Ryan Salas

CSUSB WRI Intern

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Introduction

It is thought that this most recent drought in California was one of the worst we have seen in a long time. Today the drought is said to be “over”, but is it really? The effects of the drought are still being experienced all over the state. Do to synergistic effects, different parts of California are experiencing a wide array of forest health and safety issues. Ranging from pests and pathogens moving from endemic to epidemic levels to increased fire hazards due to historic fire suppression and an increase in fuels loading resulting from the mortality rates of drought stress and beetle kill. These results can be attributed both directly and indirectly to the drought that Californians and others have been dealing with for the past couple years. The Mendocino National Forest is no exception.

President Roosevelt was among some of the first to recognize the need to protect our ecological heritage and saw fit to set aside the Mendocino as a “forest reserve” in 1907. However, the forest wouldn’t come to be called the “Mendocino” until much later. It was originally named the Stoney Creek Forest Reserve and then the California National forest, but higher authorities thought there would be confusion with naming a forest the same name as the state it is in. thus, on July 12, 1932 President Herbert Hoover decided to name it the Mendocino National Forest. A name which he got from Cape Mendocino located in Humboldt County (USDA.gov, 8/3/2016).

The forest its self is approximately 65 miles long and 35 miles across. It is located two to three hours north of San Francisco and Sacramento, and covers a moderate 913,306 acres of mountains and canyons, which encompass a variety of recreational lands and opportunities ranging from; Camping, hiking, and backpacking to nature study, photography, and off highway vehicle travel. Even with its moderate acreage, the forest is divided in to three districts; the Covelo, Grindstone, and Upper Lake districts (USDA.gov, 8/3/2016). My time was spent working on the Grindstone ranger district for the entirety of my internship.

The forest also encompasses all or part of, four wilderness areas as well as two "units" located outside the boundaries of the national forest. The two units outside the boundaries are the Chico Seed Orchard and the Red Bluff Recreation Area. The four wilderness areas that the forest manages are; the Snow Mountain Wilderness that is 37,679 acres, the Yolla Bolly-Middle Eel Wilderness which is 147,070 acres, the Yuki Wilderness that is 53,887 acres, and finally the Sanhedrin Wilderness that is 10,571 acres. The Grindstone Creek Canyon is the lowest point on the forest sitting at 750 feet above sea level, and the South Yolla Bolly Mountain in the northern portion of the forest which rests at 8,092 feet and over all the average elevation is 4,000 feet. It would have been nice to work at the higher elevations considering how hot it got this summer; the work sites surveyed on this project were among the average elevation. (USDA.gov, 8/3/2016).

The Mendocino is the only one of California's eighteen National forests that is not transected by paved roads or highways. In addition to the recreational opportunities the Mendocino is also a "working forest" which means that timber harvesting operations and grazing both take place on the forest and within private land holdings located within the forest boundaries (USDA.gov, 8/3/2016). Being a working forest, there are an array of conditions and circumstances that take effect on the forest health.

The primary venture that is currently underway on the forest is the Four Beetles Project, which is named after the four different types of pine beetles currently attacking the forest with a relatively high mortality rate. These beetles are the Red Turpentine Beetle *(Dendroctonus valens LeConte)*, The western Pine Bark Beetle *(Dendroctonus brevicomis LeConte)*, the Mountain Pine beetle *(Dendroctonus* *ponderosae)*, and an Ips species, probably *(Ips Pini)*. The high level of successful beetle attacks is a synergistic result stemming from the drought. This combined with wild fires in the past years has led to a lot of dead standing and downed woody debris, as well as overcrowded stands due to historic fire suppression. As mentioned earlier the fuels build up, overcrowding, and the fact that the forest is a working forest; is why it is relatively easy to understand the need for timber operations to take place both commercially and non-commercially. The operations are being planned so that any monetary resources the forest is offering can be extracted, and to protect any and all recreational usage, and reduce threats of catastrophic wildfire.

However, prior to any kind of timber operation either commercial or non-commercial, the United States Forest Service (USFS) is driven and compelled both legally and morally to do its part to protect, our resources as they are right now and for future generations. In order to accomplish this, the USFS is actively conducting surveys on the forest from a variety of aspects. The two types of surveys I was involved with during my internship were; stream stability surveys (Pfankuck surveys) and road culvert surveys. The amount of work put in and number of man hours used so far is remarkable and yet it is shadowed by the amount of work and man hours this project has yet to demand.

