# Sequoia ForestKeeper Intern
# Final Report
# Summer 2008

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The objectives for the Sequoia ForestKeeper Intern Program for the summer of 2008 was to: 1. gather scientific data that is unbiased and consistent, unlike data used by the US Forest Service; 2. survey conditions of Giant Sequoia regeneration, especially canopy cover of young Sequoias; 3. survey grove boundaries; identify what types of logging activities were going on; and 4. survey overall forest health. Our methods, while they varied somewhat from week to week, consisted of road and compass transects, with three surveys being done (the two outer surveys were done 100 feet from the center point) at 200 foot increments. We used a hip chain to measure out distances, compasses to determine our directions, densiometers to calculate canopy cover, diameter tape measure to measure DBH, and a GPS system to map applicable points. Our data was analyzed using TOPO! and Microsoft Excel programs.

One significant finding from our research was the relationship between canopy cover and woody brush. We estimated ground cover and used densiometers to calculate the canopy cover. Our data from both Freeman Creek and Clear Creek supported findings from the 2007 interns, namely that there is an inverse correlation between the percentage of canopy cover and the percentage of woody brush. Thus, it would seem that the fuel reduction policy of removing fire resistant large trees actually increased fire danger by increasing the growth of woody brush that is not fire resistant. Additionally brush can act as a ladder fuel that can ignite adjacent trees.

Another one of our significant findings was that Giant Sequoias regenerate in closed canopy in the unmanaged forest. Our data showed that there were more sequoia saplings and seedling observed in closed canopy than in open canopy. This negates the claim by the US Forest Service that Sequoias need open canopy to regenerate, and the claim that they must cut trees within Sequoia Grove boundaries to promote sequoia regeneration. Our data showed that most of the Sequoias we observed were found in 90-100% canopy cover, which supports data collected by the 2007 interns. While we observed that Sequoias can regenerate in open canopy (as we observed when Sequoias were replanted after a clear cut), our data strongly suggests that removal of canopy cover to allow for Sequoia regeneration is not necessary.

Other conclusions were also drawn from our data and observations. Our surveys of 2002 McNally Fire sites first surveyed in 2004 showed that overall there were more pine and fir seedlings than in 2004, and fewer snags. Ground cover, however, increased since 2004 in some sites and decreased in others. Additionally, we observed obvious signs of extensive post-fire logging. Another important issue we observed at Freeman Creek Grove, McIntyre Grove and

Landslide Grove was that the marked Giant Sequoia boundaries were highly inaccurate and in need of updating.

Our surveys also revealed that most marked hazard trees that were observed were, in reality, not hazardous to human safety. Most were too far away from the road, were still very alive, or were otherwise securely leaning in the opposite direction of the (often far away) road.

The following are the summaries from each individual week of data collection and observation. Each summary includes objectives, methods, results, and conclusions specific to the week. Tables and graphs of collected data can also be found in the following summaries.

Sequoia ForestKeeper
Clear Creek Project
2008 Survey Summary
Natalie Stauffer

**Introduction**

Natalie Stauffer, Marissa Williams, Christian Michel, Ara Marderosian and Dan Christenson participated in this survey. Four days were spent in the Clear Creek Project to survey general forest conditions. We especially looked for hazard trees marked for cutting, and the extent of fuel reduction projects. Logging practices in general, and how they differentiated between points where various treatments were applied throughout the forest, was also noted.

Several weeks after our surveys were completed, a fire swept through the area, and an unknown (but very large number) of acres were burned. We hoped to resurvey the area after the fire, but, unfortunately, the area will be closed for the next two years to allow for "rehabilitation."

**Methods and Materials**

Fourteen transects from 7 different road points (on FS 27S02, 28S18, 28S18B, 28S44 and 28S44) were conducted. At each road point, we did surveys along a "hip chain" transect perpendicular to the road on either side, with 4 or 5 points 200 feet apart. At each transect point there was an additional survey point on each side of the transect line approximately 100 feet from and perpendicular to the transect line. A compass was used to determine the bearing of the transect line from the road. At each point, we counted, speciated, and measured all trees within a 25 foot radius. We also counted seedlings, estimated ground cover, and recorded the percentages of the various types of ground cover (brush, litter, forbs, rock etc). Spherical densiometers were used to calculate canopy cover at the middle of each point. Additionally, we made note of evidence from mammals (for example, scat, beds and trails), and logging, namely the number and diameter of stumps and the evidence of heavy machinery or logging roads. Other unusual observations were also recorded.

**Results**

For Transect 1, there were a medium number of stumps in the area, and average canopy cover (57%) and ground cover (88%) were within range (Table 1), but percent brush (1%) was a bit low (Graph 1). Section B of Transect 1 was performed on a steep slope.

Transect 2 had only a few stumps, except point B5, where there were many stumps, and an assumed type conversion plantation, which had a very different type of "forest" than other points. The forest consisted of similarly aged Jeffrey Pines and was very dense.

For Transects 3, 4, and 5 there were many trees marked with blue "x"s, which identified hazard trees to be cut, and a high number of cut stumps. There were small areas of clearcutting, some of which had brush while some was bare dirt.

For Transect 6, the two sides of the transect were very different. Section A was a plantation with only Jeffrey Pines and a single species of brush with a very high number of cut stumps. It was obviously a replanted area that looked like a Christmas tree farm. There were large cut stumps and huge heaps/piles of branches and pulled out bushes. Side B had fewer stumps, a more open forest, and an old logging road running through it.

For Transect 7, the A side of this transect has a high number of stumps, and appeared to be the result of type conversion. Similar to the plantation observed in Transect 6, the plantation observed in this transect was also only Jeffrey Pines of similar age. There were large piles of unburnt branches, pulled out brush, and stumps. The B side of the transect had a low/medium number of cut stumps, and was very different from the A side. Trees in general were larger and the forest was more open, with a creek running through it and multiple rock formations. Additionally, there was much evidence of cows, including multiple trails and a water trough.

Overall, the type of forest most common in our transects was characterized by slopes, mostly closed canopy, little brush, and a relatively low tree density (with the exception of the two plantations). For all of the transects, the number of trees ranged from 154 (Transect 7) to 342 (Transect 3). The average size of Jeffrey Pine was approximately 12.0" DBH, while the sizes ranged from seedlings to 45.3" DBH. For White Fir, the average size was approximately 7.5" DBH, and its sizes ranged from seedlings to 53.1" DBH. Black Oak had an approximate average size of 7.7" DBH with sizes ranging from seedlings to 14.6" DBH. Sugar Pine, the least common tree found in the area, had an approximate average size of 4.8" DBH with sizes ranging from seedlings to 10.3" DBH. Table 1 summarizes the averages and ranges of all transects.

**Conclusions**

The Clear Creek Project area was obviously very "managed" in that there were a high number of marked hazard trees and cut stumps and several areas that were a monoculture due to type conversion. Many of the trees that were marked for cutting were far away (300 feet or more at times) from any logging roads, and were clearly of no true threat to human safety. One interesting observation was that many of the cut stumps we observed and measured were larger than the biggest standing trees we encountered. Also, as Graph 1 illustrates, a more open canopy often translates into more woody brush on the ground, which fuels fire. Thus, it appears that simply clearing the forest of its largest trees is a fuel removal practice that increases the flammable woody brush thus increasing the fire danger

**Personal Reaction**

I was overwhelmed by the logging practices that were going on in the area, and was very disappointed to learn that the U.S. Forest Service is not the protector of our national forests that I thought they were, I was able to see first hand the destructive logging practices that are widely used, but are rarely questioned. It is incredible to notice the variety of bird calls audible in a well-managed (or simply untouched) forest, where there is more plant diversity (and thus more bird diversity). We sampled two plantation areas, which were obviously neither natural nor fire-safe. These areas were densely packed with a single species of trees (namely Jeffrey Pines), often with piles of "fuel," or wood that was of no use for loggers when they cut down the old forest, and that now is simply fuel for any fire that passes through. The number of other trees marked by spray paint, usually blue spray paint, was also notable. It can be assumed that these trees were marked to be cut down, most likely because they were "hazard trees," which are supposed to be trees that pose an immediate threat to human survival, and thus must be cut down. However, it would have been obvious to anyone that a large, large majority of these "hazard" trees posed absolutely no threat to human safety, namely because it is understood (using common sense) that when a tree falls, it cannot possibly jump 200 feet to land near/on a road, and also that trees will not fall if they are young, healthy, and nestled safely in a forest. The number of trees that were

marked was ridiculously high, and, if they are all cut, the health of the forest, especially the amount of canopy cover, will greatly change the dynamic of the forest in an undesirable way.

Appendix

Table 1- Transect Conditions

| | | GPS Location | | | | | |
|---|---|---|---|---|---|---|---|
| Road Point | Survey Points | Latitude (North) | Longitude (West) | Transect Bearings | Ground Cover % and Range | Brush% and range | Canopy Cover% and range |
| 1 | 24 | 35, 31, 16.9 | 118, 24, 45.3 | NE (A); SW (B) | 88; 60-100 | 1; 0-20 | 57; 3-98 |
| 2 | 27 | 35, 29, 31.2 | 118, 25, 27.6 | W(A); E(B) | 92; 60-98 | 7; 0-73 | 59; 5-99 |
| 3 | 24 | 35, 28, 54.1 | 118, 24, 58.4 | NE (A); SW (B) | 82; 20-100 | 4; 0-80 | 67; 20-98 |
| 4 | 24 | 35, 29, 08.4 | 118, 24, 26.9 | SE (A); NW (B) | 77; 5-100 | 1; 0-20 | 48; 30-98 |
| 5 | 24 | 35, 29, 16.6 | 118, 24, 39.3 | W(A); E(B) | 83; 20-100 | 4; 0-40 | 59; 0-93 |
| 6 | 27 | 35, 28, 49.8 | 118, 25, 21.2 | SE (A); NW (B) | 68; 7-100 | 12;0-81 | 48; 0-98 |
| 7 | 24 | 35, 27, 54.8 | 118, 23, 41.5 | SE (A); NW (B) | 67; 15-100 | 35;0-60 | 42; 5-85 |

