

Steven J. Barnhart Herbarium Internship 2015-2016: Restoration Research and Techniques at Pepperwood Preserve



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Internship Overview

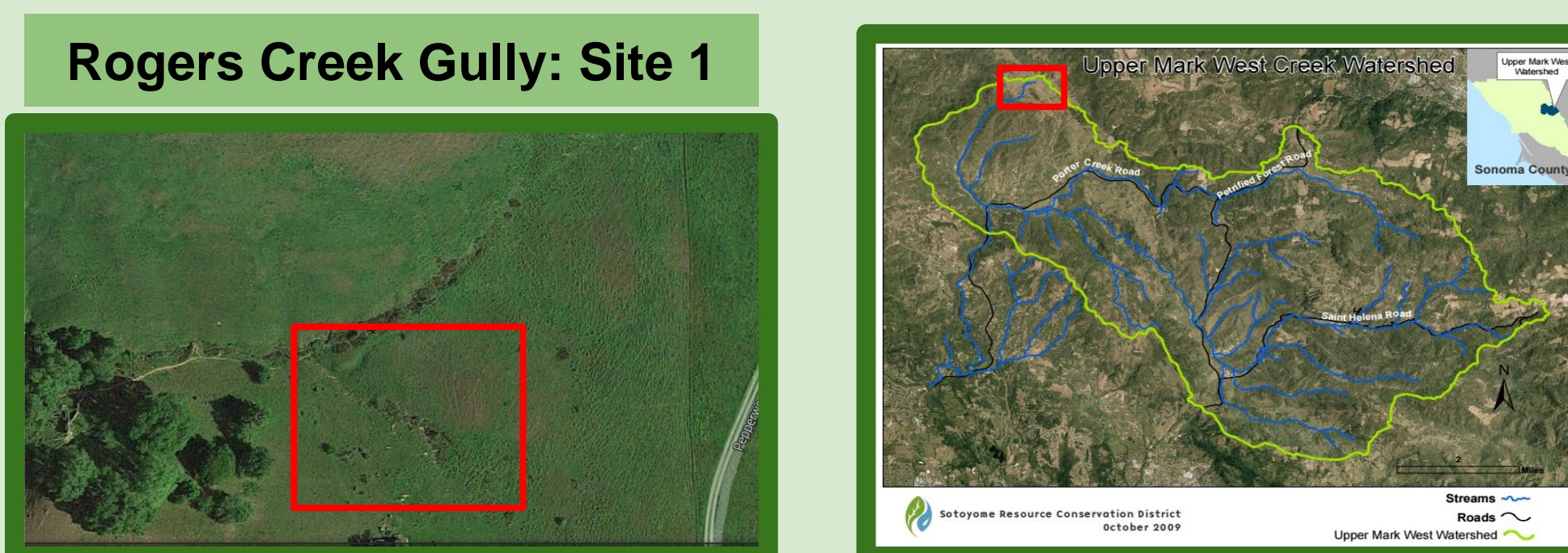
In spring of 2015 I was awarded the Steven J. Barnhart Herbarium Internship at Pepperwood Preserve. I wrote a project proposal to gain skills in the field of restoration ecology. Having been given the honor of the internship I knew I wanted an aspect of it to be on site; an opportunity to explore the Preserve and gain field experience. I chose to split the focus of my project between greenhouse research with *Salix lasiolepis* propagation, and restoration site identification and recommendation work.

Riparian corridors offer the resources to encourage biodiversity as they act as a buffer to rivers and streams. A few benefits of a healthy riparian zone include stabilizing soil, removing excess nutrients, reducing sun exposure, and offering shelter. Being the headwaters to several smaller watersheds within the Russian River Watershed, as Pepperwood is, it is important that the riparian zones are functioning well. The impacts of roads, construction, invasive species, and grazing can affect the riparian zone's efficiency. Land management practices are being utilized at Pepperwood Preserve to reduce these impacts. The goal of the field project is to further reduce erosion through revegetation and brush check-dam construction. Several headcuts have been identified by the RCD (Resource Conservation District) and have been the focus sites selected for this project.

