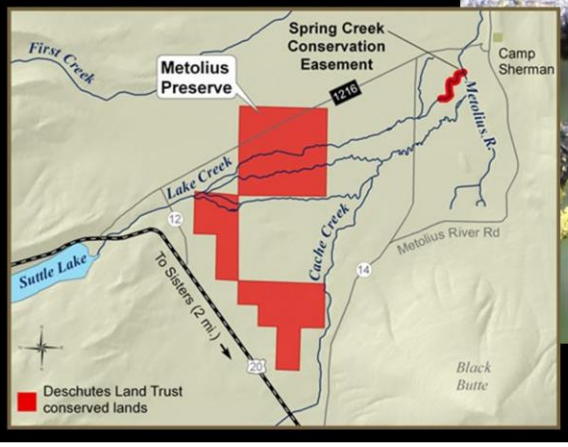
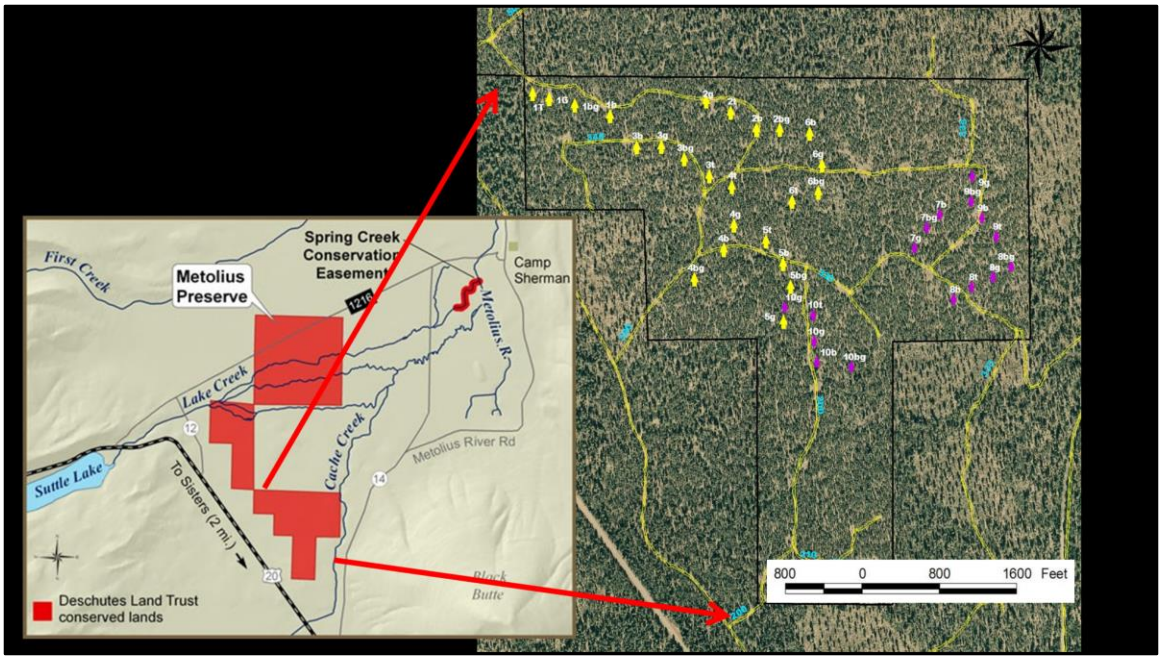
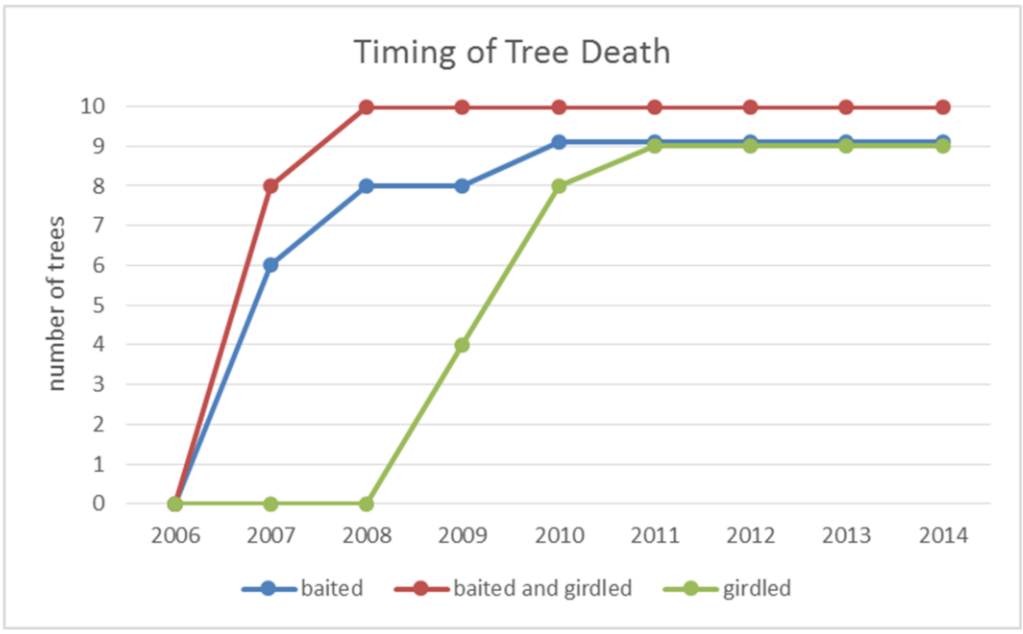
Ecological Restoration of Standing Dead Wood: Evaluation of the use of bark beetle pheromones and other snag-creation methods to provide standing dead wood for cavity-nesting species.