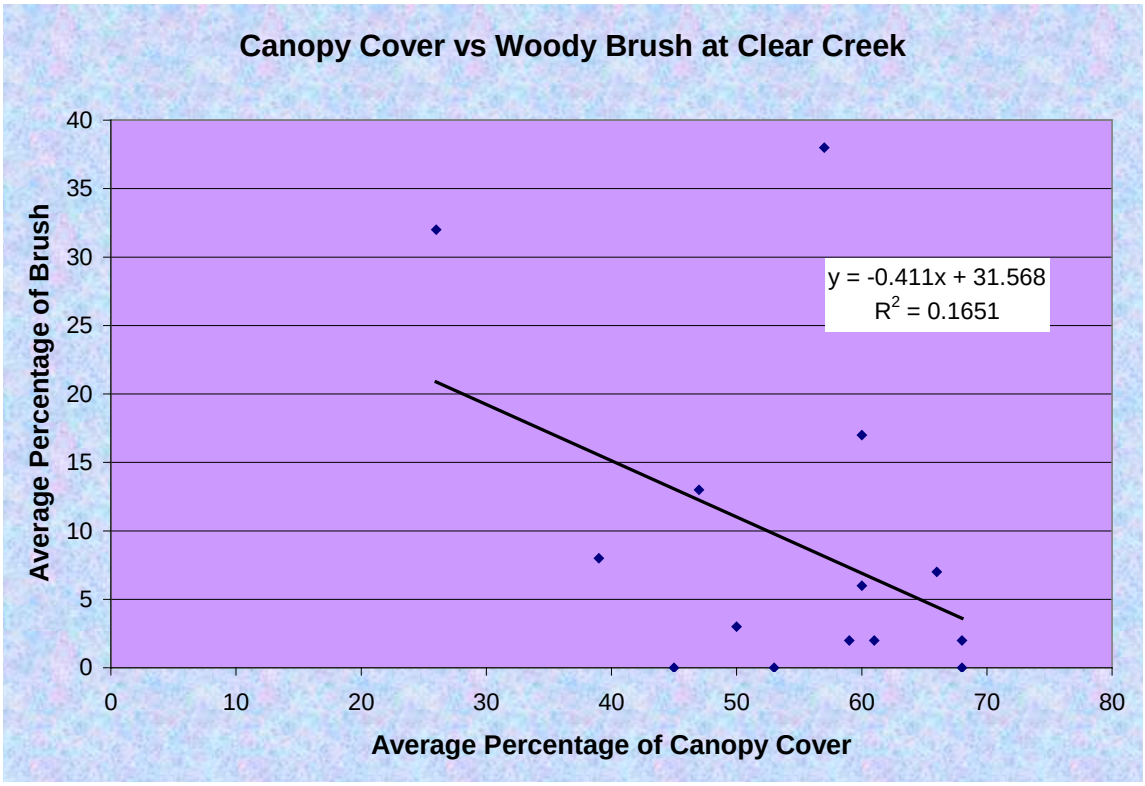
Table 2-Tree Species-Note: all sizes are DBH's

| Road Point | # of Jeffrey Pines | Average & range of size | # of White Firs | Average & range of size | # of Black Oaks | Average & range of size | # of Sugar Pines | Average & range of size |
|---|---|---|---|---|---|---|---|---|
| 1 | 211 | 8.0; 0.3-28.5 | 75 | 7.8; 0.3-28.4 | 46 | 6.0;0.25-28.3 | 9 | 4.6; 1-10.3 |
| 2 | 114 | 11.6; 0.5-43.8 | 60 | 15.4; 0.5-39.2 | 0 | n/a | 1 | 12 |
| 3 | 229 | 12.8; 0.3-22.4 | 107 | 10.5; 0.3-26 | 6 | 10.65; 9.2-14.6 | 0 | n/a |
| 4 | 78 | 9.9; 0.3-33 | 146 | 7.25; 0.3-29.5 | 0 | n/a | 0 | n/a |
| 5 | 88 | 10.8 0.3-43 | 132 | 7.6; 0.25-43 | 0 | n/a | 0 | n/a |
| 6 | 129 | 11.2; 0.2-45.3 | 71 | 14.3; 0.3-53.1 | 12 | 8.4;0.25-16.7 | 0 | n/a |
| 7 | 109 | 9.5; 0.3-38 | 45 | 8.1; 0.3-40 | 0 | n/a | 0 | n/a |

Table 3- Tree Species

| Species | Average # | Average Size (Approx.) | Size Range |
|---|---|---|---|
| Jeffrey Pine | 137 | 12.0 | seedling-45.3 |
| White Fir | 191 | 7.5 | seedling-53.1 |
| Sugar Pine | 1 | 4.8 | seedling-10.3 |
| Black Oak | 9 | 7.7 | Seedling-14.6 |

Graph 1



Sequoia ForestKeeper
Freeman Creek Grove
2008 Survey Summary
Marissa Williams

**Introduction:**

Freeman Creek, located within the Giant Sequoia National Monument, runs through the Freeman Creek Grove of Giant Sequoias. Efforts were focused on this area for three consecutive weeks spanning from June 30, 2008 to July 17, 2008. The first week (June 30th to July 3rd) consisted of completing transects on the east side of the Lloyd Meadow Road (FS 22S82). At this location, the main objective was to determine if the established grove boundaries were adequately set. To accomplish this, it was key to pay close attention to any Giant Sequoias around the boundary markers. For the second and third weeks, transects in each compass direction (north, east, south, and west) were each conducted for an entire day from a predetermined GPS location within the upper and lower areas of the grove, respectively. This is a continuation of surveys conducted in other areas of the grove by ForestKeeper interns in 2007. In the grove, the intention was to complete the regular transects, while marking Giant Sequoias on the handheld GPS and focusing on young Sequoia regeneration conditions (particularly canopy cover).

East of the Lloyd Meadow Road we completed nine transects traveling either on a bearing of due east from the road, or due west adjacent to and south of the previous transect and headed back towards the road. The starting GPS location was N 36°08'42.7", W 118°29'29.0", while the last road transect was at N 36°08'15.6", W 118°29'24.7." It is important to note that the last road transect completed was right before the road itself turns in the eastward/westward direction. (For future purposes, it might be best to continue due east transects after the road turns in another direction or complete transects after traveling due south at 300 ft intervals.)

At the upper Freeman Creek Grove location, (second week: July 7th through July 10th), the predetermined starting point GPS coordinates were as follows: N 36 08' 32.9' and W 118 31' 26.9". Transects were completed in each compass direction with six survey points north, four points east, four points south, and nine points west.

At the lower Freeman Creek Grove location, (third week: July 14th through July 17th), the predetermined GPS starting point was set at the coordinates N 36 08' 41.0" and W 118 31' 00.2". Using this as the center location, six survey points were completed in the eastward bearing, eleven points west, nineteen points north, and eight points south.

**Procedure/Materials:**

Overall procedures for completed transect data for all three weeks and the instruments utilized were the same as below mentioned.

From the starting point, a survey line (transect) is traveled in a compass direction of north, east, south or west. The length of a transect traveled is indeterminate, depending upon the steepness of terrain, difficult of travel through underbrush, and the amount of time taken to record data. The survey team leader follows the compass direction, stopping at approximately every 200 feet as determined by using a "Hip Chain." At each point Global Position System (GPS) latitude and longitude reading is recorded. Other team members travel in parallel to the leader at approximately 100 feet away on either side of the leader and perpendicular to the transect line. At each point, each team member records the species and diameter at breast height

of each tree within an approximately 25-foot radius. For each point, an estimate of canopy cover is recorded, verified periodically by the use of a spherical densitometer, and an estimate of ground cover percent and whether it is brush, forbs, or litter (i.e. slash, limbs, twigs, pine needles, etc.) is recorded. Any other significant observation is also recorded.

At both the Upper and Lower locations of the Freeman Creek Grove, the procedure was the same. As stated above, transects were completed in each compass direction, and Sequoias were measured and GPS marked if they were within 300ft of the survey point. The canopy cover for the young Sequoias (those with a diameter of 18" or less) was determined using the spherical densitometer instrument facing toward most open sky area. When applicable, the contribution to the canopy cover made by the Giant Sequoia itself was deducted from the total percentage or rather simply ignored. (A special note in this area: surveyor, initials CM in the database, recorded only DBH "ranges" for tree species at each survey point rather than the diameters of each tree).

As for the second week, the first transect was started 150 ft south of the Freeman Creek road bridge. We completed 10 survey points along each road transect traveling in the compass direction of due east (the procedure differs from the other weeks by the fact that we are traveling in one direction from the road and not in all compass directions). After 200ft away from the road, the first survey point was conducted, while each additional survey point was successively 200ft from the last point. When ten points were completed along one eastward transect, we traveled approximately 300 ft south and then completed a westward bound transect targeted at a previously entered GPS point set along the road. Due to this procedure, some westward transects have only 9 survey points as apposed to the predetermined 10 points otherwise, and previously-surveyed forest areas may have been intersected (meaning that survey areas were close to old ones). For each additional transect, we walked 300-350 ft down the road to begin the next transect and set of surveys. (At this particular location, only diameter (DBH) ranges were completed, not the diameter of each individual tree in the survey area)

**Data/Results:**

East of Lloyd Meadow Road (East of Road)

As provided by table 1 and figure 1 (see appendix), the dominant tree family in this area was Pine. The most significant species in tree and seedling numbers overall was Jeffery Pine, and it appeared as their number increased even more so as we traveled further East into drier conditions and away from the creek itself. (At one particular location on the first transect we came across an area with over 300 Jeffery Pine seedlings and young trees.) For all trees, the lowest DBH recorded was 0.5 inches, most likely because otherwise it was determined to fall in the seedling category. The largest sizes were also in the pine family, as both Jeffery Pine and Lodgepole Pine were recorded at about 4 feet and 3.5 feet DBH. The Black Oak range is considerably less than all other species and could be explained by the fact that it is present in very low numbers and not represented well in this area.

The average, mode, and range of details (canopy cover, ground cover and percent of brush) recorded from each survey point along the transects is shown in Table 2 in a collective form. In the East of Road area, there was a very high percentage (91%) of ground cover (predominantly litter) and an average of about 50% canopy cover, while the percentage of brush was relatively low at 9%.

For the nine transects completed, there was a very low number of stumps found in the area. The range of stumps was anywhere from zero to eight at a given survey point, where the

highest of eight stumps was located near the pack station and most likely on private property. The range of sizes for these stumps was from 7” to 48” in diameter.

The terrain of the East of Road was relatively flat. Along the transects there were numerous creek and trail crossings, and at some locations willow thickets hindered our ability to continue a transect in a straight eastward or westward direction. Most importantly, three meadow areas were crossed. Two of the three meadows appeared to be healthy with no signs of cow grazing; however, in one of the meadows there was evidence of cow grazing, (i.e. cow scat), and most of the flowers were gone and head-cut erosion was occurring. Another significant finding occurred at the last survey point on the last transect (furthest south), where we discovered signs of freshly cut trees.

The East of Road area provided evidence of past Sequoias due to an abundance of down logs found along survey points. The average size of the Sequoia down logs was 4.96 feet in diameter, the mode was four feet in diameter, and the range was 2.5 to 10 feet. In total, 57 down logs were located and recorded; however, no live Sequoias were found within the transect areas. It is important to note that there was one live Giant Sequoia found near the East of Road area approximately 75 feet from the road and was marked at the GPS location N 36,07,52.3 and W 118,28,53.1.

**Upper and Lower Freeman Creek Grove Locations**

At both the Upper and Lower locations of the Freeman Creek Grove, the general tree species in dominance based on the number of trees and seedlings was white fir (or a hybrid of white fir and red fir) with a total average size of around 6” in diameter. The sizes of the trees for all other species are shown in Figures 2 and 3, but are not a representative of the general forest area sizes due to the small numbers found. The range of tree sizes for the all transect areas fell between 0.25” to approximately four or five feet in diameter for the majority of species.

As for the information collected regarding survey point conditions of canopy cover, ground cover, and percentage of brush, both of the Upper and Lower Locations were similar in terms of average, mode, and range. The average canopy cover for the Upper Location was 69%, while the lower was 68%. The ground cover and percentage of brush showed the same trend where the Lower Location average was one percentage point lower than that of the Upper. Ground cover was predominately litter and at 97% (96% Lower), and brush percentage was 16% (15% Lower). The mode for the canopy cover and ground cover was 100%, while for percentage of brush the mode was 0%. This coincidence in similarities between the Upper and Lower Locations can possibly be explained by the fact that both locations consist of natural forest that has not been logged.

In addition to completing survey points, we also recorded information about nearby mature Sequoias and canopy cover for young Sequoias. The average percentage of canopy cover for Sequoias 18" in diameter or less at the Upper Location was 91% (this contains data from 233 trees), and 81% at the Lower Location (containing data from 352 trees). Once again, the data from the Freeman Grove overall complemented one another, showing closed canopy conditions are suitable for Giant Sequoia regeneration.

