FOUR BEETLES PROJECT

ALEJANDRO RAMIREZ
CALIFORNIA STATE UNIVERSITY, FRESNO
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CURTIS FAIR (DISTRICT ARCHAEOLOGIST) & JOHN KELLEY (DISTRICT HYDROLOGIST)
MENDOCINO NATIONAL FOREST

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Introduction

During my summer internship I got the opportunity to work at the Mendocino National Forest in both departments; Hydrology and Archaeology. Both disciplines are working toward a big project called the Four Beetles Project (FBP). It was created in response to high tree mortality in our forest due to the rapid spread of bark beetles. The FBP will encompass 17,000 acres located in the Grindstone Ranger District of the Mendocino National Forest. The main goal is to create forest resilience and resistance to pathogen and insect outbreaks. This project is number two on the Districts priorities for planning. The extensive drought is helping the beetles spread at higher rates since the forest needs more water to produce sap for the protection against these bark eating insects. While working with Hydrology, stream surveys were collected from all watersheds inside the project boundary. In Archaeology we had to search for artifacts such as; projectile points, flakes and house pits. Once many artifacts were found within an area, we will flag and protect the area from any form of activity that could destroy the site. Throughout this report I will give an insight on the job description for each department and how it will benefit the overall condition of the forest.

Frame

While working with Hydrology Stream surveys such as; Pfankuch, shading and woody debris were completed throughout my internship. Shading and woody debris surveys were selected from the Stream Condition Inventory (SCI) protocol. Pfankuch gives a score based on many attributes that will tell us about channel stability, whether it is excellent, good, fair or poor. Before starting the Pfankuch survey we must identify what stream we are dealing with. Streams are identified as a Rosgen A, B, C, D, E F stream, and once you identify the right one there is a

1-6 option for each letter such as; B1, B2, and B3. The letter identifies the slope of stream we are dealing with and the numbers on each letter identifies the substrate the stream is composed off such as; bedrock, boulder, coble, gravel, sand and silt. Within the Four Beetles Project most stream reaches were type A and B. Once we collect the stream type there are scores on each attribute along the upper bank, lower bank, and bottom that determines the stability of the watershed. The 15 attributes that determine the overall condition of a stream are:

Upper Bank

1. Landform Slope: This is the measurement of the bank slope gradient. The steeper the slope the more unstable a watershed will be. But in order to better understand the stability of a stream, rock content and vegetation determine the stability of landform slope.

2. Mass Wasting: This is scored as existing or potential detachment of side banks that collapsed into watershed below. Having large volumes of soil in a stream can cause an increase in flow velocities and cutting power (Pfankuch, D. J., 1975).

3. Debris Jam Potential: Debris Jam Potential are considered objects such as; tree trunks, limbs, twigs and leaves. Well imbedded trunks can create sediment traps and provide good fish habitat for years (Pfankuch, D. J., 1975). This category is given a score on the size and number of debris along the whole stream reach.

4. Vegetative Bank Protection: Vegetation on the bank protects the soil from detachment by using their roots. Riparian plants protect the surface of the soil while trees and shrubs offer more bank stability due to deeper and stronger roots. Trees and shrubs also help in reducing water flow, making it a more stable watershed during high peak flows. The score is determined based on the percent of vegetation along the bank of the watershed (Pfankuch, D. J., 1975).

Lower Bank

5. Channel Capacity: Channel capacity determines how well a channel of water can handle changes in discharge. Low width to depth ratio indicate a deep and narrow channel, which means it can handle changes in discharge better than a high width to depth ratio. A high width to depth ration is a wider less narrow stream, which can’t support flood years (Pfankuch, D. J., 1975).

6. Bank Rock Content: Rock content is important in determining the capacity of the bank to resist erosion. Shape, size and volume of rocks is used to determine the resistance of banks to flow in a watershed (Pfankuch, D. J., 1975). The larger the size the more stable that rock is from moving downstream during wet years.

7. Obstructions Flow Deflectors Sediment Traps: These are usually large rocks and embedded logs that will change the direction of water creating sediment traps. Having obstructions is not necessarily bad since it provides long-term cover for fish (Pfankuch, D. J., 1975. But when those obstructions begin to cut the bank it can have a negative impact on the stability, creating massive movement of soil and debris along the stream.

8. Cutting: Cutting refers to the erosion along the bank, producing vertical walls exposing roots (Pfankuch, D. J., 1975).

9. Deposition: Occurs in less steep or the lower bank of a reach. Occurs after recent bank cutting and will deposit along bends or flat areas (Pfankuch, D. J., 1975). This is a cause to do unstable banks collapsing downstream and also embedded woody debris creating sediment traps.

Bottom

10. Rock Angularity: Rock angularity in an important aspect in determining stream stability. Sharp edges will be more stable, since they will require more force to move than a round/smooth rock (Pfankuch, D. J., 1975). Sharp edges allow for rocks to fill in any gaps making them interlock with each other. On the other hand, smooth and round rocks are not able to fill in the gaps facilitating rock movement along the stream.