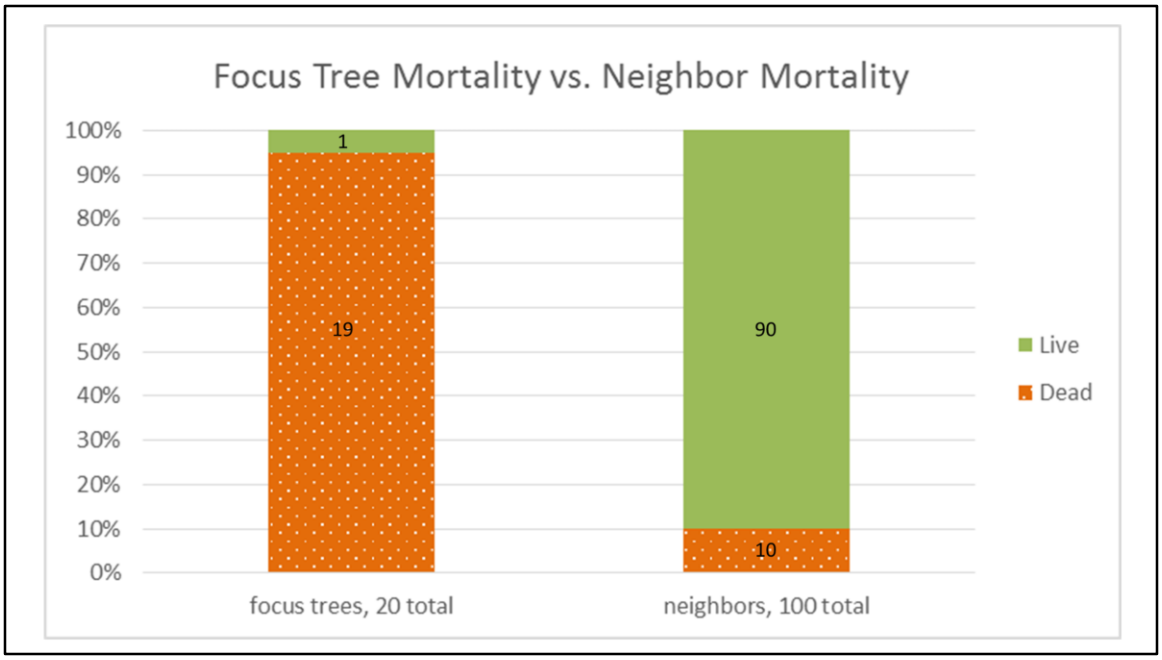




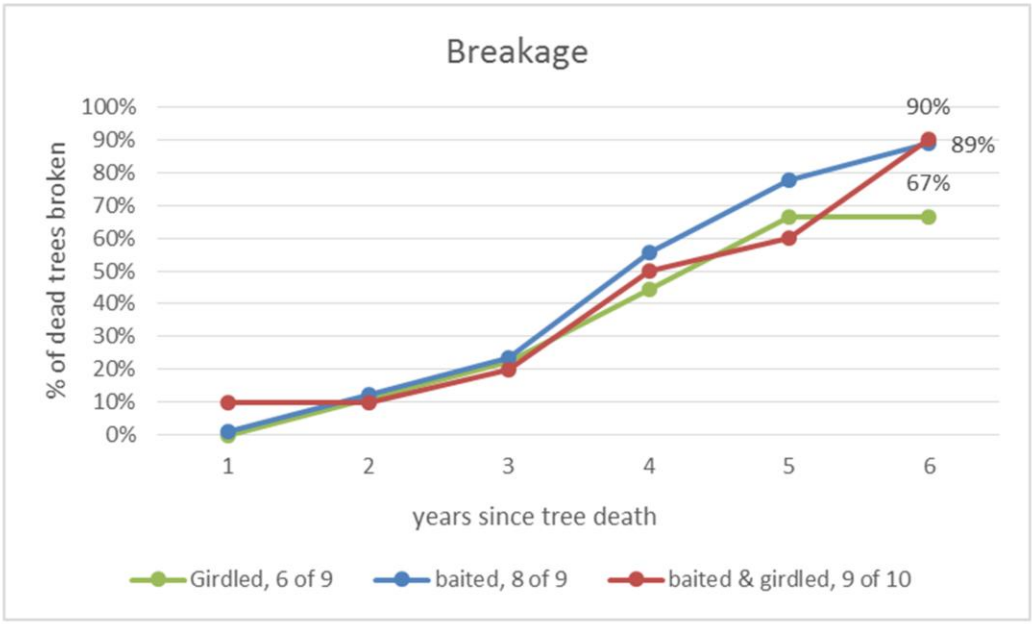
My name is Kelly Regan and I am an undergraduate natural resources student at OSU Cascades. I started worked on this project as a part of my regular coursework spring term of 2014 and have continued to work on the project into the summer of 2014. In 2006 forty trees were treated on the Metolius Preserve northwest of Sisters, Oregon to create snags for cavity nesting wildlife. Ten were topped using a mechanical harvester, 10 were girdled, 10 were baited with western pine beetle aggregation pheromones, and 10 were both girdled and baited. I will be presenting some of the results of the study as of the spring of 2014 as well as talking about additional trees that were treated in 2011 and 2012 to supplement the study.



Here you can see the timing of tree death following treatment. Topped trees are excluded from this graphic as they were considered dead at the time of treatment. Trees that were both baited and girdled died most rapidly followed by baited trees and finally girdled trees. At this time one baited and one girdled tree remain living.



In using pheromone baiting to create snags we also wanted to get an idea of the effect of baiting on non-target trees so in addition to monitoring focus trees the five nearest trees to each pheromone baited tree were also monitored. At this time 19 of the focus trees have been killed by treatment, 10 of the baited and girdled trees and 9 of the trees that were only baited. As you can see of the 100 neighbors monitored only 10 have died. This suggests that incidental tree mortality from pheromone baiting may be somewhat limited.