The only significant difference between the Upper and Lower Locations was the terrain. At the Upper Location, the terrain was very steep in all four compass directions and we crossed the creek in both the North and West transects. The Lower Location area was less steep and we crossed the creek in the North and South transects where the terrain became somewhat steeper.

Overall:

Combining all of the data from the three weeks of surveying in the Freeman Creek Grove area, there was a slight relationship between the percentage of canopy cover and the percentage of brush present in all survey points. Looking at Figure 5, the less canopy cover the more brush is present. Taking out the East of Road data (Figure 6) shows a stronger relationship between these conditions and might be connected with the fact that the East of Road area is not natural, meaning that it has been logged in the past.

**Conclusion**:

As interns for the Sequoia ForestKeeper, we have seen how differences in climate and soil conditions gravely impact the type of forest vegetation in a given area.

In the East of Road area we were dumbfounded by the evidence of numerous down Sequoia logs, especially since there were many Sequoia on the opposite (westward) roadside. The fact that there were no Sequoias on the east side of the road was even more confusing provided the moist and favorable conditions for this particular tree species. The question then arose of what caused the falling of Sequoias where there are now no live ones. Could it have been a drastic change in the water table, or a flood that caused a significant difference in soil conditions? The area appears to be an alluvial plane, so this is a good possibility. And for the grove boundaries, we could strongly conclude that they are currently insufficiently set, as there was at least one Giant Sequoias located outside the designated area, although we did not come across any other Sequoias within our transects.

During the two weeks spent within the Grove, like what is already known, we found the Sequoias growing in moist climate conditions. What came as a surprise, however, was the discovery of young Sequoias and seedlings thriving in closed canopy conditions. So, why is this such a surprise – well only because the Forest Service states that the Giant Sequoias need open canopy conditions for regeneration, basically providing them with an excuse to log. Looking at Figure 4, it can be concluded that Giant Sequoias can regenerate in closed canopy conditions. This is not to say, however, that they do not thrive in open canopy, as it is known that trees need plenty of sunlight and other favorable conditions to survive.

With the specialized conditions required for proper Giant Sequoia growth and success we can only hope that the unfortunate climate change will not effect this magnificent tree species population.

**Appendix**:

| Tree Species | Average Number of Trees | Average Number of Seedlings | DBH Range of Trees |
|---|---|---|---|
| Fir | 0.63 | 0.404 | .5 to 36 " |
| Jeffery Pine | 6.115 | 3.741 | .5 to 48" |
| Lodgepole Pine | 2.315 | 0.104 | .5 to 43" |
| Cedar | 0.285 | 0.237 | .5 to 23" |
| Black Oak | 0.044 | 0.048 | .5 to 6" |

**Table 1: East of Road** Tree Species

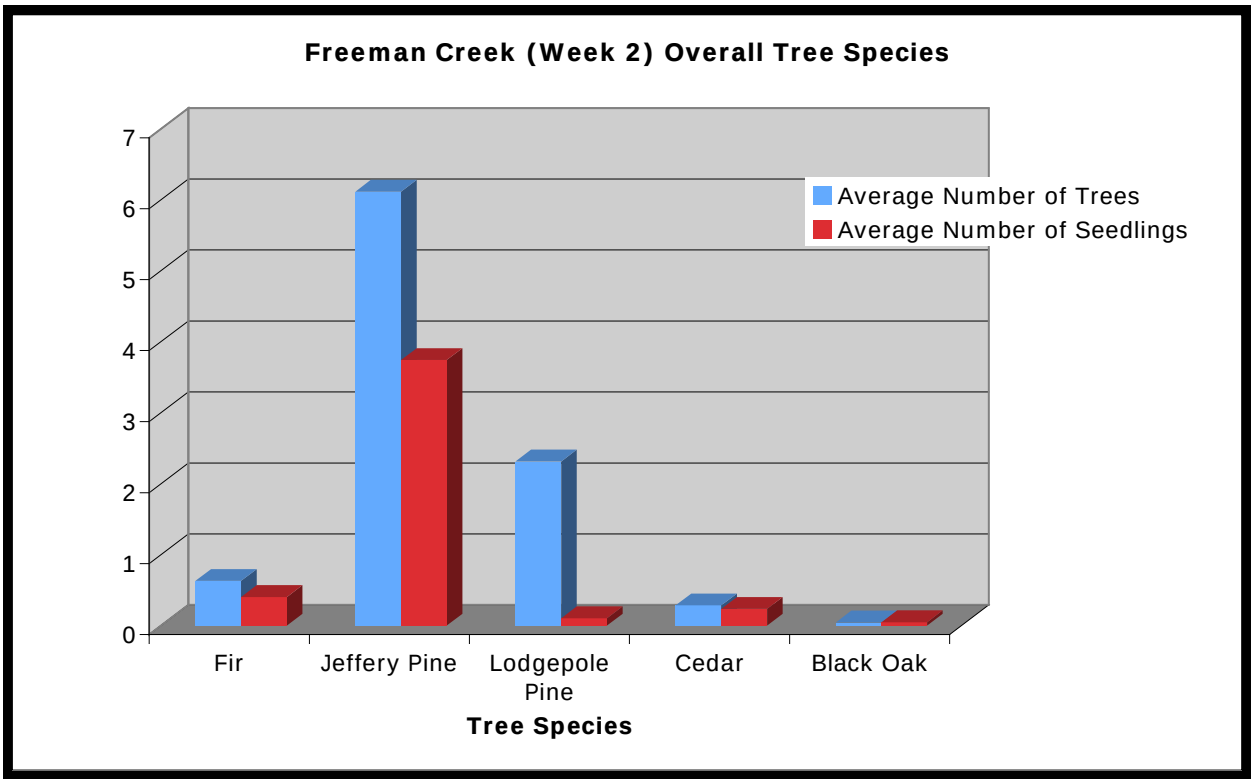



**Figure 1:** East of Road Tree Species Numbers

| | Canopy Cover | Ground Cover | Brush |
|---|---|---|---|
| **Average** | 53% | 91% | 9% |
| **Mode** | 0% and 85% | 100% | 0% |
| **Range** | 0 - 100% | 8 - 100% | 0 - 75% |

**Table 2:** East of Road Survey Point Miscellaneous Data

| Tree Species | Average Number of Trees | Average Number of Seedlings | Average Size of Trees | DBH Range of Trees |
|---|---|---|---|---|
| Fir | 10.971 | 8.812 | 6.545 | .5 to 48" |
| Jeffery Pine | 0.014 | 0.014 | 29.5 | 1 to 58" |
| Black Oak | 0.58 | 0.507 | 10.014 | .5 to 22" |
| Sugar Pine | 0.188 | 0.362 | 17.53 | .7 to 61" |
| Cedar | 0.058 | 0.014 | 22.5 | .7 to 66.5" |

**Table 3:** Upper Grove Location Tree Species Data
(*4 Lodgepole Pine trees recorded overall)
(**Giant Sequoias are inputted on a separate spreadsheet. The total number of Sequoias in the Upper Grove was 540)

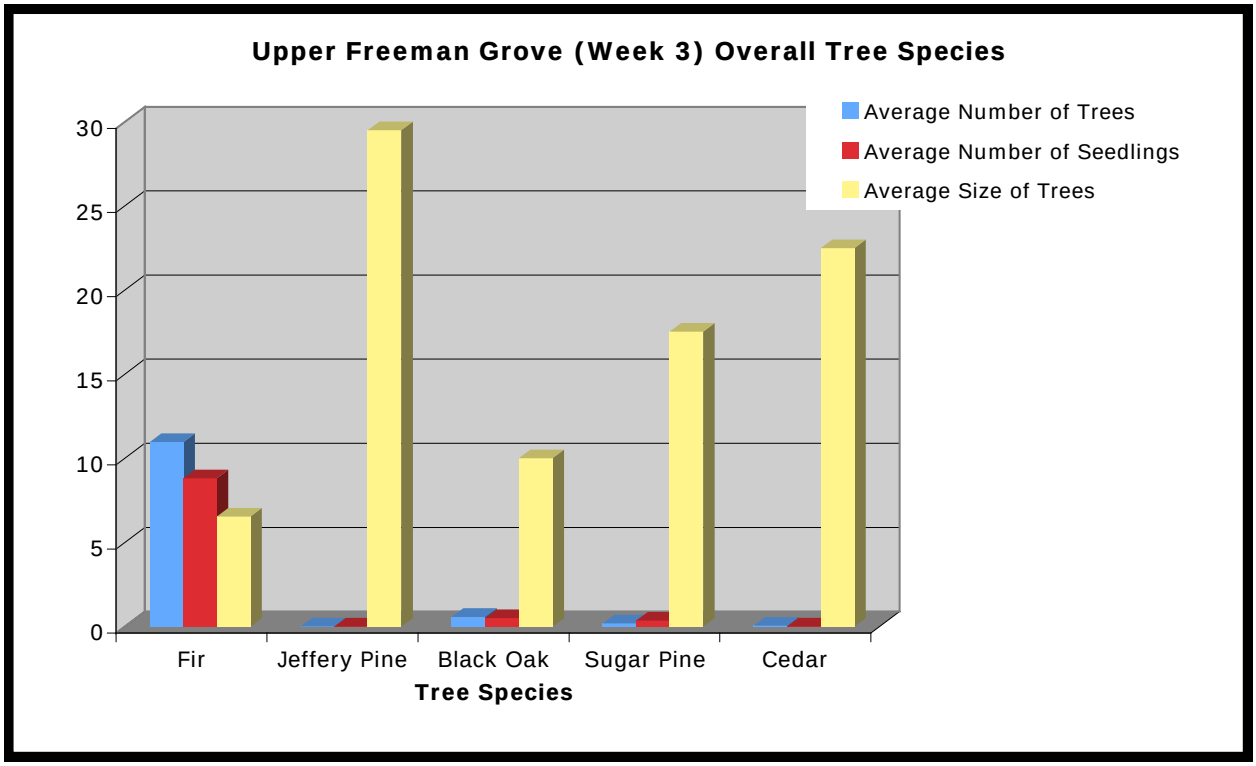



**Figure 2:** Upper Grove Location Tree Species Numbers

| | Canopy Cover | Ground Cover | Brush |
|---|---|---|---|
| **Average** | 69% | 97% | 16% |
| **Mode** | 100% | 100% | 0% |
| **Range** | 0 - 100% | 65 - 100% | 0 - 100% |

**Table 4:** Upper Grove Location Survey Point Miscellaneous Data

| | Seedlings | 1 to 10" DBH | 10 to 18" DBH | Total |
|---|---|---|---|---|
| **Average** | 94% | 92% | 89% | 91% |
| **Mode** | 98% | 97% | 93% | 97% |
| **Range** | 80 - 100% | 40 -100% | 10 - 100% | 10 - 100% |
| **Number of Trees** | 25 | 139 | 69 | 233 |

**Table 5:** Upper Grove Location Giant Sequoia Regeneration

| Tree Species | Average Number of Trees | Average Number of Seedlings | Average Size of Trees | DBH Range of Trees |
|---|---|---|---|---|
| Fir | 14.63 | 4.93 | 6.07 | .3 to 60" |
| Ponderosa Pine | 0.58 | 0.16 | 13.48 | .5 to 58" |
| Black Oak | 1.14 | 2.79 | 7.085 | .25 to 25" |
| Sugar Pine | 0.49 | 0.25 | 12.1 | .5 to 48" |
| Cedar | 2.4 | 1.55 | 5.73 | .5 to 57" |

**Table 6:** Lower Grove Location Tree Species Data
(*3 Canyon Live Oak trees recorded overall)
(**Giant Sequoias are inputted on a separate spreadsheet. The total number of Sequoias in the Lower Grove was 529)

