

**Sequoia National Forest Meadow Survey Internship 2016**

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## Executive Summary

The study of meadows is a small, but quickly growing, discipline. Much of the scientific data currently being used to analyze meadow conditions is over one decade old. Meadow experts believe that the degradation of meadows on public lands has negative ecological, recreational, and fiscal consequences. They likewise believe that the restoration of meadows will have positive ecological, recreational, and fiscal effects. As interest in meadow-study grows, so too do the opportunities for the funding of small meadow projects, such as this one, grow.

This report describes the 10 weeks of surveys conducted on 20 meadows within the Sequoia National Forest by one Isabella Rosales, Melia Susilowati, and Carrie Williams. This 10 week project had the 6 following main purposes:

- 1) To measure the level of degradation of 20 Sequoia National Forest meadows
- 2) To identify the causes of Sequoia National Forest meadow degradation
- 3) To update the Sequoia National Forest Services data bank on the status of meadow waterways
- 4) To determine if Rainbow Trout were present in any of these 20 meadows.
- 5) To assist the YouthCorps with the Osa Meadow Restoration Project
- 6) To provide WRPI Interns and Forest Service student volunteers with practical experience

These purposes were accomplished in a variety of ways during the 10 week period. Special training by AmeriCorps, American Rivers, and Chief Hydrologist Andy Stone was given to interns and volunteers in order to aid in accurately identifying meadow degradation and its causes. California Trout accompanied the project and aided in identifying the fish found in meadow streams. Interns and volunteers were taught to use and implement the most modern meadow restoring techniques. Interns and volunteers were given experience with the greenhouse-gas-measuring “closed-chamber” method. Meadows was analyzed via satellite image, GPS tracking, and in-field surveying. All written data and pictures were then compiled into a series of documents and shared with both the U.S. Sequoia National Forest Service and American Rivers.

Our results were as follows: degraded, at-risk, and healthy meadows were identified; possible causes of degradation within meadows were identified; fresh data on waterway locations and flow was reported; at least one Rainbow Trout was identified during the course of this study; the first phase of Osa Meadow Restoration was completed; lastly, WRPI Interns and Forest Service student volunteers left the internship with new skills, knowledge, and life experiences.

## **Project Objectives**

The purpose of this project was to gather current information on meadows for both the Sequoia National Forest Service and California Trout. It was also to provide us interns and volunteers with hands-on experience related to our fields of study. As an Environmental Studies major and an Outdoor Education and Recreation minor I entered this project with the purpose of furthering my knowledge in both these fields. I intended to practice my backpacking, hiking, as well as my science communication skills. I also wanted to learn more about the inner functions of the Forest Service and to understand what government jobs specializing in sustainability and conservation existed. I particularly wanted to develop my familiarity with using GIS and GPS technology. I hoped to become comfortable with using devices such as the Trimble in remote areas. I believed that this project would prove invaluable in helping me to build a career working with both science and the outdoors. At the time I was considering a career as a mapmaker or a docent.

During the course of the project my particular goal of developing my GIS and GPS skills changed. This is because GIS/GPS use was minimal throughout the entirety of this project. What I instead ended up developing were my fieldwork skills as well as my knowledge/interest in ecological restoration.

The Sequoia National Forest Meadow Survey Project involved a detailed survey questionnaire and an already-approved meadow restoration site called Osa Meadow. The survey objective was to analyze the overall state of the given meadow using its water sources state, its vegetation cover, and any unusual features found within. After the initial 2 day training, it was my team's responsibility to complete a written survey for 25 proposed meadows. The Osa Meadow Restoration Projects objective was to complete the non-mechanical aspect of the restoration before the bulldozers arrived to re-landscape the meadow. It was my team's responsibility to oversee and aid the YouthCorps in re-seeding and hay-waddling Osa Meadow.

## **Project Approach**

My initial approach to the Sequoia National Forest Meadow Survey Project was to focus on using the GIS/GPS. After the first few days my team and I realized that, though we will be using a GIS/GPS device occasionally, the bulk of our data will be coming from fieldwork observations. Having never done field research before, I at first relied on my team to teach me the precise methods to conducting accurate surveys. My new goal was to learn the proper procedures to fieldwork notetaking, fieldwork photographing, and fieldwork measuring. It was to also understand why a meadow must be restored and how it is done.

The survey questionnaire determined meadow degradation using main channel bank height, transects, and observations of unusual features. After identifying the meadows main water source, the average main channel bank height was taken by measuring a jacob staff every 7-15 paces from the center of the thalweg. Special care was taken to insure that a measurement was taken from every "run" of a waterway as well. 3 transects were then conducted across the top, middle, and bottom of each meadow. During these transects, after every 3-7 steps, the type of foliage/terrain underfoot was recorded:

graminoid, forb, bare ground, or gopher ground. While observing a particular meadow the presence of predictors of degradation were noted. Some of these predictors are: corn lilies, sagebrush, conifer encroachment, cow presence, gullies/ditches, evidence of previous conservation efforts, erosion, sediment deposits, headcuts, OSD/culverts, and channel incision. An annotated picture was taken for every unusual feature, for every transect and for most major measurements. A rudimentary grade was then assigned to the whole meadow with our detailed notes below.