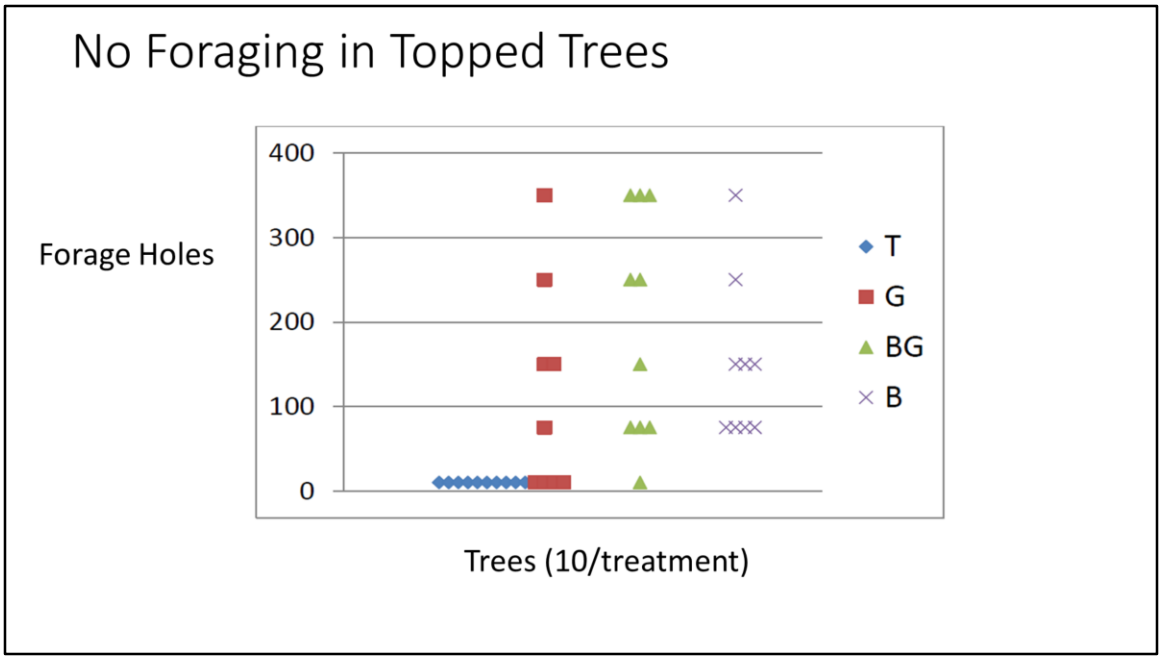


A substantial number of the trees that were successfully killed by treatment have broken since death. One thing to note about these and the majority of the results you will see here is that these results have been weighted to the timing of tree death instead of being counted from the time of treatment. This is something that a number of prior studies failed to do but we feel it is important to understand the timing factors such as use and breakage. Again, topped trees were left out of this figure because they are essentially considered broken at the time of treatment. Trees with broken tops are believed to be more easily affected by decay fungus making them more desirable to wildlife that rely on wood decay to soften wood and aid in excavation. This figure shows the number of years between tree death and breakage. The majority of these trees remain between 20 and 50 feet tall though a few have broken off at or near the ground

Left: pheromone-killed tree with woodpecker flaking.

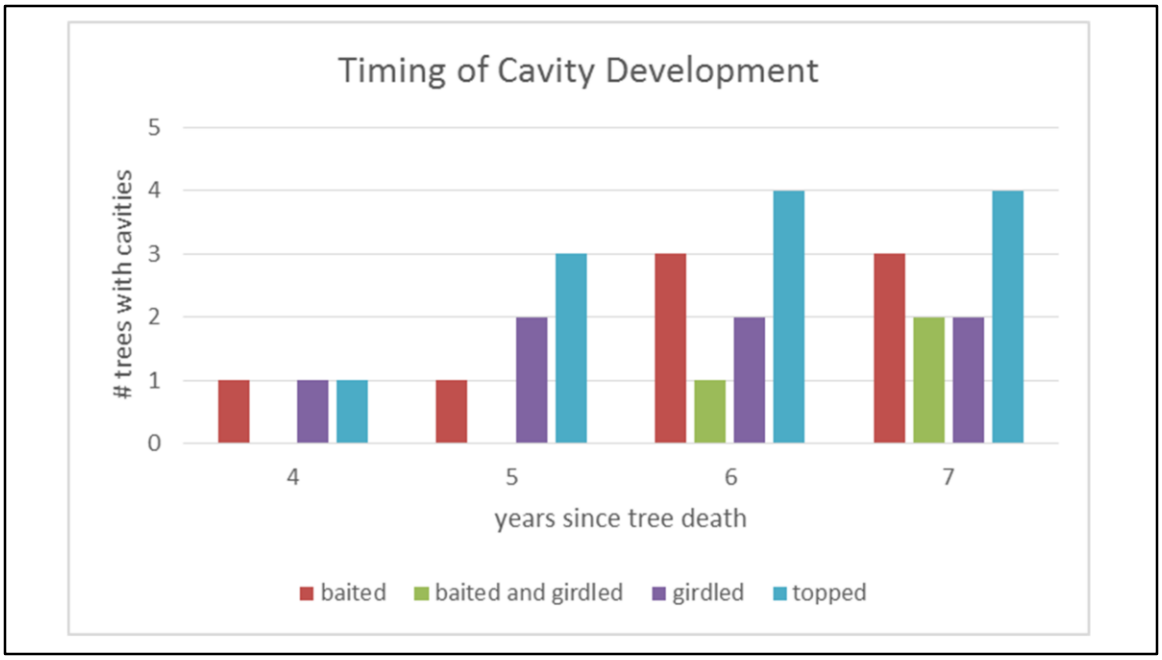
Above: feeding holes

Another factor we have been tracking in our treated trees is foraging behavior. Here you can see feeding holes and flaking associated with foraging activity.

