid activities and programs that promote ESF's mission of protecting the Elkhorn Slough, and promote the engagement of the community to value the Elkhorn Slough by spreading conservation knowledge (Elkhorn Slough [date unknown b]). Working as an ESF intern, three areas of focus included propagating and transplanting native plants and working on Sand Hill Farm, Hummingbird Island, and the Carneros Creek Outdoor Classroom. In addition, the Honor Grove Trail and newsletter compiling were two separate projects where tasks were handled and managed individually.

Each landscape worked on in this internship has a restoration story or background information important for understanding each project. Sand Hill Farm is a property purchased and attained by ESF where the land has been heavily degraded due to past unsustainable farming practices. Because of these harmful practices, native plants have been wiped out in a large portion of this property, and the land is now very erosive. In addition, a large amount of trash was left behind. Restoration goals on Sand Hill Farm included converting steep slopes into native habitat for erosion control and removing farm debris. Hummingbird Island is located at the end of the Elkhorn Slough Reserve and is a protected area owned by ESNERR. Work at

Hummingbird Island included assisting with a biochar project; the goal of this project comprised of generating biochar produced from eucalyptus trees and utilizing it as fertilizer for use at restoration sites. Next, the Honor Grove Trail is a small section of land within a property owned by ESF, and the goal of this project was to create a trail and cage young oak trees to discourage herbivory and promote survival. Lastly, the Carneros Creek Outdoor Classroom is also a property owned by ESF where elementary and middle school students go on field trips to learn about their watershed and the natural world by partaking in a variety of activities.

My goal is to obtain a career that focuses on restoration or conservation, either within the Natural Resources Conservation Service or the US Forest Service. Through my passion, knowledge, and devotion, I hope to conserve and promote the preservation of our natural resources and environment. I also hope to spread my knowledge on restoration and conservation to others, thereby to have others recognize the value of our environment.

Project Approach

Day-to-day tasks as an ESF intern were variable; at Sand Hill Farm, projects pertaining to erosion control involved planting arroyo willow stakes into an artificial channel. Irrigation was also set up near the planted arroyo willow stakes to promote the survival of the trees. Another project in relation to erosion control and replenishment of native habitat included outplanting natives characteristic of Maritime Chaparral habitat. Two other side projects on Sand Hill Farm comprised of monitoring outplanted oak trees and surveying elevation shots. For monitoring, the following information was recorded for each tree: vigor, cage type, height, and diameter. After post-processing the data, information recorded for each oak tree was then transferred onto Microsoft Excel. For surveying elevation, survey shots of same elevations were taken with the use of a scope and rod for the purpose of erosion control. Trash on the property was also picked up and disposed of in a garbage bag on some of the days spent working on Sand Hill Farm.

The first objective at Hummingbird Island included preparing for eucalyptus tree burnings by covering multiple wood piles with wax paper. The purpose of covering wood piles with wax paper was to keep moisture out before the burnings. After the burnings took place, the biochar was raked up and put into bags with a shovel. Each bag was labeled with date and approximate biochar size. Bags were then stored, and the biochar was then ready for use at restoration sites.

The Honor Grove Trail and newsletter compiling were two projects that were managed individually. At the Honor Grove Trail, trees and other vegetation which obstructed the trail were trimmed and removed with loppers and other weeding tools. To discourage herbivory and promote growth, wire cages were also adjusted and installed around young oak trees. One service learner from Cal State Monterey Bay assisted in measuring the wire and securing the cage into the ground with a mallet. After all oak trees were caged and it was ensured that the trail was free of any blockages, the trail and caged trees were mapped using a GPS Trimble device and ArcGIS (See Appendix B). For the newsletter project, tasks consisted of generating one complete set (10 newsletters) for each Tidal Exchange publication, the Elkhorn Slough Reserve's official newsletter. Newsletters were first gathered from ESF's archive and then organized by volume and issue number. The number of each newsletter on hand was then documented with Microsoft Excel. For newsletters that did not have a complete set of 10, the appropriate number of copies were produced. In addition to completing tasks individually, I was responsible for setting my own deadlines and making sure that assignments were completed on a timely manner. Planning in advance was essential for these projects; I had to ensure that I had all the proper equipment before going out to work and plan for the weather when working outside. I also had to ensure to follow safety protocols when working alone and driving out to sites.

Plant propagation and transplanting native plants were also central tasks of this internship. Native salt marsh plants were transplanted by preparing new cells with soil, dividing plants by hand, following proper pre-treatment, and then securing the newly split plant into the cell. Salt marsh plants were also propagated by going out in the field and trimming plant matter. Cuttings were placed in cool water overnight and transferred into pots the following morning. Natives propagated and transplanted were stored in the greenhouse or nursery for future restoration use.

At the Carneros Creek Outdoor Classroom, youth field trips were supported by educating students from Hall District Elementary School through hands-on experiences and activities. Classrooms were divided into teams where instructors and chaperones then instructed the students. Students partook in several activities such as bird watching, picking up trash, outplanting natives, identifying insects, and taking short nature walks. Students recorded their findings into data sheets provided to them. Side projects for the Carneros Creek Outdoor

Classroom consisted of land maintenance and propagation research. At the outdoor classroom, areas where invasive mustard and poison hemlock plants were mowed with a string trimmer. Propagation research encompassed researching and documenting propagation protocols for native plants that will be grown at the Elkhorn Slough Reserve's nursery and outplanted in the outdoor classroom by students in the future.

