

# Water, Wildlife, Recreation, Timber... Coarse Woody Debris?<sup>1</sup>

John R. Mount<sup>2</sup>

## Abstract

A natural forest ecosystem has two essential components that seem to be in conflict with one another: fire and coarse woody debris. If fire originally occurred at regular intervals with each acre burning every 10 years, then how could coarse woody debris have existed? As a part of my management program, I advocate returning the forest to a natural fire regime. I also understand that woody debris in all of its forms is required for a healthy forest ecosystem. Given this, I needed additional information on how these two diametrically opposed components existed together in the central Sierra Nevada. After 20 years of harvesting timber and using prescribed burns, I have determined through an inventory system that coarse woody debris and fire can and do co-exist.

## Introduction

Before 1980, Southern California Edison Company lands were in a condition that was less than any desired level as a functioning natural ecosystem. A patchwork of brush fields, under-stocked areas, and overstocked stands was the vegetative pattern of the lands at that time. This forest composition was a direct result of the harvesting methods used at the turn of the century. The large brush fields replaced harvested old-growth stands, and the overstocked stands consisted of young, untouched stands that had no value to the land managers in those early years.

Fire exclusion has also significantly skewed the vegetative structure in all of the various stand types. There was too much woody debris in all size classes of dead material, with the exception of very large snags. Although there was an abundance of large downed material, (logs over 40 inches) most of it was over 50 years old and in an advanced state of decay. All of these factors contributed to the disrupted, unhealthy forest that I would be managing.

In 1980, I wrote a Land Management Plan for my new employer, Southern California Edison Company. As I was outlining my vision of a well-managed forest, a conflict between natural fire and coarse woody debris surfaced. I knew both were significant to the forest ecosystem, but they seemed mutually exclusive. Because my long-range goal was to return the property to a pre-1850 stand structure, the challenge was to both maintain a healthy forest ecosystem and affect the needed changes within the boundaries of the biome of this area. The very first priorities were that I needed to harvest the over crowded stands that occupied 50 percent of the

---

<sup>1</sup> An abbreviated version of this paper was presented at the Symposium on the Ecology and Management of Dead Wood in Western Forests, November 2-4, 1999, Reno, Nevada.

<sup>2</sup> Forest Resources Manager, Southern California Edison Company, PO Box 600, Shaver Lake, CA 93664 (e-mail: mountjr@sce.com)

property, and at the same time, return fire to the ecosystem. I also needed to consider tree species distribution and how to restore it to pre-1850 conditions.

Early objectives included reduce fuel loading and stocking, restock brush fields, and maintain an adequate amount of dead material. In other words, the primary management objective for coarse woody debris was to preserve an adequate inventory of material that best suited wildlife needs, while also reducing forest fuels. My approach had to be fairly rapid and economical. It became apparent that more detailed information was needed about the stand structure. The information was necessary not only for timber production but also for other components of a balanced forest ecosystem. There were several obvious deficiencies, such as large snags and snag recruitment, larger size trees, and overstocked areas of young trees (less than 20 feet in height). However, hard data was lacking.

## Methods

The first step to understanding the co-existing relationship between coarse woody debris and fire was gathering information. In 1993 I was finally able to establish a forest inventory system. The availability of geographic information systems (GIS) and global positioning systems (GPS) made it possible to include a large variety of information and growth modeling of the existing forest composition. The inventory system that was designed included data on brush species, oaks, snags, and coarse woody debris as well as timber volume and species distribution.

The field portion of the inventory system used 1/10-acre circular plots. The small plot size was used so that more points were sampled with relative uniformity within each plot. With larger plot sizes, a large variation exists within each plot in terms of canopy cover, brush percentage, or stand type. Using the smaller area size encourages variety while maintaining consistency among measurements. Also, the measurements of coarse woody debris include a breakdown of dead and downed material, as well as snag classification. I divided the measurements into size and decomposition levels as expressed by age classifications.

Another category was added to the inventory system termed “green snag.” A green snag was defined as a live tree that would not be harvested due to disease or deformity, but would be preserved for wildlife purposes. At this time, there was an obvious deficiency in the existing stand structure of unhealthy trees. Because the forest was relatively young, I needed to increase the number of trees that for one reason or another were dying or damaged. I would mark these “wildlife” trees with a “W,” but needed an estimate of size and volume. A “W” is also used for other reasons such as nesting trees, perch trees, potential habitat trees, as well as green snags.