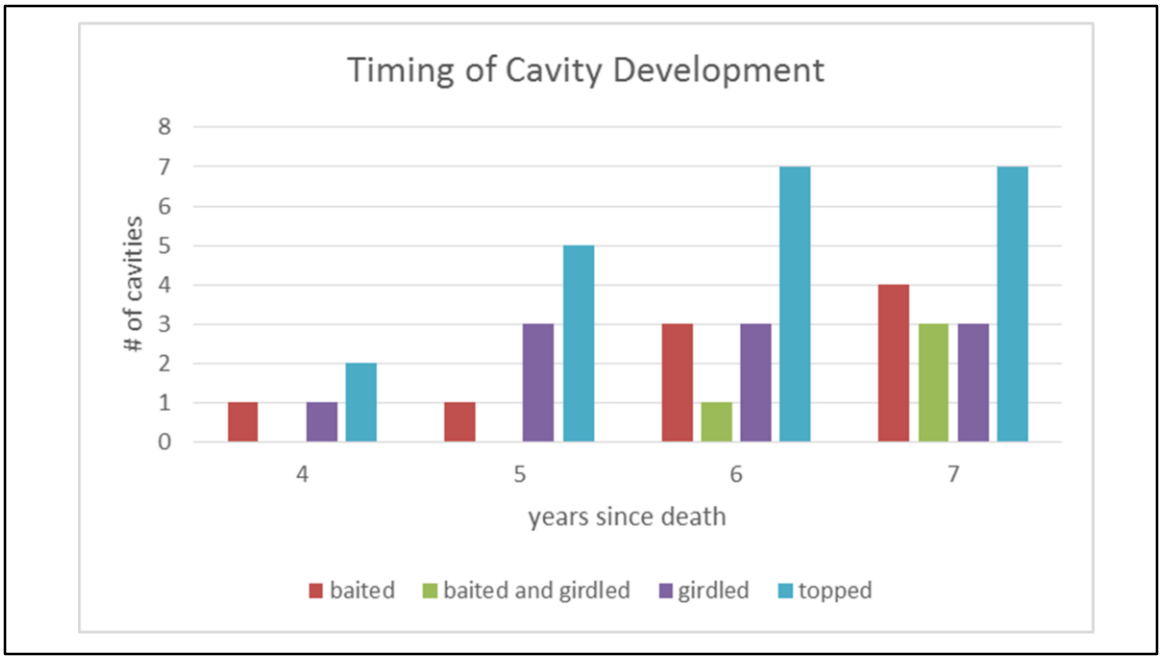


Interestingly there has been no foraging activity observed in the topped trees in our study, but the three other treatments received similar levels of use.

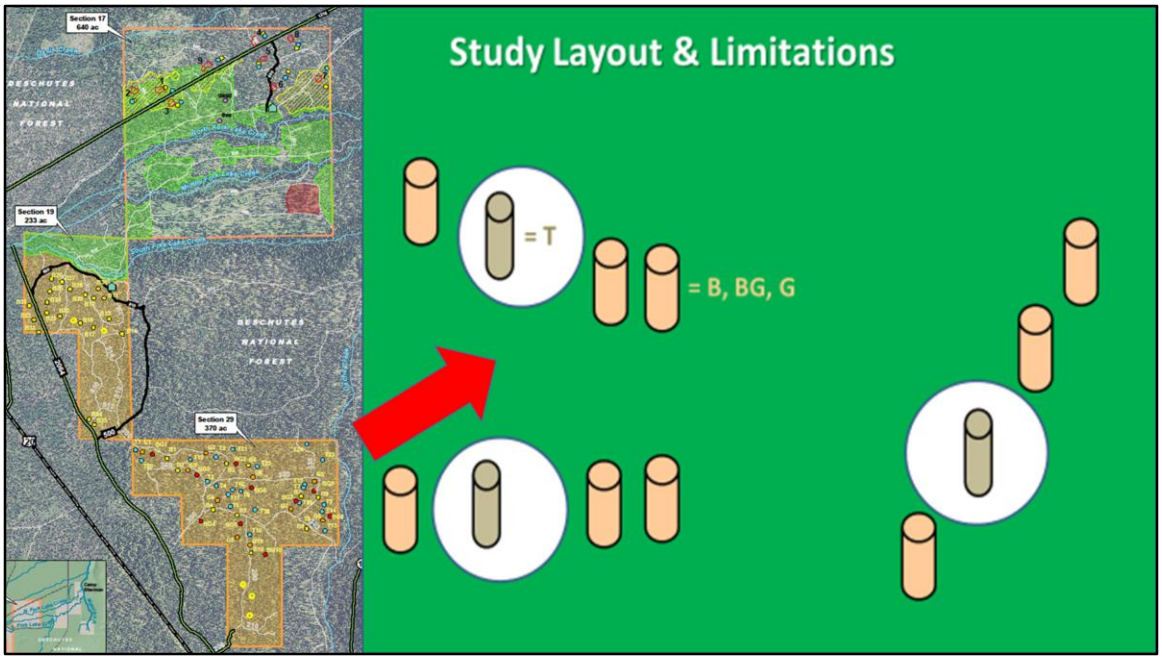
We also observed cavity development in our study. Here you can see a student checking out one of the occupied cavities with a camera.