Project Outcomes

There were a variety of lessons I learned during my internship in relation to restoration work. I learned that the duties pertaining to ecological restoration is highly variable; for instance, tasks I undertook were often non-linear and diverse. Although there were many different areas that I worked in during this internship, this diversity allowed me to gain experience in a variety of areas. I also learned that restoration work is often complex since ecosystem dynamics and many different environmental situations and factors need to be taken into consideration for restoration planning. Timeframes are also crucial; staff must take seasons, weather, precipitation, plant maturity times, and many other important aspects of restoration work into account. Most importantly of all, individuals working in the ecological restoration field must be flexible and well-rounded; they must be able to effectively function in different types of environments and situations, adapt accordingly as plans change, and be able to handle and operate equipment. While handling and operating equipment, following safety protocols at all times is critical. Field work can also be physically challenging and demanding.

Conclusion

Restoration ecology is a challenging field, but physically putting the work into the landscape is highly rewarding. This internship opportunity has been a remarkable experience and has given me a foot in the door to pursue a career in conservation/restoration at the USDA. Through this internship, I was able to attain real-world experience in restoration ecology. I practiced a variety of valuable skills such as GIS/GPS, plant propagation, environmental education, equipment handling, and project management and planning. The skills I attained and practiced at this internship is surely to be of benefit to my future endeavors as an employee at the USDA.

References

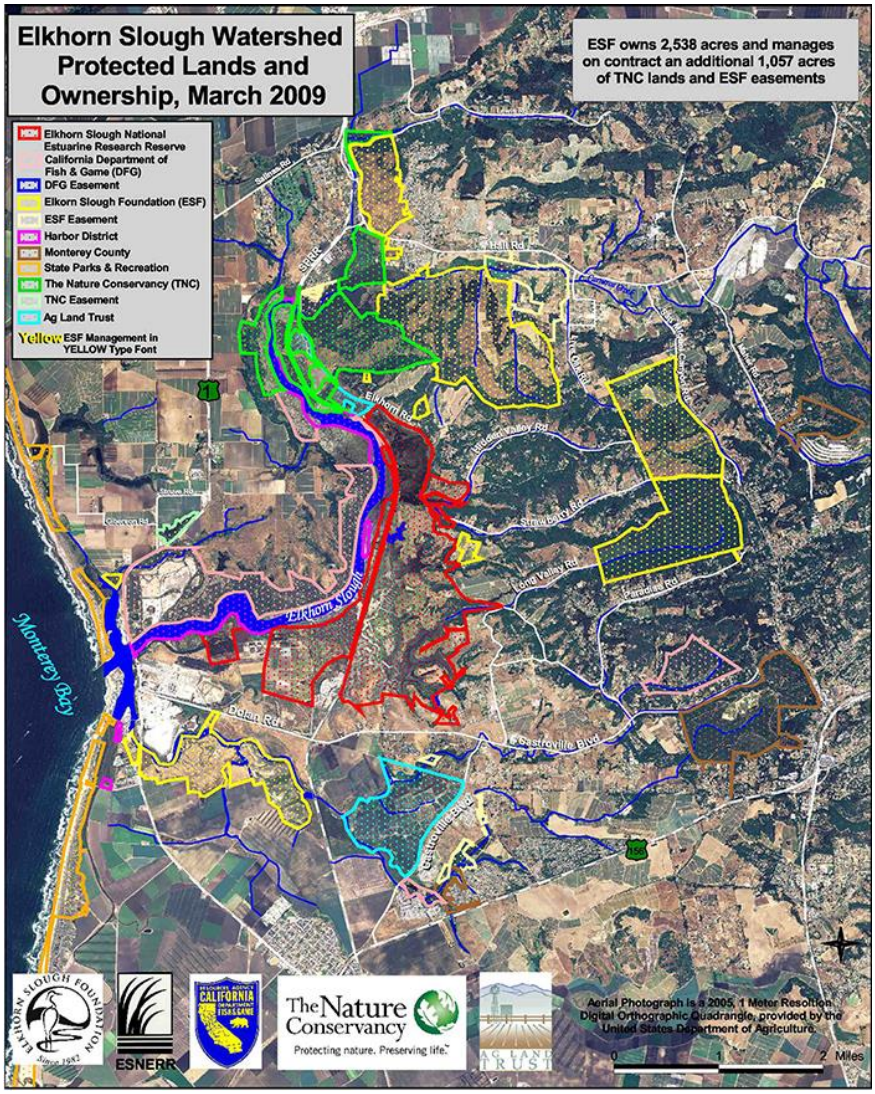
Elkhorn Slough. [date unknown a]. About Elkhorn Slough. [Internet]. [cited 2018 Oct 30].

Elkhorn Slough. [date unknown b]. Elkhorn Slough Foundation. [Internet]. [cited 2018 Oct 30].

Silberstein M. 1989. Elkhorn Slough. Monterey, Calif: Monterey Bay Aquarium Foundation.

Appendix

Appendix A.



Appendix B.

The Honor Grove Trail
Elkhorn Slough Preserve