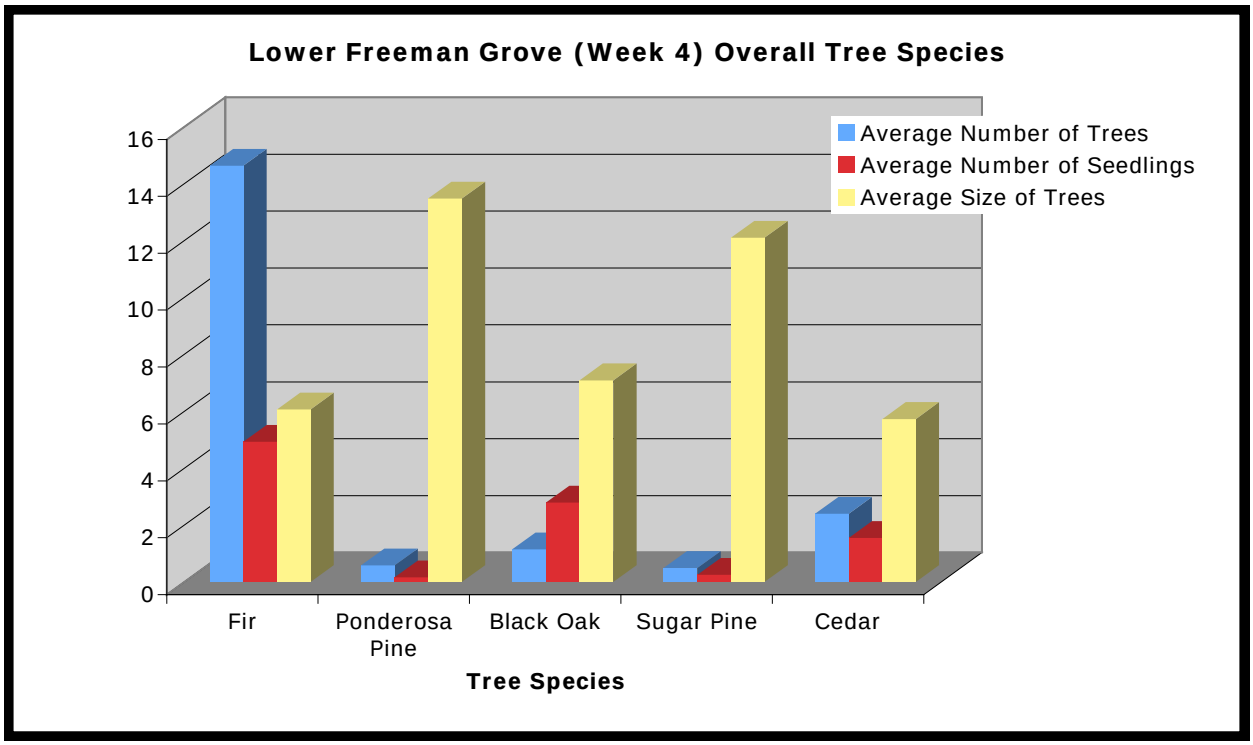



**Figure 3:** Lower Grove Location Tree Species Numbers

| | Canopy Cover | Ground Cover | Brush |
|---|---|---|---|
| **Average** | 68% | 96% | 15% |
| **Mode** | 100% | 100% | 0% |
| **Range** | 0 - 100% | 70 - 100% | 0 - 100% |

**Table 7:** Lower Grove Location Survey Point Miscellaneous Data

| | Seedlings | 1 to 10" DBH | 10 to 18" DBH | Total |
|---|---|---|---|---|
| **Average** | 83% | 81% | 82% | 81% |
| **Mode** | 95% | 85 and 76% | 90% | 90% |
| **Range** | 59 - 95% | 20 - 100% | 10 - 99% | 10 - 100% |
| **Number of Trees** | 20 | 237 | 95 | 352 |