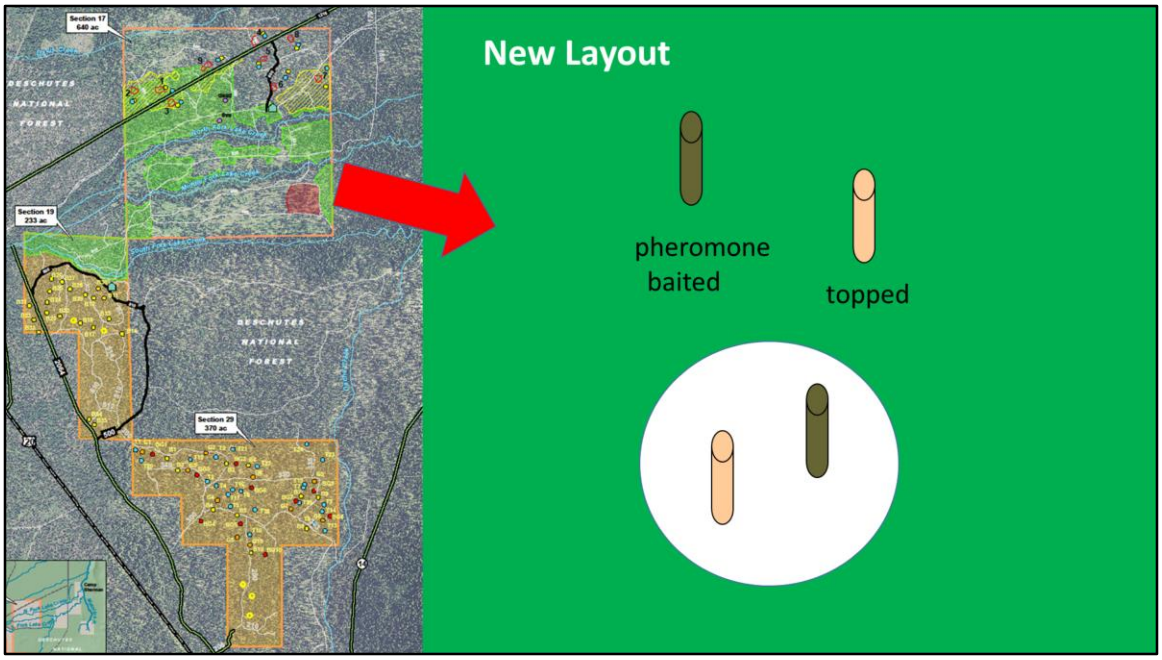
Unlike the results for feeding holes, not a lot jumps out in terms of cavity use,