The Osa Meadow Restoration occurred during the last two weeks of the Sequoia National Forest Meadow Survey. For this restoration the meadow survey team, as well as California Trout and YouthCorp worked together to re-landscape Osa meadow. The survey team began by digging out samples of riparian foliage from the healthy stream-side areas of Osa Meadow. These samples were then taken to the Kern River Ranger Districts greenhouse and repotted where they await re-seeding. Biodegradable waddles were taken to Osa Meadow and used to fill in incised channels. These waddles were staked in and covered with a coconut fiber cloth to encourage water to flow over the land rather than back down through the soil. A tiered U-bend was then created around the source of meadow degradation in order to slow the effects of erosion. Extra waddles were taken to the surrounding area around Osa Meadow and used to change the flow of the water source from a concentrated stream to a broad overland runoff. In the following year after this project bulldozers will have flattened a hillside of Osa Meadow, making its shape more gradual. The repotted riparian foliage will be planted into the once-dry soil and hopefully within 2-3 years the meadow will have recovered.

### **Project Outcomes**

During the 10 week internship we conducted 344 hours of field work and completed surveys on 21 out of the 25 proposed meadows. 2 of the proposed meadows were unreachable by trail or vehicle. Of the surveyed meadows 4 out of the 21 were significantly degraded, having an average assessment score of 13/24. The other 17 meadows earned scores between 20-24 with no more than 2 being noted as “at risk”. 1 meadow, “Little Horse” showed signs of degrading due to drought, not stream incision, livestock, or culvert causes. Over 800 pictures were annotated and 96 pages of surveys were transcribed into one comprehensive folder. Separate files were made for and sent to the Forest Service and California Trout based on which data each organization requested.

The results were unexpected to me in that there weren't as many degraded meadows as I thought there would be. During my time living in Kernville and working in the Sequoia National Forest I observed the effects of the drought and bark beetles on the forest trees. I expected there to be more meadows in danger of disappearing due to drought conditions.

If I were to repeat this survey I would want to spend more time around each meadow to better understand where the damage was coming from. There were times where my team and I would find signs of erosion and incision within the meadow yet were unable to follow the trail out due to physical obstacles. If I were to repeat this survey I would also want detailed aerial maps of each proposed meadow from the very start. Conducting transects and orienting ourselves within a particularly large

meadow was much easier after having printed out the aerial maps. There was a time when we weren't sure where in a meadow we were making our observations and if we were even in the correct meadow.

From this internship I learned fieldwork protocol, the importance and potential of meadow restoration, meadow restoration techniques, common Sequoia National Forest plants & animals, the responsibilities of the U.S. Forest Service and more. I became more precise and observant. I was also able to better appreciate the importance of accuracy when conducting surveys and when transcribing. I learned how to work in a team and how to bring out each person's natural strengths. I learned how to be with another person 16 hours a day every day without incident. I even learned how to get a 2-wheel drive truck out of soft soil.

### **Conclusions**

This project was the precursor to a more in-depth study into Sequoia National Forests meadows. My team acted as scouts for future scientists to determine which meadows to visit. I believe revisiting the most degraded meadows and taking more time to collect data will benefit this project's mission. Further, I think a follow-up scouting survey to assess the status of the meadows post-drought would be beneficial.

This internship has provided me with some of the most useful and inspiring experiences I have ever had the privilege to receive. Being exposed to people who are already working within the world of ecological restoration has broadened my horizons. I can see myself working in this type of field and I intend to learn more about how I may become a part of this. Thanks to this experience I believe I will apply for AmeriCorps to further my experience with ecological restoration.

**Appendices**

**Closed chamber:** a method using a syringe and a closed chamber used to measure certain natural gasses

**GIS/GPS:** Geographical Information System/Global positioning system

**Meadow:** a natural occurring grassland area where water is allowed to flow very slowly

**YouthCorps:** a paid Forest Service program designed to engage youth over the summer

**Transect:** a straight line that is walked

**Jacob Staff:** a staff used in field work to measure things or for scale in pictures

**Thalweg:** the deepest part of a water pathway

**Run:** the part of a water pathway where there is choppy water

**Graminoid:** grasses; need a comparatively larger amount of water to survive

**Forb:** leafy flowering plants; comparatively need less water to survive

**Conifer encroachment:** Conifers survive best with less water and will eat at the outer edges of an unhealthy meadow

**Cow presence:** Cow hooves damage water pathway bank, cow patties contaminate water sources, cows tear clumps of foliage out of the ground making meadow bumpy