**Table 8:** Lower Grove Location Giant Sequoia Regeneration

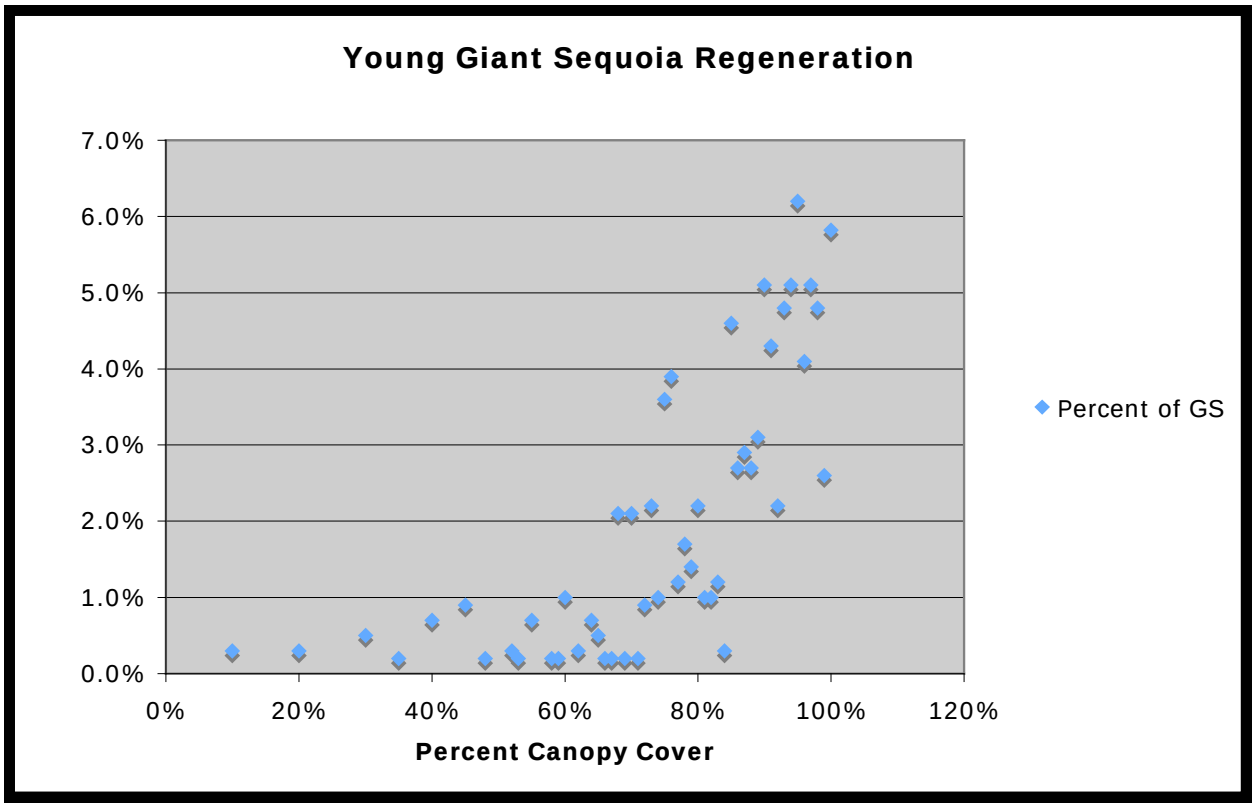



**Figure 4:** Upper and Lower Grove location Giant Sequoia Regeneration

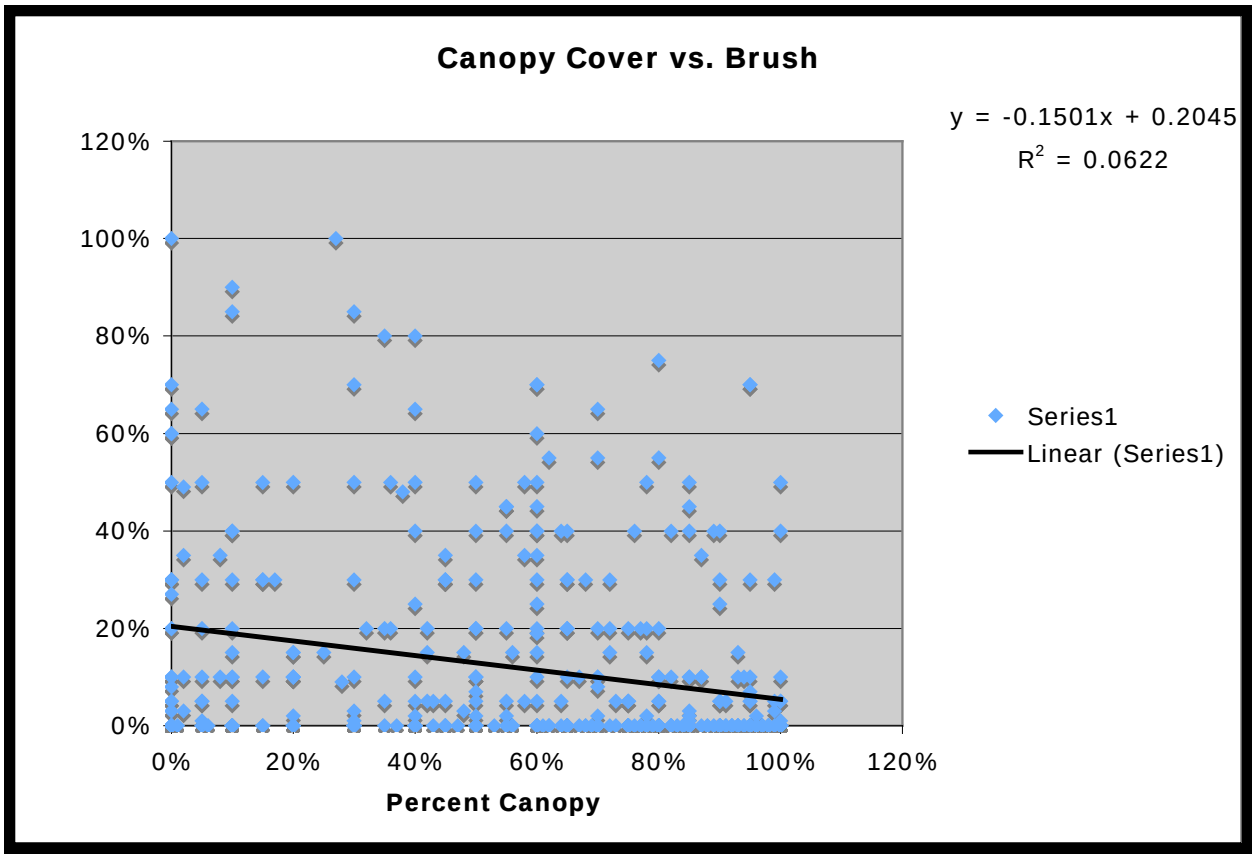



**Figure 5:** Canopy Cover and Brush Relationship (All)

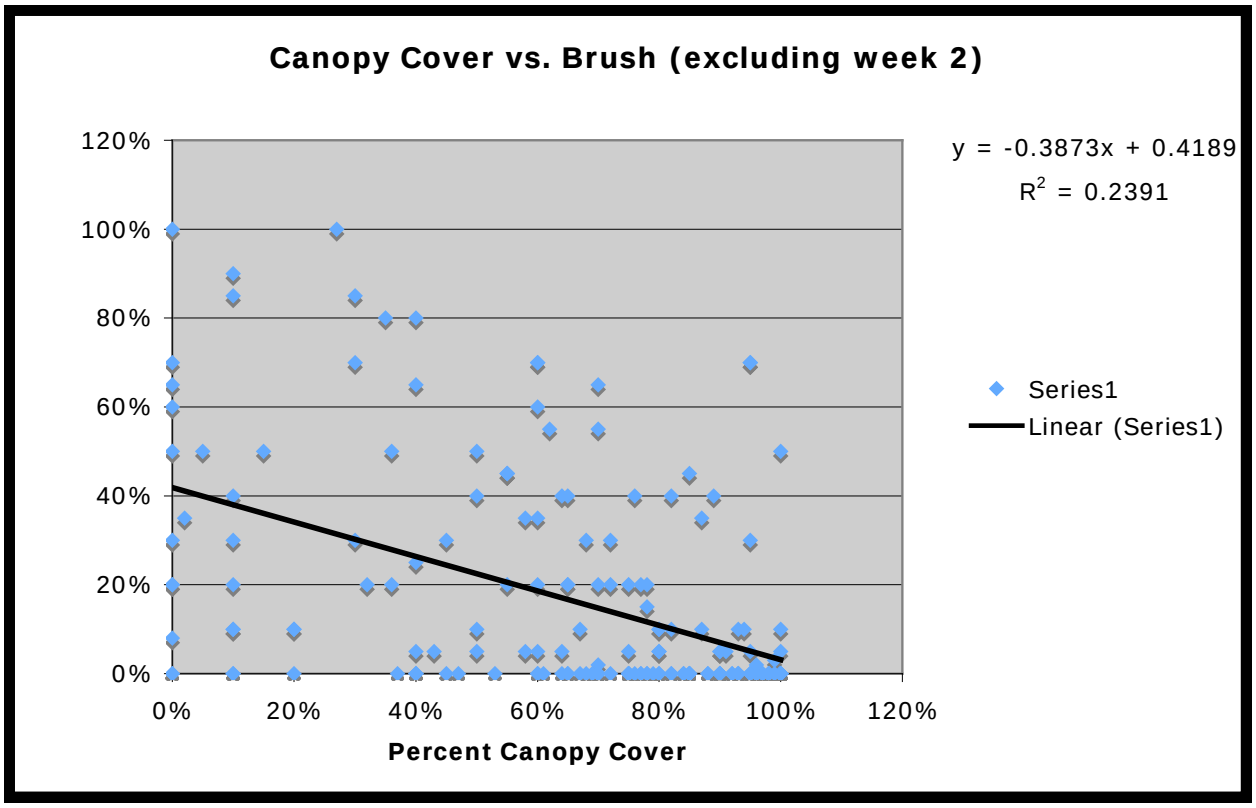



**Figure 6:** Canopy Cover and Brush Relationship (excluding East of Road)

Sequoia ForestKeeper
McNally Fire Study Plot
2008 Survey Summary
Christian Elizabeth Michel

**Introduction:**

The purpose of this survey was to make observations of the regeneration process of the forest communities that were affected by the McNally fire of 2002. We want to note how many, if any, seedlings have sprouted since the fire, or are surviving since the 2004 surveys. We also looked for fallen burned trees and those with broken tops to determine how long fire-killed trees will stand.

**Methods:**

In July of 2008 Marissa Williams, Natalie Stauffer, and Christian Michel surveyed eight sites from those which had been surveyed in 2004 (Table 1). These sites were either ¼ acre or 1 acre in size. Sites 1, 2 and 3, located in T22S, R33E, Sec. 26, and sites 4 and 5, located in T22S, R33E, Sec. 27, are within the Brush Creek drainage and sites 6, 7, and 8 were located near Bonita Meadows in T21S, R34E, Sec. 31, all within the Sequoia National Forest.

Each site was found using the GPS coordinates of the 2004 survey. To survey these sites we divided the area into transects on compass directions of north, south, east or west. Each of the three surveyors would follow a parallel transect ranging from 10 to 50 feet wide. To effectively search for seedlings, transect width was determined based on the thickness of the ground cover and the contours of the site. Level sites with relatively less ground cover were sampled using wider transects. Older seedlings were usually less than an inch in diameter and under three feet tall. To avoid duplicating coverage, the transect nearest a previous one was done by the same person so that she would remain in the same area laterally.

Furthermore, we made note of the ground cover, vegetation types, and cut stumps. We determined if the stumps had been cut before the fire if the cut part of the tree was burnt, whereas those cut after the fire would not be burnt.

**Results:**

**Site 1**

This site showed a 38.5% increase in ground cover (see Table 1 and Figure 1), which included lupine, whitethorn, elderberry, gooseberry, chinquapin, astragulus, and others. On average, shrubs were about 3 feet high making it thicker and deeper than what was observed in 2004. The bare ground patches in this site were dirt mounds. This site also had wet spots where water could be seen running along the surface and skunk cabbage was growing.

In 2004 no seedlings were observed, however this site now had a total of three pine seedlings (see Figure 2), each of which was about two feet tall.

The number of standing snags decreased from 216 to 24 with a range from 1 to 64 inches. In 2004 the majority of the trees ranged from 1 to 29 inches, whereas in 2008 the majority ranged only from 10in to 14in.

**Site 2**

This site showed a 23% increase in ground cover (see Table 1 and Figure 1), which consisted of lupine, chinquapin, elderberry, whitethorn, morning glory, and others. In this site, which in 2004 had one seedling, none were observed (see Figure 2).

The number of snags decreased from 115 (with a range from 1 to 34 inches) to 67 (with a range from 1 to 39 inches). However in 2004 the range with the most trees was from 1 to 9 inches where as in 2008 the range with the most trees was from 5 to 14inches.

**Site 3**

This site showed a 23% increase in ground cover (see Table 1 and Figure 1), which consisted of astragulus, whitethorn, Manzanita, and others. In 2008 93% of the ground cover consisted of whitethorn.

This site had a decrease in seedlings from 12 in 2004 to 2 in 2008 (see Figure 2).

The number of snags decreased from 72 (with a range from 1 to 64 inches) to 30 (with a range from 1 to 19inches). However, in 2004, 1 to 4 inches was the range with the most trees, where as in 2008 5 to 9 inches was the range with the most trees. A five foot diameter stump, which had been cut before the fire, was on site.

**Site 4**

Data for 2004 is not available, so we were unable to compare results from 2004 to 2008. In 2008, this site had 90% Ground Cover which consisted of astragulus, whitethorn, grasses, morning glory, clycladenia, elderberry, gooseberry, lupine, and others. This site had an old logging road running through it and appeared to have been heavily logged after the fire. The vegetation ranged from 4 to 6 feet tall.

No seedlings were observed.

Eighty-nine snags were recorded, ranging from 1 to 34 inches in diameter, with the most being from 5 to 9 inches.

**Site 5**

Data for 2004 is not available for this site either. In 2008, this site had 68% ground cover which consisted of astragulus, dry grass, Manzanita, morning glory, elderberry, whitethorn, gooseberry, and others.

We recorded 137 seedlings on this site.

There were 139 snags with a range from 1 to 39 inches in diameter, with the most snags being found within a range from 1 to 4 inches. The majority of the snags were black oak. Most of these had several sprouts up to 10 feet tall from the base.

**Site 6**

Unlike all others, site 6 showed no difference in ground cover (60%) from 2004 – 2008 (see Table 1 and Figure 1). Here the ground cover consisted of Manzanita, willow, grass, chinquapin, whitethorn, gooseberry, and others. Some of the bare ground on this site consisted of disturbed soil from an old logging road.

This site increased from 56 to 66 in the number of seedlings (see Figure 2).

The number of snags decreased from 95, with a range from 0 to 54 inches, to 55 with a range from 1 to 29 inches. However, in 2004 1 to 4 inches was the range with the majority of snags, whereas in 2008, 5 to 9 inches was the range with the most trees.

**Site 7**

Site 7 showed a 25% decrease in ground cover (see Table 1 and Figure 1), which consisted of Mahala mat, Manzanita, chinquapin, whitethorn, buckwheat, lupine, gooseberry, and others. The vegetation was low to the ground and consisted of relatively few plants.

This site had an increase in seedlings from 38 in 2004 to 60 in 2008 (see Figure 2).

The number of snags decreased from 82, with a range from 0 to 49 inches, to 21 with the same range. However, in 2004, 1 to 4 inches was the range with the most trees, where as, in 2008, 10 to 14 inches was the range with the most trees.

**Site 8**

Site 8 showed a 20% decrease in ground cover (see Table 1 and Figure 1), which consisted of Manzanita, chinquapin, whitethorn, buckwheat, lupine, gooseberry and others. There were two sections of visible logging road running through this site.

This site had an increase in seedlings from 3 in 2004 to 30 in 2008 (see Figure 2).

The number of snags decreased from 31, with a range from 0 to 54 inches, to 9 with a range from 1 to 14 inches. However, in 2004, 1 to 4 inches was the range with the most trees, whereas in 2008 10 to 14 inches was the range with the most trees.

**Conclusion:** Unfortunately, many of the sites have been disturbed by logging and will no longer produce accurate data about the natural processes that such areas in the Sequoia National Forest would undergo after being affected by fire. However, they do provide lots of information on the effects of logging that can be compared to sites that have not been logged after a fire. Such a comparison could produce valuable information on the recuperation of the forest based on whether or not the area is further disturbed after fire. In particular the information would be valuable with respect to recuperation following anthropogenic disturbances, such as logging.

There appeared to be various age classes of seedlings, but overall the seedlings found were mostly in the smaller age classes (between about 2 inches tall to 1 foot tall). Over all sites ground cover ranged from being really thick and deep to being present in low-lying -sparse communities. Also on the sites it appeared that there were fewer standing snags half due to naturally falling and half as a result of logging practices.

Further research will have to be conducted to determine why on some sites the number of seedlings has decreased. Some hypotheses are that either the vegetation was too thick and tall to allow us to notice seedlings or that through competition from all the brush they had died out. It might be possible to conduct a more accurate survey just as the snow begins to thin or has melted because any brush that might grow on the sites during the summer would not be as thick and tall therefore providing more visibility.

**Appendix:**

| Date of Survey | Site # | North | West | Elev. | Acre Size | % Ground Cover | Pine/Fir Seedlings | Black Oak Sprouts |
|---|---|---|---|---|---|---|---|---|
| 6/10/2004 | 1 | 35,58.920 | 118,22.927 | 7990 | 1 | 70% | 0 | 7 |
| 7/21/2008 | 1 | 35,58.920 | 118,22.927 | 7990 | 1 | 98.5% | 3 | 0 |
| 6/18/2004 | 2 | 35,58.980 | 118,23.176 | 7710 | 1/4 | 75% | 1 | 9 |
| 7/21/2008 | 2 | 35,58.980 | 118,23.176 | 7710 | 1/4 | 98% | 0 | 0 |
| 6/18/2004 | 3 | 35,58.948 | 118,23.020 | 7882 | 1/4 | 70% | 12 | 0 |
| 7/21/2008 | 3 | 35,58.948 | 118,23.020 | 7882 | 1/4 | 95% | 2 | 0 |
| N/A | 4 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 7/22/2008 | 4 | 35,59.187 | 118,24.273 | 6748 | 1 | 90% | 0 | 50 |
| N/A | 5 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 7/22/2008 | 5 | 35,58.803 | 118,24.082 | 6763 | 1 | 68% | 137 | 70 |
| 5/23/2004 | 6 | 36,02.676 | 118,19.951 | 8408 | 1/4 | 60% | 56 | 0 |
| 7/23/2008 | 6 | 36,02.676 | 118,19.951 | 8408 | 1/4 | 60% | 66 | 0 |
| 6/23/2004 | 7 | 36,02.750 | 118,19.912 | 8635 | 1/4 | 90% | 38 | 0 |
| 7/24/2008 | 7 | 36,02.750 | 118,19.912 | 8635 | 1/4 | 65% | 60 | 0 |
| 6/23/2004 | 8 | 36,02.816 | 118,19.908 | 8640 | 1/4 | 95% | 3 | 0 |
| 7/24/2008 | 8 | 36,02.816 | 118,19.908 | 8640 | 1/4 | 75% | 30 | 0 |