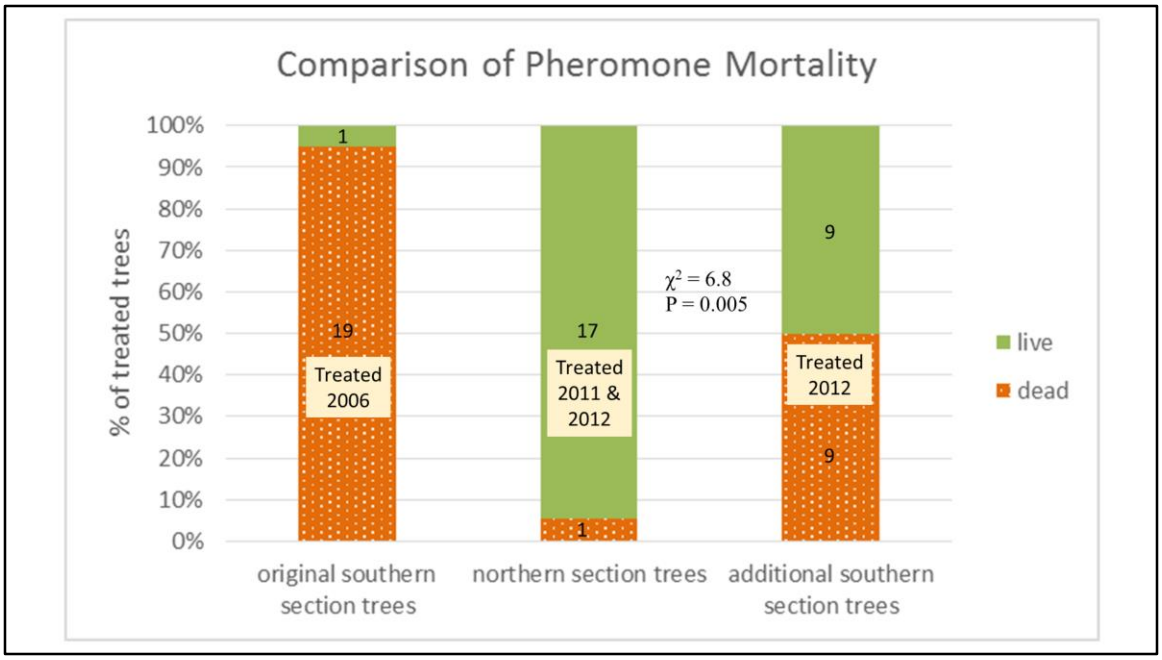
though there seems to be a bit more of a trend when you look at the number of individual cavities rather than the number of trees with cavities.



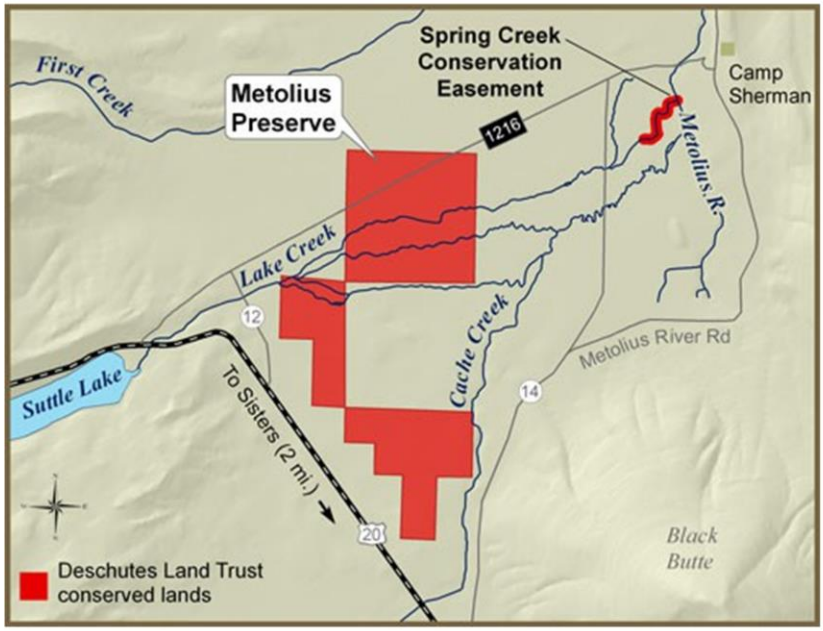
Since observational studies have shown that white-headed woodpeckers tend to prefer habitat in gaps it was clear that the original layout of the study had some limitations. One of these confounding factors was the fact that in the initial 40 treated trees all topped trees were placed within gaps.