Alongside the field component, research has been done on the propagation of Arroyo Willow (*Salix lasiolepis*) using a pruning sealer. The sealer is thought to prevent excessive transpiration from the cutting, as recommended by Aberdeen Plant Materials Center, and therefore increase survival rate and root mass. My research showed no significant difference with the treatment (p-value 0.767). The field component along with a controlled experiment have allowed for a range of skills from experimental design to field data collection to be explored and developed, while also contributing to the baseline data of the sites at Pepperwood.

Pepperwood & Restoration

Pepperwood Preserve is a 3120 acre nature preserve in the headwaters of Mark West, Franz, and Brooks watersheds. Rogers creek and Pepperwood creek are intermittent streams part of the Mark West Springs Watershed which flows into the Russian River. Mark West watershed is home to anadromous fish including Coho (*Oncorhynchus kisutch*), Chinook (*O. tshawytscha*), and Steelhead (*O. mykiss*). Mark West has been designated as Phase 1 expansion area for Coho recovery by the National Marine Fisheries Service Central California Coast Coho Recovery Plan (2010). This plan makes this watershed a priority for restoration. Lessening erosion upstream decreases sediment load and can improve conditions downstream. This is why I selected Rogers Creek as the focus site for restoration.



Aspects of the Internship

- > **Field exploration**
 - walking creeks and making observations
- > **Restoration site identification and recommendations**
 - Gullies, check dams, and plantings
- > **Seed collection for future plantings**
 - *Juncus Patens*
- > **Willow Propagation Research**
 - *Salix lasiolepis*, homemade sealer, greenhouse grown



Salix Research

- > **52 cuttings:** Cut in December at Pepperwood
 - 18 inches long (plant 12" deep)
 - 1/2-3/4 inch diameter
- > 26 treated with pruning sealer
 - Lanolin, Linseed oil and Beeswax
- > Planted in pots with sand
 - 4" diameter 36" deep on carts (rotate)
- > Watering regimen: 1 cup 1-3 times a week.
- > Harvest in March: measured dry root mass and % survival for comparison.
- > **Results:** Grown 112 days
 - 100 Percent survival
 - No significant difference in root mass with treatment (p-value 0.767).
 - Correlation between cutting mass to root mass and number of nodes to root mass.



$$\text{Root Mass} = -0.27184 + 0.01113(\text{Cutting Mass}) + 0.04723(\text{nodes})$$

Brush Check dams

- > **Site assessment, workplan, implementation and monitoring**
 - Observe and Assess- choose sites
 - Recommend- Best techniques
 - Implement- planning and volunteers
 - Monitor- successful?

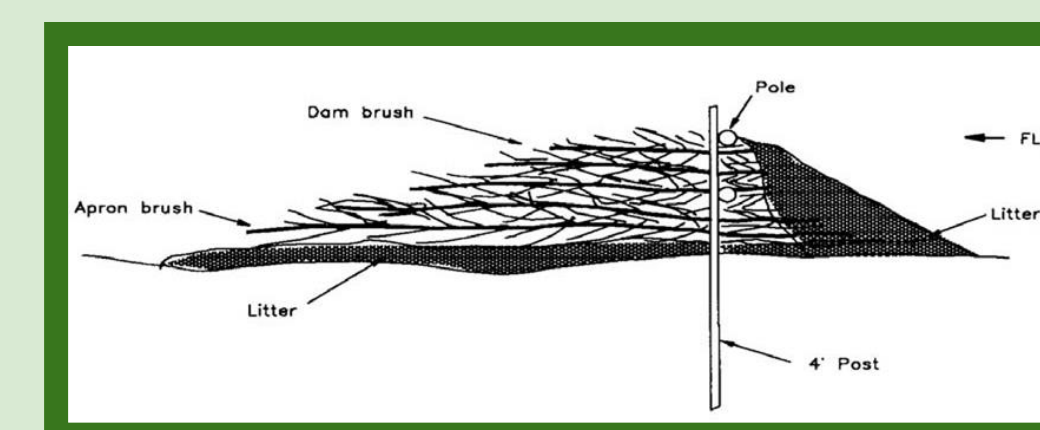


Figure VII-70. Post Check Dam (Kraebel and Pillsbury, 1934)