**Gullies/Ditches:** rows of erosion formed by concentrated water

**OSD:** overside drains; common on roadways; concentrate rainwater into destructive stream

**Culvert:** a tunnel that funnels water away from the road but into the soil

**Riparian:** river-side

**Waddle:** long bundle of hay

**Incised channel:** a waterway that has eroded and sunk into the ground




**AmeriCorps:** Government program that accepts applicants into civil society programs

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	A	B	Z	AA	AB	AC	AD	AE	AF	AG
1	Common_Name	UCD/DFG_ID#	Encroachment	Restoration_Effo	Comments_on_F	Headcut_F	Number_of_Headcut	Headcut_Description	Inset_Fl	Inset_Floodplain
2	Little Big	059	3 No			No	0		No	
3	Frog	062	3 No			No	0		No	
4	Big	068	3 Yes	Check dams	Yes		2 HC1: Movement potential: low. Jump height: 70	Yes	Localized to upp	
5	Horse on Salmon Ck.	070	3 No			No	0		No	
6	Double Bunk	088	3 No			No	0		No	
7	Double Bunk West 1	088	4 No			No	0		No	
8	Holey	089	4 Yes	Photo 26; rock c	Yes		1 Movement potential: low. Jump height: 20cm th	No		
9	Mosquito	090	4 Yes	Erosion control,	No		0		Yes	
10	Lower Holey	093	3 Yes	Two rock check i	Yes		1 Movement potential: high. Jump height: 80cm	1 No		
11	Parker	096	4 Yes	Check dams and	No		0		No	
12	Round	099	4 Yes	Possible old che	No		0		No	
13	Upper Parker	101	3 Yes	Check dams. T-ç	Yes		2 HC1: Photo 288. GPS 009, height: 30, width: 12	No		
14	Horse	103	4 Yes	Check dams and	Yes		3 HC1: Knickpoint 1.7 ft deep caused by fallen lo	Yes	Floodplain is onl	
15	Snow Survey Cabin	106	4 No			Yes	1 should be in GEOSPATIAL DATA folder (might	Yes	Localized in mid	

**Fig.** A sample of our work for California Trout



Meadow Name: 000090 Mosquito		
Watershed: 8/G		
Date: 07/08/2016		
	Photo	Description
1		505-Overview of meadow from top of meadow looking down
2		506-OHV trail running length of meadow on paved road-side of meadow
3		507,508- OHV trail running through portion of middle meadow and crossing main channels

**Overall Score: 3-4 Excellent**

Date: 07/27/2016  
Meadow Name: Snow Survey Cabin  
UCD: UCDSNM000106  
Huc 12:180300010403  
Huc14:8FB  
GPS Location: 35°N 58' 18.3" W 21' 49.7"  
GPS Datum: 11S E037704515 N3981665  
Elevation: 8949 ft County: Tulare Landowner: USFS  
USGS Quad Name: Sirretta Peak 7.5'  
Observers: B. Rosales, C. Williams, M. Susilowati

**Protocol Parameter Results.**

1. Bank height in Main Channel: 4- Natural Condition
2. Bank Stability: 4- Natural Condition
3. Gullies/ditches outside of main channel: 4- Natural Condition
4. Vegetation Cover: 2- Moderately Impacted
5. Bare Ground: 2- Moderately Impacted
6. Conifer or Upland Shrub Encroachment: 4- Natural Condition

Total Points: 20/24

**Transect**

Lower Transect  
- 17 Graminoids, 29 Forbs, 4 Bare Ground No Gopher, 5 Bare Ground Yes Gopher, and 2 Other Cover  
Middle Transect  
- 30 Graminoids, 19 Forbs, 0 Bare Ground No Gopher, 1 Bare Ground Yes Gopher, and 2 Other Cover  
Upper Transect  
- 30 Graminoids, 28 Forbs, 2 Bare Ground No Gopher, 4 Bare Ground Yes Gopher, and 0 Other Cover  
Total Points: 173  
Total Vegetation: 153  
Total Bare ground: 16  
Graminoid: 45%  
Bare: 9%  
Gopher Disturbed: 6%

\*All com lilies marked as Forb. All sage brush marked as Other.

**Additional Observations:**

1. Maybe evidence of conservation or restoration efforts. Photo 786. Main channel has rocky base.
2. Yes headcut present in meadow  
Description: GPS point: 017

**Fig2&3.** A sample of our work for the U.S. Forest Service



**Fig4:** We are “out standing” in our field



Figs: This 2 wheel drive truck got stuck twice 2 hours away from civilization with 3 interns at its wheel