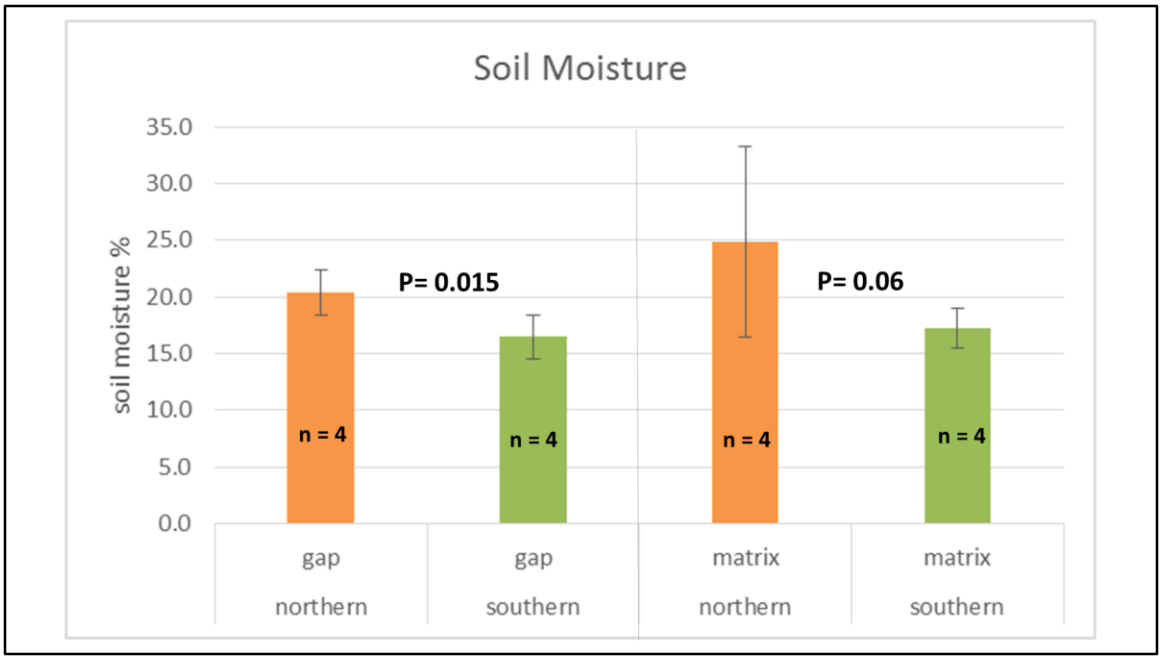
In response to this in 2011, 36 trees were added to the study in the northern portion of the preserve. 18 trees were topped, half within small gaps and half outside of these gaps. In addition another 18 trees were baited with mountain pine beetle aggregation pheromones, half within gaps and half outside.



By 2012 none of the trees in the northern portion of the preserve had died so the 18 pheromone baited trees were baited a second time and 18 more trees were baited in the southern portion of the preserve. These 18 new trees were baited to allow simultaneous comparison of mortality between the two areas as well as rule out the possibility of yearly differences in beetle activity as an explanation for the difference in mortality between the two sections. Currently one tree has died in the northern section but despite being treated twice the trees in the northern portion of the preserve have shown significantly less mortality than those in the southern section. As for the differences in mortality in the southern section in 2006 vs. 2012, it is possible that the 90,000 acre B & B fire in 2003 may have pushed larger numbers of beetles into the Metolius area than exist there today.



Soil moisture is also known to be a factor affecting tree mortality under beetle attack and it appears that there could be a difference in soil moisture availability between the two sites. In light of this Ron Reuter's Field Instrumentation class started investigating basic differences in the sites in Spring of 2014. From this map you can clearly see Davis Creek, and the North, Middle, and South Forks of Lake Creek in the vicinity of the north section as well as Cache creek in the vicinity of both the north and south sections. The western section was not looked at in this analysis.



The class collected and analyzed soil samples from the two locations. Preliminary data from just 4 sites in each section suggests that soil moisture is higher in the northern section than it is in the southern section. This is consistent with the lower mortality rates from beetle attack that we have seen in the northern part of the preserve.

Conclusions

1. Creating ponderosa pine snags with mountain pine beetle pheromones…
   - Killed few neighboring trees
   - Created foraging sites
2. Mortality is inconsistent from site to site and year to year. May be affected by soil moisture.

In Conclusion, we have found that all four snag creation methods are effective for killing trees to benefit wildlife in snag deficient areas and that some methods kill trees more quickly than others. We also found that creating snags with mountain pine beetle pheromones created foraging sites and killed few neighboring trees. In addition topped trees showed little to no foraging activity in our study. Finally, pheromone mortality varied from one site on the preserve to another and that there is a possible connection between differences in soil moisture between the sites and mortality.