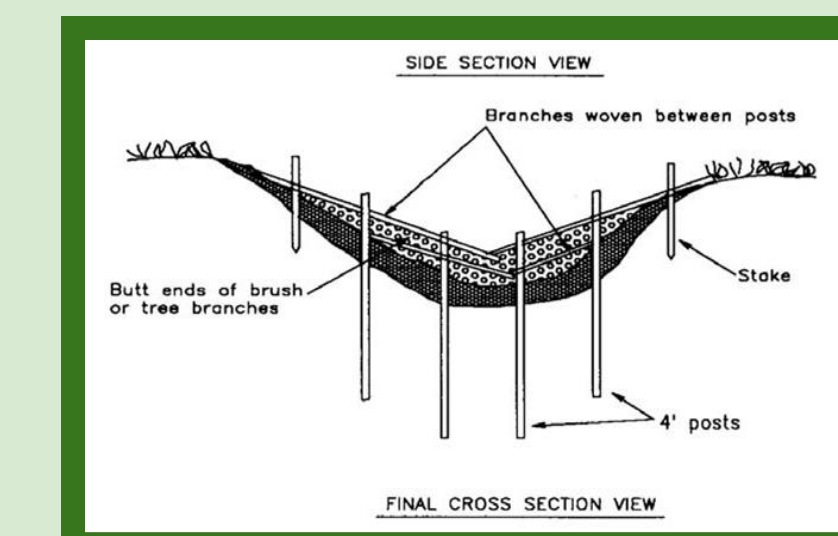


Figure VII-70. Post Check Dam (Kraebel and Pillsbury, 1934)