Methods

Stream Stability Surveys (Pfankuck) – The Pfankuck surveys, as described by Dale J. Pfankuck; "… were developed to systemize the measurements and evaluations of the resistive capacity of mountain stream channels to the detachment of bed and bank materials and to provide information about the capacity of streams to adjust and recover from potential changes in flow and/or increases in sediment production"(Pfankuck, 1975). Basically, these surveys were developed so that the measurements and evaluations would be done in a uniform and standard fashion. The actual measurements and evaluations are in terms of the "resistive capacity to the detachment of bed and bank material” and “capacity of stream to adjust and recover from potential changes …” which were mentioned above (Pfankuck, 1975). This refers to how easy the bed and bank material can be eroded or moved, how easy is it for the stream to adjust to any changes congruent with increased flows, or how easy it is for the stream to recover from any adverse effects caused by increased sediment loading.

Some definitions; a “reach” is a section of stream that has fairly consistent feature characteristics and can vary in length. “First order streams” define stream size based on a hierarchy of tributaries. These are the streams at higher elevations where water first begins to collect and before it merges with another first order stream.

The Pfankuck surveys take into consideration a wide array of data collection points in its effort to assess and evaluate the two terms mentioned above. The survey breaks up the streams, in the cross sectional plain, into three different parts; the upper bank, the lower bank and the bottom. Doing this allows us to evaluate the streams in the same way and makes it relatively simple to follow.

The subsequent paragraphs will adhere to the following format. Each portion of the stream in the cross sectional plain (Upper bank, Lower bank, Bottom) are evaluated in various categories, each category has four descriptions and associated ratings. The first description for each “category” is associated with the rating of “excellent” and the second description provided will be associated with a poor rating. There are two additional descriptions, covering the mid-level ranges, which have ratings associated with them. However, they have been omitted from this report.

The upper bank is assessed through four different categories; landform slope, mass wasting, debris jam potential, and vegetative bank protection. Each of these categories is given a rating based off of a short description. The ratings are excellent, good, fair, and poor, and the descriptions plus the surveyor’s ocular analysis are what determines the rating given. The description for landform slope range from “Bank slope gradient < 30%” being excellent to “Bank slope gradient 60% +” being poor

(Pfankuck, 1975). Slope is assessed because the streams with reaches that have greater slopes tend to be less stable which means the resistance capacity might be lower and sense the type of streams we are surveying are first order streams they are usually steep sloped and wedged in a steep walled drainage. That being said the “capacity for stream to adjust” is limited due to the confined space. The mass wasting descriptions range from “No evidence of past or future mass wasting” being excellent to “frequent/large sediment yearlong OR imminent danger of same” which is poor (Pfankuck, 1975). This aspect is evaluated because if there is visible evidence that material is being eroded and deposited then it is easy to see that the system is less stable. The debris jam potential description range from “essentially absent from immediate channel area” which is excellent to moderate to heavy amounts, predominantly larger sizes” this of course is poor (Pfankuck, 1975). The descriptions for vegetative bank protection are between “90%+ plant density. Vigor and variety suggests a deep dense soil binding root mass”, deep dense root masses is a good thing and gets a rating of excellent. On the other end of the scale we have “<50% density + fewer species and less vigor indicates poor discontinuous and shallow root mass” (Pfankuck, 1975). With root masses that are poor discontinuous and shallow the soil and materials are not being held in place as strongly, thus the resistance capacity is less.

The lower banks characteristics are categorized as follows: channel capacity, bank rock content, obstructions flow deflectors and sediment traps, cutting, and deposition. The descriptions for channel capacity go from “ample for present and some increases. Peak flows contained. [Width to depth] ratios (W/D) < 7” to “Inadequate. Overbank flows common. W/D ratio > 25” (Pfankuck, 1975). this is an important aspect says Pfankuck; because “it reflects the lower bank’s ability to contain changes in discharge. low W/D ratios indicate deep channels which can accommodate increases in flow…” (Pfankuck, 1975). An increased ability to cover the changes and put up with the increases will make for a more stable system. Bank rock content is assessed between “65% large angular, boulders 12” +, numerous” and “< 20% rock fragments of gravel sizes, 1-3” or less” (Pfankuck, 1975). The material that the lower banks are comprised of is important in assessing stability because the smaller the fragments that make up the banks the easier it is for the material to dislodge. Obstructions, flow deflectors, and sediment traps are assessed between “Rocks and old logs firmly embedded. Flow pattern without cutting or deposition. Pools and riffles stable” and “Frequent obstructions and deflectors cause bank erosion all year long. Sediment traps full, channel migrations occurring” (Pfankuck, 1975). Obstructions and flow deflectors are assessed because they can cause drastic changes in the flow of the stream which can cause the stream to want to reposition its self and cut into banks or areas that it normally would not. Cutting is described as “little to none evident. Infrequent raw banks < 6” high generally”, all the way to “almost continuous cuts, some over 24” high. Failure of overhangs frequent” (Pfankuck, 1975). Cutting is an easy aspect to assess visually and is a strong indicator of problematic issues. Deposition’s descriptions range from “little to no enlargement of channel or point bar”, to “extensive deposits of predominantly fine particles. Accelerated bar development” (Pfankuck, 1975). Again, this is an easy characteristic to assess visually and is also a strong indicator of problematic conditions up stream, so it is very useful in determining stream stability.