**Table 1: Data comparison between 2004 and 2008**

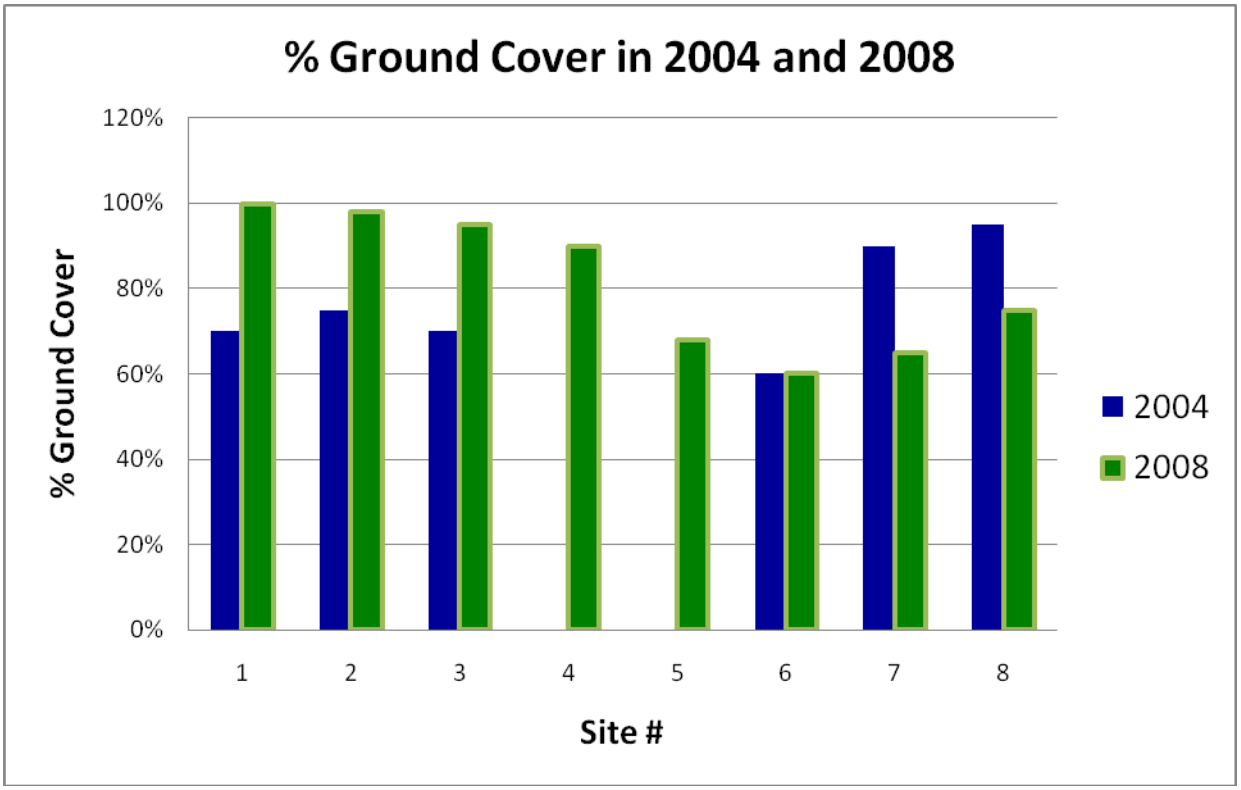



**Figure 1: % Ground Cover comparison between 2004 and 2008**

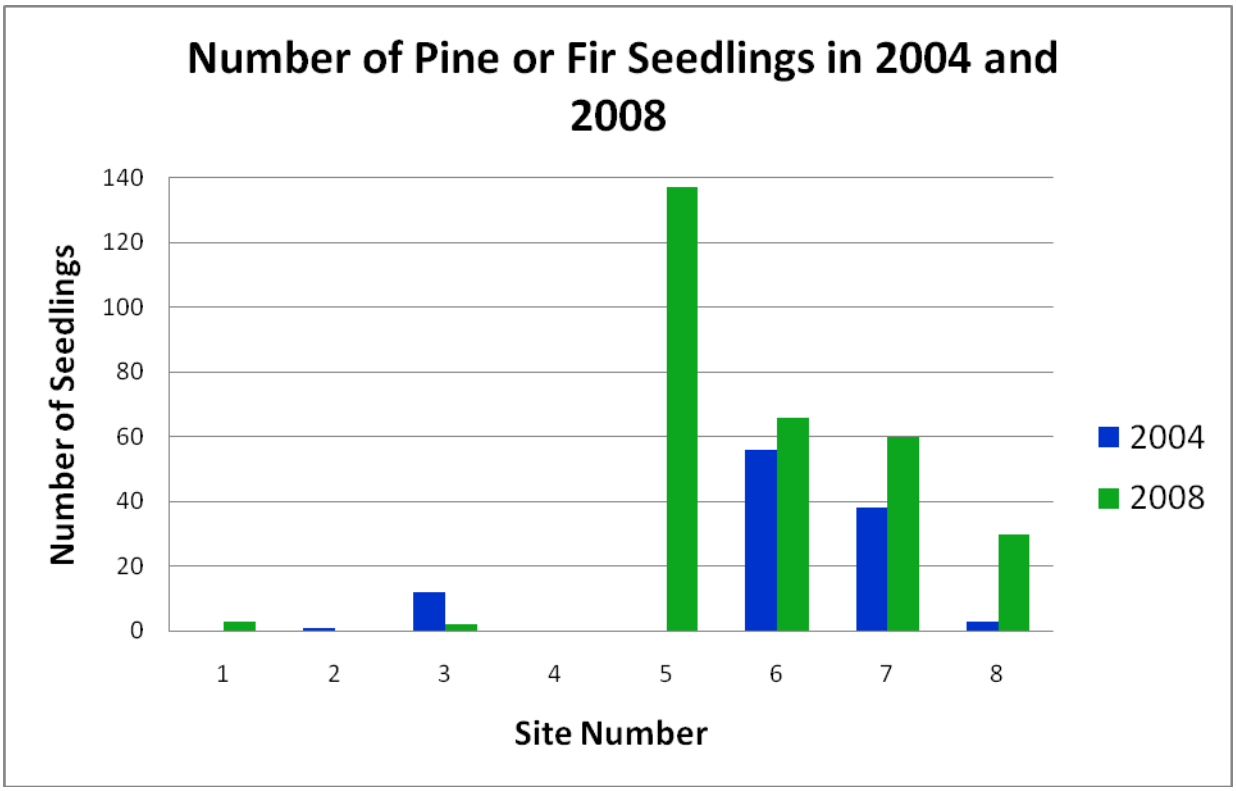



**Figure 2: Comparison of the Number of Seedlings observed from 2004 - 2008**
(note: 2005 data for sites 4 and 5 is not available)

Sequoia ForestKeeper
Landslide Giant Sequoia Grove
2008 Survey Summary
Natalie Stauffer

## Introduction

Natalie Stauffer, Marissa Williams, Christian Michel, Rich Kangas and Dan Christenson participated in this survey. Four days were spent in the Landslide Grove area to locate Giant Sequoias in an effort to more accurately delineate grove boundaries, to document sequoia regeneration, and to determine whether or not there had been recent logging close to any Giant Sequoia.

## Methods and Materials

We used a GPS to mark all Giant Sequoias in the grove. Any Sequoias that were within a fifty foot radius of a GPS point were surveyed. Thus, many of the GPS points mark multiple Sequoias. We also used the GPS to mark grove boundary markers that we observed. We used a hip chain to ensure that we did not miss any part of the grove, or mark a Sequoia more than once. We walked transects downhill from the road above the grove as directed by Dan Christenson and Rich Kangas. On each succeeding transect we passed next to all previously noted Sequoias to make sure that no outliers were missed. To assess regeneration, for each Sequoia with a diameters of 18" or less the canopy cover was measured using a densitometer held horizontally and pointed toward the most open space near the tree to avoid overestimation.

## Results

We observed that the boundary markers were highly inaccurate and outdated. On several occasions there were medium sized (40+ inches in diameter) Sequoias that were clearly living outside of the boundary markers. Additionally, we noted that there were two clear cut areas with replanted tree groves made up of artificially planted pines, cedars and Sequoias. In these areas, the canopy cover for Sequoias, which had an average of 9%, was significantly less than the naturally regenerated areas, which had an average canopy cover of 87%. Canopy cover in natural areas ranged from 30% to 100%. Old cut stumps and the resulting plantation, which appeared to have been logged approximately 30 years ago, were within 200 feet of the (incorrect) boundary markers. We also observed stumps of large trees closer to the road. We did not observe any recent widespread cutting in the grove.

40 sequoias regenerating in 100% canopy cover
75 sequoias regenerating in 95-99% canopy cover
98 sequoias regenerating in 80-89% canopy cover
34 sequoias regenerating in 70-79% canopy cover
26 sequoias regenerating in 60-69% canopy cover
4 sequoias regenerating in 50-59% canopy cover

2 sequoias regenerating in 40-49% canopy cover
4 sequoias regenerating in 30-39% canopy cover

**Conclusions;**

According to our surveys, the Landslide Grove boundary markers are incorrect and need to be updated and placed at the appropriate distance away from the nearest Sequoia. We found no evidence of recent logging close to the grove. Additionally, Sequoia regeneration clearly occurs naturally in a substantially closed canopy, and this has presumably been occurring for thousands of years. Only in the artificially planted clear cut area were sequoias regenerating under an open canopy.