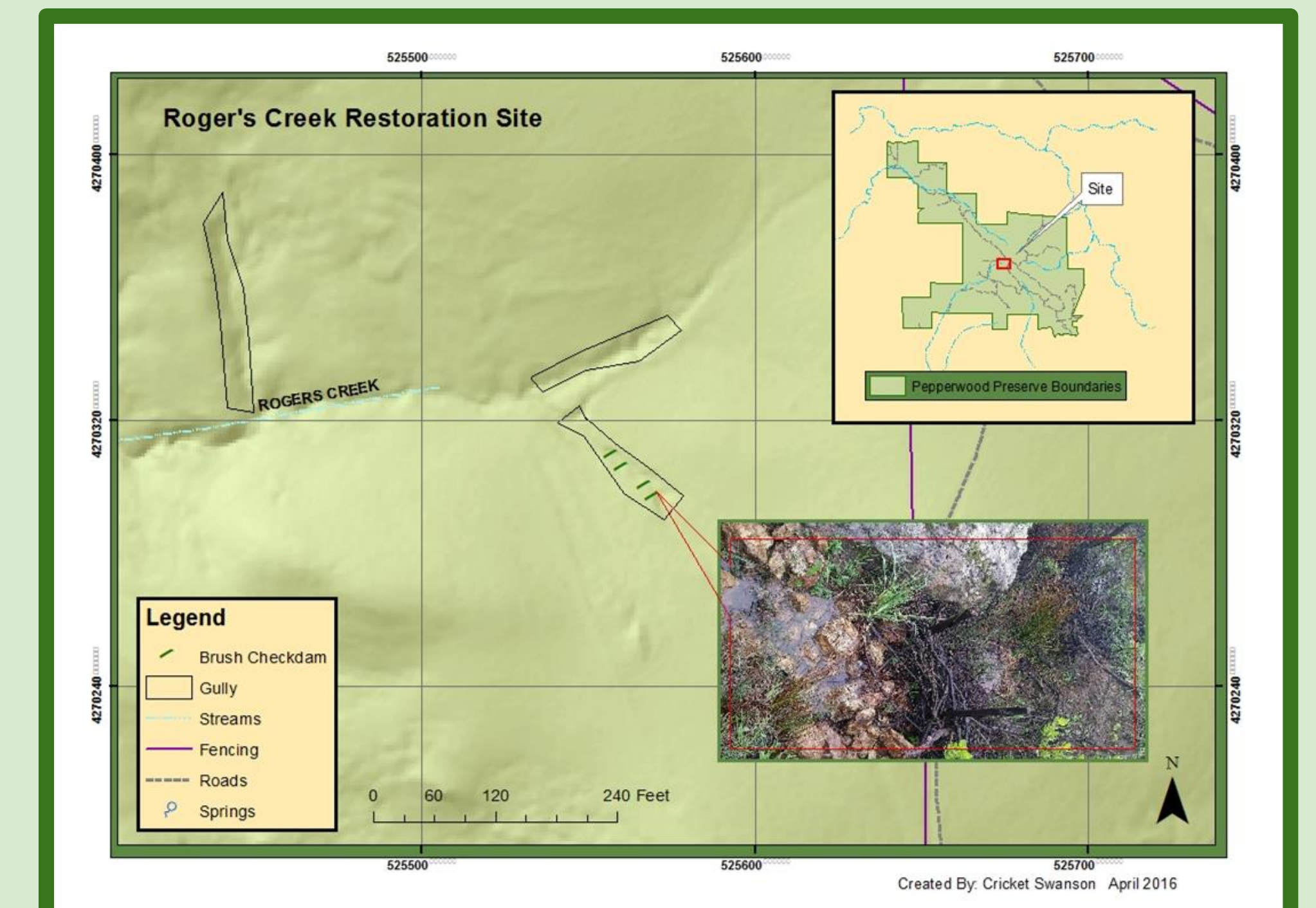
Objective

The primary goal for this project is to reduce erosion through gully repair and headcut stabilization via armoring and the construction of brush check dams.

Restoration is needed to limit downcutting and catch sediment through gully repair and revegetation. Improvements of the upper watershed conditions and reduction of sediment load can help improve lower/mid watershed habitat conditions. The brush check dams in place have been observed to slow water and catch sediment. Further monitoring is needed.

Reflections & Conclusions

The work plan proposal for the brush check-dam was implemented and will continue to be monitored. Further recommendations will be considered for future projects. The willow research supported the known correlations between root mass and cutting mass, while treatment with a sealer showed no significant difference in root mass or success. Future treatments under stressed environments can be done to further test the impact of the sealer on establishment success.



The field component along with a controlled experiment have allowed me to explore and develop a range of skills including experimental design and analysis, field data collection, and project management. I have gained experience and confidence through this endeavor and have further developed my community of like minded peers and knowledgeable advisors. These relationships are vital to me as I continue in my personal and academic journey toward a career in ecological management and restoration.

Acknowledgements

Pepperwood: Advisor Michael Gillogly (Preserve Manager), Steven J. Barnhart, Nelson Weller, Lisa Micheli, Michelle Halbur, Cassandra Liu, Celeste Dodge, Sandi Funke, Linda Barnhart, and other Pepperwood Preserve staff, stewards, volunteers, and members.
Santa Rosa Junior College: Advisor Anthony Graziani (Biology), Bob Coey (NRM), Peggy Rockwood (Biology), Kasey Wade (NRM), Shawn Brumbaugh (Biology), Darci Rosales (MESA), Abigail Zoger (Biology), and NRM 88 class of Fall 2015.
Community: Rose Anne Fuhrman, John Schroder, Jen Swanson, Nicole Synnott, Mark Synnott, and Michael St. John.

I am very grateful to have in my community such knowledgeable and supportive people.

Thank you.