As for the bottom of the stream channel, it is assessed in the six categories that follow: Rock angularity, Brightness, consolidation (particle packing), Bottom size distribution and % stable material, scouring and deposition, and clinging aquatic vegetation (algae and or moss). For the rock angularity’s descriptions they are “Sharp edges or corners, plane surfaces roughened” and “well-rounded in all dimensions surfaces smooth” (Pfankuck, 1975). This is an indication of how far the martial present has traveled from it source. It also indicates the level of stability because the rougher the material the more friction is present, which means that the material will require more force in order to be relocated. The brightness of the material that is present is evaluated between “surface dull, darkened or stained. Generally not bright” and “predominately bright , 65% + exposed or scoured surfaces” (Pfankuck, 1975). If the bottom material has little to no algae growing on it could show that the stream is less stable. This is because if the material is moving around the algae and other things that make the surfaces dull will not be able to attach to the materials. Consolidation (particle packing) the description for this ranges from “associated sizes tightly packed and/or over lapping” to no packing evident loose assortment easily moved” (Pfankuck, 1975). The particle packing plays a role in stream stability because if the materials are well consolidated they are harder to dislodge, this adds to the stability. Bottom size distribution and the percent of stable materials are described as “no change in size evident. Stable material 80-100%” and Marked distribution changes. Stable materials 0-20%” (Pfankuck, 1975). Scouring and deposition has descriptions that are from “less than 5% of the bottom effected by scouring and deposition” to “More than 50% of the bottom in a state of flux nearly all year long” (Pfankuck, 1975). Finally, clinging aquatic vegetation is described as “abundant. Growth largely moss like, dark green, perennial. In swift water too” to “Perennial types scarce or absent. Yellow green, short term bloom may be present” (Pfankuck, 1975). The last three categories all refer the how much, how far, and how often the bottom material has/is able to travel.

Forest road culvert surveys – the culvert surveys are as important if not more important than the Pfankuck and other surveys being conducted simply because they are costly to repair and or replace and their failures lead to access restrictions and or temporary road closures. There are 23,000 miles of drainages and streams located within the forest, as well as 3,200 miles of roads (Kelley, 2016). The density of drainages and roads calls for large numbers of intersections which requires a large number of culverts. However, decades ago when the roads systems were being built they were built with undersized inadequate culverts, designed to accommodate the twenty five year flood event. After the 1964 flood, and a few others, it was determined that all culverts should be resized in order to accommodate a 100 year flood event. My experiences this summer were mainly with culvert surveys.

The culvert surveys were collected using a Trimble hand held data recorder. The data topics collected are as follows; location: road number and a “GPS” point, culvert shape, diameter, culvert type, percent blocked, drainage type, depth of inlet, inlet and outlet types, stream connectivity (Kelley, 2016). The location is probably the most important piece of data considering it is necessary to map where all the culverts are. The shape, diameter, and type are all useful information pieces to have for tracking and planning purposes. Pieces of information such as percent blocked, the type of drainage, depth to inlet, and stream connectivity, are important in analyzing the potential costs and levels of damage that is associated with the culverts repairs and failures.

Conclusion

The task of completing the culvert surveys was assigned to me and a couple of different Youth Conservation Corps (YCC) crews. I was assigned to the Thomes watershed, and was able to complete approximately twenty four miles of road culvert surveys. Some of the challenges I encountered with these surveys was acquiring and maintaining sufficient satellite, and cutting through the occasional fallen tree, some of which I was unable to hack through and was compelled to walk the remaining portion of the road if I was unable to connect with it from the other end.

In general the culvert surveys did not possess a high degree of difficulty and were a pleasure for me to take part in. It is my sincerest hopes that the data I collected is of the highest quality possible and that it proves to be extremely valuable in the further planning and completion of the Four Beetles Project.

Work Cited

- Pfankuck, Dale J. Stream Reach Inventory and Channel Stability Evaluation. U.S. Department of, 1975. Print.
- "Mendocino National Forest." *USDA.gov*. U.S. Department of Agriculture, 16 Dec. 2013. Web. 3 Aug. 2016.
- Kelley, John; July, 2016; Personal communications.