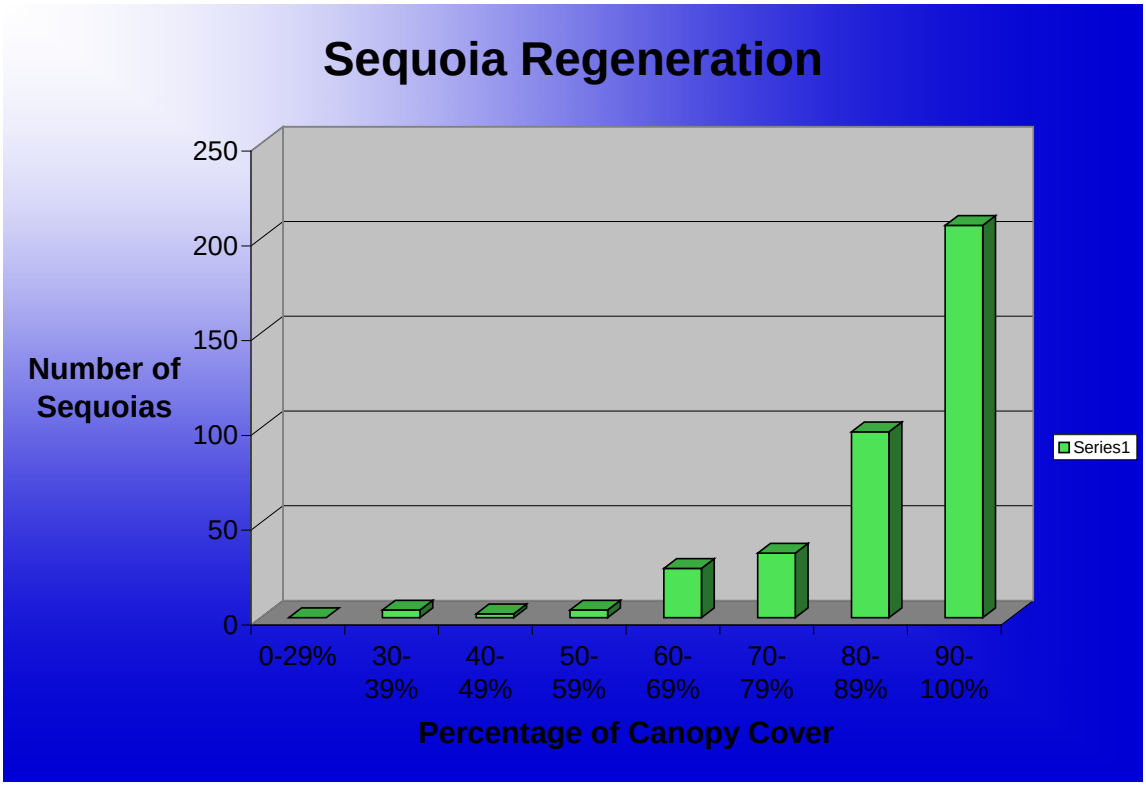


Table 1, GPS'd Sequoias- From Landslide GS Excel Spreadsheet

| North | West | Sequoia Diameters |
|---|---|---|
| 36,45,08.6 | 118,51,50.1 | 192, 200, 225 |
| 36,45,09.9 | 118,51,50.9 | 127, 136, 117, 78, 37, 42, 84, 91 |
| 36,45,13.0 | 118,51,55.4 | 140, 142, 91, 87, 217, 67, 49 |
| 36,45,08.7 | 118,51,53.4 | 140 |
| 36,45,08.2 | 118,51,57.0 | 30 |
| 36,45,09.5 | 118,52,00.4 | 23 |
| 36,45,07.0 | 118,51,59.8 | 40 |
| 36,45,09.6 | 118,52,03.1 | 39 |
| 36,45,10.5 | 118,52,02.1 | 47 |
| 36,45,11.5 | 118,52,02.9 | 38, 36, 22 |
| 36,45,09.7 | 118,51,54.3 | 90 |
| 36,45,10.8 | 118,51,56.1 | 120, 132 |
| 36,45,09.9 | 118,51,57.7 | 168, 174 |
| 36,45,10.5 | 118,51,59.4 | 86, 72 |
| 36,45,11.5 | 118,51,57.4 | 180 |
| 36,45,11.9 | 118,51,57.8 | 49 |
| 36,45,12.7 | 118,51,59.7 | 32, 150, 30, 63 |
| 36,45,12.5 | 118,51,02.0 | 132, 29, 22, 31, 25, 37, 23, 26, 25, 42, 43, 21, 25, 27, 26, 45, 75, 37, 22, 50, 46, 38, 43 |
| 36,45,13.4 | 118,51,00.8 | 120 |
| 36,45,14.3 | 118,51,05.4 | 36, 38, 47, 25, 22, 28 |
| 36,45,15.0 | 118,51,02.6 | 48 |
| 36,45,14.5 | 118,51,00.1 | 164, 84, 48, 96, 108, 120, 120, 132 |
| 36,45,15.6 | 118,51,44.4 | 70, 60, 73, 80, 65, 90, 150 |
| 36,45,12.1 | 118,51,51.5 | 100, 24, 90, 96, 84, 105, 90, 191, 80, 136, 204, 45, 59, 219, 92, 24, 23, 35, 39, 26, 25, 2 |
| 36,45,12.9 | 118,51,56.3 | 25, 23, 28, 30, 31, 38, 120, 114, 28, 37.5, 29, 37 |
| | | 30, 70, 36, 22, 26, 30, 36, 28, 35, 29, 40, 48, 26, 51, 23, 38, 23, 37, 48, 41, 35, 30, 42, 4 |
| 36,45,15.0 | 118,51,54.3 | 22 |
| 36,45,12.6 | 118,51,56.3 | 30, 50, 24, 27, 45, 34, 38 |
| 36,45,17.2 | 118,51,57.1 | 28, 41 |
| 36,45,18.6 | 118,51,56.2 | 100, 50, 85 |
| 36,45,18.1 | 118,51,56.2 | 111 |
| 36,45,13.6 | 118,51,56.3 | 52 |
| 36,45,17.1 | 118,51,52.8 | 240, 187 |
| 36,45,13.7 | 118,51,52.2 | 36, 38 |
| 36,45,14.2 | 118,51,51.9 | 33, 140 |
| 36,45,14.0 | 118,51,50.0 | 96, 90, 54 |
| 36,45,13.6 | 118,51,47.0 | 25, 49, 61, 25, 22, 31 |
| 36,45,13.0 | 118,51,48.4 | 80, 150 |
| 36,45,11.2 | 118,51,46.6 | 75, 90, 80, 100, 84 |
| 36,45,10.0 | 118,51,45.5 | 80,65, 83, 50, 85, 110, 130 |
| 36,45,11.8 | 118,51,42.6 | 40, 29, 38, 21 |
| 36,45,10.9 | 118,51,40.5 | 240, 91, 101, 89, 124, 136, 170, 105, 29, 24, 180, 24, 23, 24, 27, 28, 31, 34, 35 |
| 36,45,13.1 | 118,51,42.6 | 23, 27, 32, 160, 194, 24 |
| 36,45,13.9 | 118,51,42.9 | 53 |
| 36,45,14.0 | 118,51,46.5 | 46 |
| 36,45,17.5 | 118,51,50.3 | 78, 67 |
| 36,45,18.3 | 118,51,52.0 | 127 |
| 36,45,09.5 | 118,51,36.2 | 120 |

| | | |
|---|---|---|
| 36, 45, | 118, 51. | |
| 09.0 | 36.6 | 33 |
| 36,45,11.0 | 118,51,38.4 | 121, 220 |
| 36,45,12.4 | 118,51,39.4 | 108, 95, 99, 90, 115 |
| 36,45,12.8 | 118,51,38.2 | 125, 110, 120, 96, 66, 72, 120 |
| 36,45,17.2 | 118,51,51.4 | 60, 72, 68, 83, 135 |
| 36,45,18.2 | 118,51,52.8 | 22, 30, 40, 23, 37, 27 |
| 36,45,13.4 | 118,51,28.4 | 44 |
| 36,45,12.9 | 118,51,30.5 | 118, 93, 57 |
| 36,45,11.7 | 118,51,32.4 | 132, 84, 120, 126 |
| 36,45,13.8 | 118,51,31.9 | 72 |
| 36,45,08.8 | 118,51,31.9 | 115, 110 |
| 36,45,08.3 | 118,51,33.7 | 58 |
| 36,45,10.1 | 118,51,34.8 | 102, 102, 66, 85.2, 102, 86.4 |
| 36,45,10.8 | 118,51,37.0 | 245, 24, 36, 28 |
| 36,45,13.2 | 118,51,36.9 | 36 |
| 36,45,15.4 | 118,51,37.5 | 33, 23 |
| 36,45,15.2 | 118,51,37.4 | 28, 45, 50, 114, 96, 114 |
| 36,45,16.0 | 118,51,33.9 | 78, 67.2, 57.6 |
| 36,45,07.6 | 118,51,55.8 | 32 |
| 36,45,09.5 | 118,52,01.8 | 34, 36, 30 |

Sequoia ForestKeeper
Nelson Grove Survey
2008 Survey Summary
Eighth Week
Christian Elizabeth Michel

**Introduction:**

The purpose of this survey was to determine and GPS the location of Sequoia trees (if any) from a randomly picked point near McIntyre Creek. We wanted to acquire information on the regeneration requirements of young Sequoia trees. Furthermore, this survey was conducted to provide information that might aid in the evaluation of proposals for fuel or hazard tree reduction.

**Methods:**

In August of 2008 Marissa Williams, Natalie Stauffer, and Christian Michel conducted four transects from a randomly picked point near McIntyre Creek in the Sequoia National Forest. We drove east from Belknap Campground until reaching the end of the road, from which we walked 500 feet south-east to mark a starting point. Transects were done in the four main compass directions (north, south, east, and west) from the starting point.

For each transect we would walk approximately 200 feet using a hip chain, in one of the four main compass directions, from the starting point to conduct our first survey point and then about another 200 feet for each additional point. The surveyor with the GPS unit and the hipchain would stay in the center and mark a new waypoint for each succeeding survey point. The other two surveyors would walk away from her in opposite directions and perpendicular to the transect direction for approximately 100 feet. Each surveyor would note the percent canopy cover, percent ground cover (including type of ground cover: brush, rocks, forbs, etc…), the number each of the different species of trees, and the diameter of each of the trees. We would do this within a 25 foot radius every 200 feet until we stopped for the end of the day or due to conditions not permitting us to move forward.

Aside from doing survey points every 200 feet along each transect we would also take note of any wildlife signs through the length of the transect and we would also mark a waypoint for any sequoias within approximately 300 feet from the surveyor walking along the center. For these sequoias we would mark one waypoint that included any sequoias within about a 50 foot radius, make a note of each sequoia's diameter, and if it had a diameter of less than 18 inches, indicating that it was relatively very young, we would also record the canopy cover using a densitometer. Using the densitometer we would stand near the sequoia and face in the direction that had the least amount of canopy cover and record that percent. Sequoia seedlings consisted of trees that were not above breast height.

**Results:**

*Transects:*

The dominant tree species based on the totals of all species (both full grown trees and seedlings) within the four transects is Cedar (see Table 1) with an average diameter

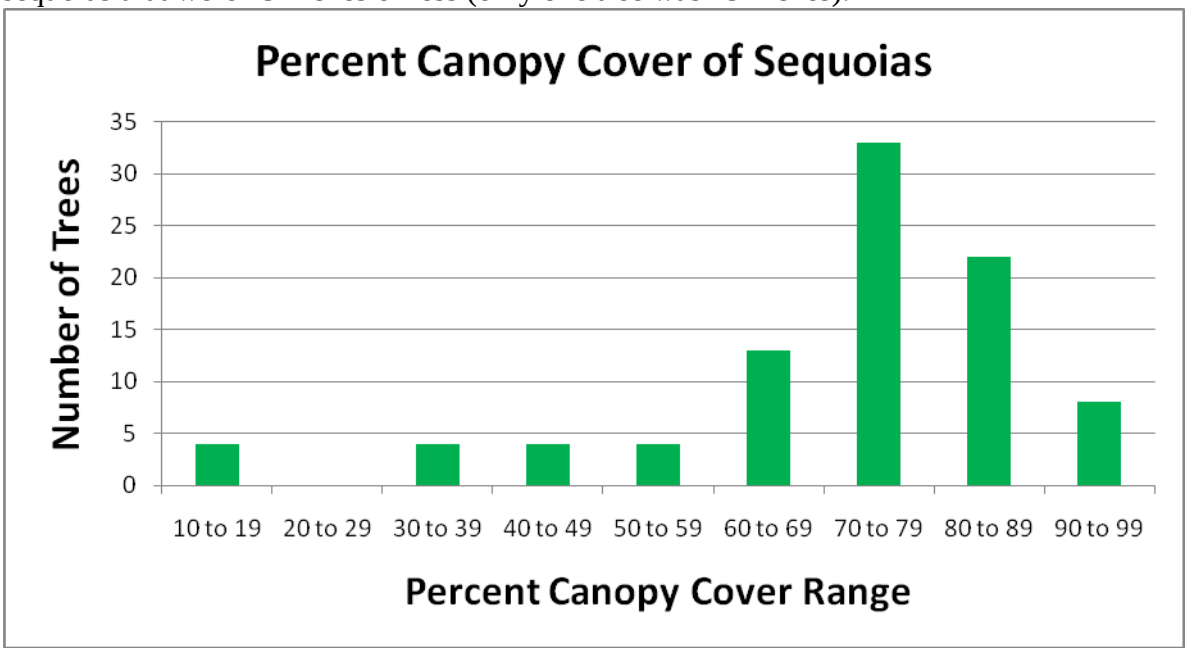
of 5.3 inches. The average canopy cover in all transects done from our starting point was 77%, while the average ground cover was 98%. The mode for both average canopy cover and average ground cover was 100%.