11. Brightness: Brightness refers to moss or algae attached to a rock. The higher the currents the brighter the rocks will be, due to tumbling and scraping. Ephemeral and perennial streams will have more dull or darkened rocks than a perennial stream (Pfankuch, D. J., 1975).

12. Consolidation (Particle Packing): Consolidation is how well the rocks are packed. If the rocks can be easily moved with your boots, they are considered to be poorly packed. The tighter they are packed the more resistant the stream is to movement by flow forces (Pfankuch, D. J., 1975).

13. Bottom Size Distribution & % Stable Materials: This is a percent of Bedrock, Boulders (>10’’), Large Cobble (5’’-10’’), Small cobble (2’’-5’’), Gravel (.1’’-2’’), Sand and Silt. One important note is that the percentage for all must add to 100 percent (Pfankuch, D. J., 1975). In addition, this information will tell us whether the stream reach is an A1, A2, A3 and so forth.

14. Souring & Deposition: Using earlier assessment such as; size, angularity and brightness will help in determining the amount of scouring or deposition in a stream (Pfankuch, D. J., 1975). Having a high percentage of bright rocks tells us that there are moving particles scraping the rocks, preventing algae to fully establish. Looking at all these attributes inform us whether a watershed is going through scouring and deposition.

15. Clinging Aquatic Vegetation (Algae): Aquatic vegetation such as; moss and algae can influence light conditions and nutrient levels in a stream. This is usually caused due to distribution, since moss and algae has no roots (Pfankuch, D. J., 1975). This attribute is measured as a percentage of aquatic vegetation along the entire reach.

Completing the Pfankuck allow us to calculate the percent of Threshold of Concern (TOC), which is used to determine amount of disturbance within a specific watershed. It determines which streams need help the most by including the percent of disturbances that could harm a watershed. Most disturbances are considered to have a 7 year recovery time, except those that clear out the canopy cover. In order to protect watersheds, we must not exceed the TOC. Disturbances such as; roads, possible or current forest fires, mud slides are used to determine the TOC in an area by including a percentage for each attribute. By using the TOC in a watershed we have a better understanding of the stability and condition of the watershed (MNF ERA, 2009). See table below.

Table 4A – Stream Stability / TOC Coefficient Crosswalk Mendocino NF		
Pfankuch Stability Rating	Descriptor	TOC Coefficient
0 – 13	High Excellent	0.16
14 - 26	Med Excellent	0.15
27 – 39	Low Excellent	0.14
40 – 52	High Good	0.14
53 – 65	Med Good	0.13
66 – 78	Low Good	0.12
79 – 91	High Fair	0.12
92 – 104	Med Fair	0.11
105 – 117	Low Fair	0.10
118 – 130	High Poor	0.10
131 – 148	Med Poor	0.09
149 – 156	Low Poor	0.08

Archeologist also have an important role in this project. They are responsible for the protection of historical sites inside the project area. The National Historic Preservation Act (NHPA) is a law protecting all historical sites in the forest. While working with archeologist, we had the opportunity to visit many sites within the Four Beetles Project area. While working with archaeology, we mostly updated old site records, fixed any mistakes such as; sketch maps, location of artifacts, and lastly re-flag the boundary area if necessary. Once re-flagging the boundary area, we used the Trimble to make polygons where they will be inserted on Arc-map for future referencing (Proposal Heritage).

Attributes that make a site are; flakes, projectile points, house pits and various archaeological tools. Usually you will find these artifacts near a glade where the slope is less than 30 degrees. Having a water source nearby is also very important. During the process of discovering new sites, clear open areas (glades) with a nice view of the mountains were always attributes of an archaeological site. The way we surveyed the land for new archaeological sites was through intensive or general survey. Intensive surveying employed a 10-30 meters wide survey transect intervals, while general surveys are 30-50 meters apart. If the slope is 0-20%, intensive survey was done. On the other hand, if we have a slope greater than 30% then general survey is used. These sites provide us with fascinating information about each tribe and their living conditions such as; tools, points and house pits. Using all this information, we can protect and record every archaeological site in the forest from destruction. This allows for future generations to learn and appreciate the history of various tribes in our forest (Proposal Heritage).

Conclusion

My internship experience has allowed me to further develop my problem solving skills and confidence that anything is possible in life. This will come useful in the future as I pursue a career as a biologist in the Forest Service. Having the opportunity to work in various departments within the forest service made me want to pursue a higher education in my career. After the internship, I am confident to pursue a career as a biologist for the U.S. Forest Service. Also I am confident that my future career will be equally rewarding and successful. After getting a feel of all the departments in the Forest Service, I plan to pursue a lifelong career as a fishery biologist. Now that I know what career I plan to pursue within the Forest Service, I can inform myself on the requirements needed to apply for that federal job position.

References

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