| Transects | Fir | JP | PP | BO | SP | C | U | CLO |
|---|---|---|---|---|---|---|---|---|
| all trees and seedlings W | 47 | 0 | 0 | 30 | 1 | 52 | 0 | 7 |
| all trees and seedlings N | 398 | 34 | 24 | 424 | 11 | 709 | 78 | 12 |
| all trees and seedlings S | 165 | 5 | 3 | 430 | 16 | 291 | 0 | 260 |
| all trees and seedlings E | 519 | 19 | 11 | 350 | 7 | 823 | 17 | 15 |
| SUM | 1129 | 58 | 38 | 1234 | 35 | 1875 | 95 | 294 |

*Table 1: The total numbers of trees in each transect and the sum of each type of tree of all transects. JP-Jeffrey Pine, PP- Ponderosa Pine, BO-Black Oak, SP-Sugar Pine, U-Unknown 1, CLO-Canyon Live Oak. W, N, S, and E stand for the main compass directions.*

*Sequoias:*

We counted a total of 167 sequoias within our survey site, including 17 seedlings. The average percent canopy cover (seedlings included) was 70%, which consisted of 92 sequoias that were 19 inches or less (only one tree was 19 inches).




*Graph 1. This graph shows the percent canopy cover above Sequoias that were 19 inches or less in diameter.*

**Conclusion:**

The forest in general, along the transects, was dense, with Sequoias sparsely scattered and with a higher percentage of relatively young Sequoias near or along McIntyre Creek. The regeneration of Sequoias occurred in nearly closed canopy although there are exceptions. Therefore, it appears that Sequoias do not have specific regeneration requirements in regards to canopy cover and grow just as well with closed canopy cover

as with open canopy cover. We included the only 19 inch Sequoia because it was it was still relatively very young.

It is important to clarify that on the West heading transect we were only able to conduct 1 survey point being that we encountered cabins further on. Therefore this transect is not representative of the general forest in that direction. Also on the south heading transect, after conducting our sixth survey point, we were unable to continue because the vegetation became too thick to travel in. For both the North and East heading transect we were able to conduct 10 survey points. From our East heading transect we were forced to turn North and then follow the McIntyre Creek West, along which we continued to make note of Sequoias. Signs of wildlife were found throughout the transects.

**Appendix:**

| Date of Survey | Site # | North | West | Elev. | Acre Size | % Ground Cover | Pine/Fir Seedlings | Black Oak Sprouts |
|---|---|---|---|---|---|---|---|---|
| 6/10/2004 | 1 | 35,58.920 | 118,22.927 | 7990 | 1 | 70% | 0 | 7 |
| 7/21/2008 | 1 | 35,58.920 | 118,22.927 | 7990 | 1 | 98.5% | 3 | 0 |
| 6/18/2004 | 2 | 35,58.980 | 118,23.176 | 7710 | 1/4 | 75% | 1 | 9 |
| 7/21/2008 | 2 | 35,58.980 | 118,23.176 | 7710 | 1/4 | 98% | 0 | 0 |
| 6/18/2004 | 3 | 35,58.948 | 118,23.020 | 7882 | 1/4 | 70% | 12 | 0 |
| 7/21/2008 | 3 | 35,58.948 | 118,23.020 | 7882 | 1/4 | 95% | 2 | 0 |
| N/A | 4 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 7/22/2008 | 4 | 35,59.187 | 118,24.273 | 6748 | 1 | 90% | 0 | 50 |
| N/A | 5 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 7/22/2008 | 5 | 35,58.803 | 118,24.082 | 6763 | 1 | 68% | 137 | 70 |
| 5/23/2004 | 6 | 36,02.676 | 118,19.951 | 8408 | 1/4 | 60% | 56 | 0 |
| 7/23/2008 | 6 | 36,02.676 | 118,19.951 | 8408 | 1/4 | 60% | 66 | 0 |
| 6/23/2004 | 7 | 36,02.750 | 118,19.912 | 8635 | 1/4 | 90% | 38 | 0 |
| 7/24/2008 | 7 | 36,02.750 | 118,19.912 | 8635 | 1/4 | 65% | 60 | 0 |
| 6/23/2004 | 8 | 36,02.816 | 118,19.908 | 8640 | 1/4 | 95% | 3 | 0 |
| 7/24/2008 | 8 | 36,02.816 | 118,19.908 | 8640 | 1/4 | 75% | 30 | 0 |

**Table 1: Data comparison between 2004 and 2008**

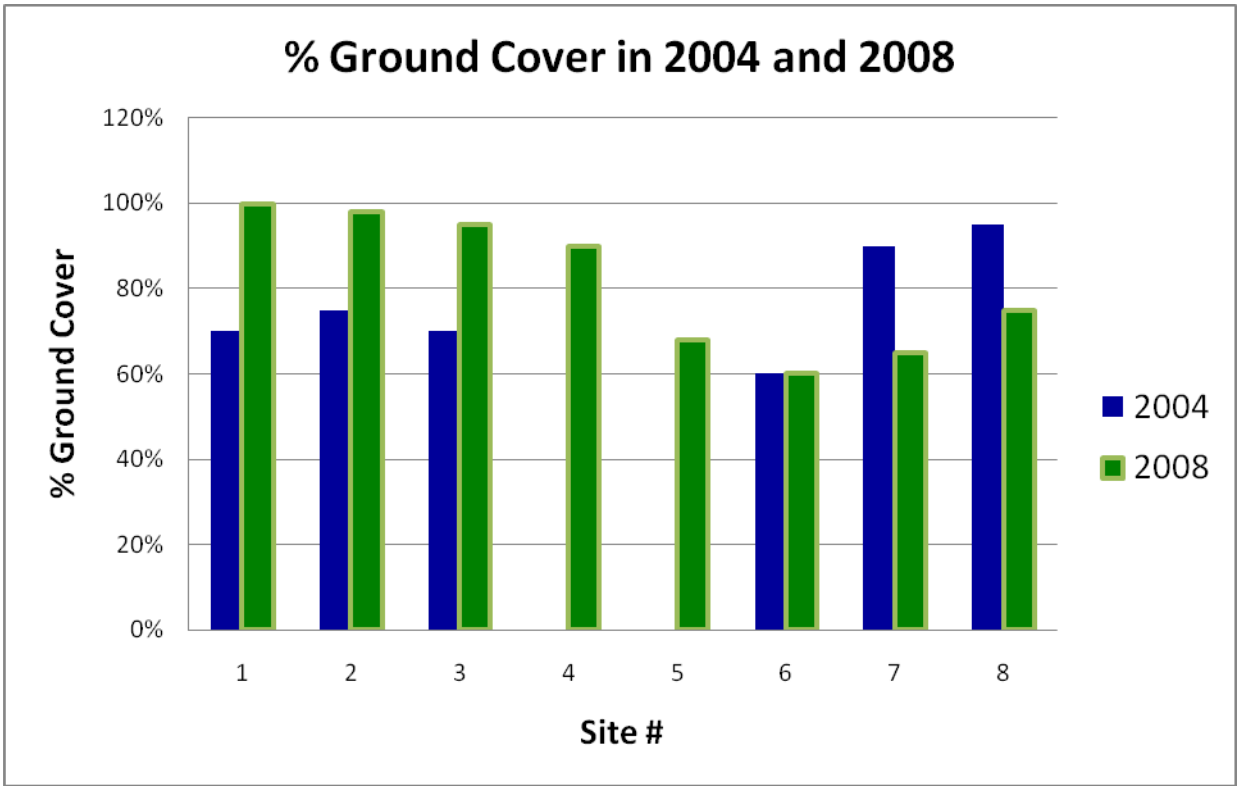



**Figure 1: % Ground Cover comparison between 2004 and 2008**

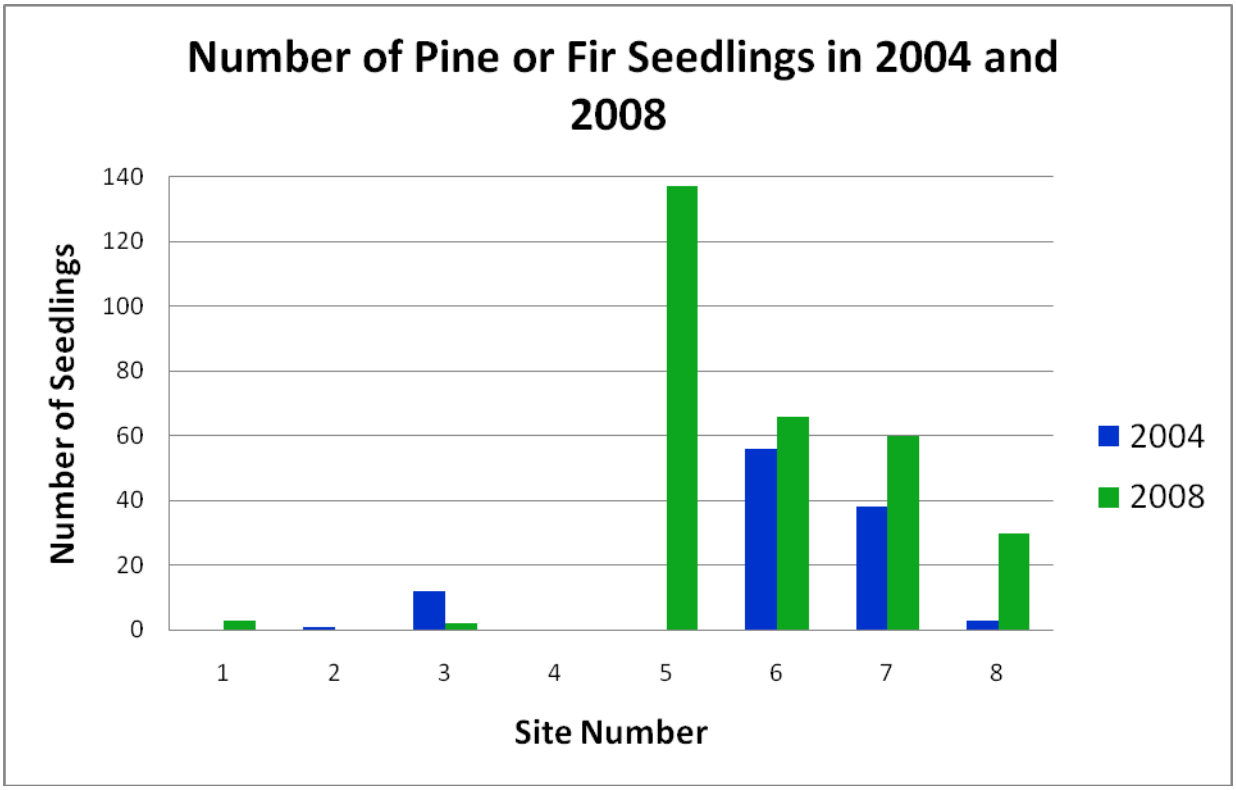


**Figure 2: Comparison of the Number of Seedlings present from 2004 - 2008**