Before the collection of any hard data in 1993 the program needed to proceed in 1980. Timber harvesting is one method of increasing coarse woody debris. High stumps (10-15 feet), tops, cull and sound logs, snag, and green snag retention all contribute to the inventory of debris. The opposite is true for salvage logging. In my management program, I have made every effort to reduce or eliminate salvage logging in order to help maintain woody debris. In fact the only salvage logging I have done on these lands was conducted in 1991, during the drought. Even during those operations, only very recently killed trees or trees actually infested with the bark beetles (*dendroctonus brevicornis* and *monticolii*) were removed. Edison has

experienced far less infestation than surrounding forest lands due to harvesting in the first 10 years (1980-90). The most difficult choices in both of these salvage operations and current harvesting is leaving recent snags that have merchantable value.

Although I have an active coarse woody debris management objective, I have an even more active fire management program. After studying all available information on natural fires that burned in the Sierra prior to 1850, I learned that they did not burn only with low intensity, as many people seem to believe. Even many catastrophic fires of today burn in a patchwork manner, leaving many completely unburned islands within denuded areas. Natural fire, as a result of a reduction of fuels, burned for many days and even months and burned hot as well as with low intensity.

The burning that I practice duplicates these fires. Initial entry is done under conditions that only burn lighter fuels, usually less than 4 inches. Subsequent burning allows us to burn very hot in areas that are adjacent to unburned patches. This burn pattern allows for areas of high coarse woody debris inventory with open areas intertwined.

## Results

The results of the burn program overlaid with the coarse woody debris retention goals have been better than expected. Using available research data as a base, the inventory indicates above-adequate volumes of coarse woody debris scattered over the entire property. The breaking up of the forest structure and occurrence of coarse woody debris also allows better fuels management against large fire incidences. The key is how the burning is done.

More directly, inventory results show an adequate stocking of coarse woody debris over the areas treated by fire. Most importantly, these areas are neither continuous nor contiguous with each other and are surrounded by openings with no woody debris at all. Snag inventory and recruitment numbers are above most recommended thresholds and increasing. The firm policy of not salvaging any dying tree except for those hazardous to the public has increased numbers of snags. The initial burning in a new area has been limited to the reduction of light fuels (less than 4 inches in diameter). Subsequent burning has been done in such a manner as to create the pattern of patchy occurrences of coarse woody debris. Bird surveys support the conclusions that fire has not reduced the incidences of any species after the initial burning. Subsequent hotter burns indicate short-term differences followed by increases in both richness and diversity.

## Discussion

By introducing fire under a variety of conditions, the results of each burn are different and important. Because of this fact, there are no unsuccessful burns. More importantly, by understanding fire behavior, certain desired results can be achieved. I have been successful in many respects, including the increase of deer browse, creating conditions conducive for natural reproduction, thinning of these new stands, rejuvenating vegetation types such as willow, creating small openings, increasing coarse woody debris, increasing wildlife diversity, and reducing fire hazard. In fact,

due to the many legal obstructions that are reducing prescribed burning opportunities, the only problem may be that there is too much coarse woody debris.

The initial process of stem reduction was completed in about 15 years. The conversion to the proper species and size composition is ongoing and will take about 30 more years. There is still a long way to go before I know which variables and components to watch in order to determine ecosystem health.

Where do I go from here? Research is paramount in knowing how to manage the forests in the future. However, the overwhelming data and sometimes contradictory research findings must be carefully evaluated. There is some good in each research project, though one can also find much misleading information. These apparent conflicts are due to varied locations of the research projects as well as their differing objectives. There is also much personal bias, not only in the data but also in turf wars between researchers.

Monitoring the work is obviously a requirement to determine the program's progress. This alone is a major focus of our program, with continuous debate on cost effectiveness. What needs monitoring and how it should be done is one of the most time consuming (and fun) discussions that my staff has each year. Relevancy, costs, and amount of detail required are some of the issues that are argued. Currently, some of our monitoring projects include bird surveys, deer counts, brush growth, tree spacing, stand release, competition, hardwood physiology, and effects of fire on the ecosystem.

Reconciliation of the differences between research and monitoring efforts is also required before work plans can be initiated in a particular ecosystem. This is mainly due to the lack of research done on this subject and also lack of knowledge on unaltered forest ecosystems. In the future, research will determine numbers of snags per acre and how many tons of coarse woody debris is necessary for a healthy forest. Unfortunately, there will be many changes in those results and numerous arguments will ensue before any final knowledge is ascertained. Grandiose programs initiated in Washington D.C. or Sacramento that may protect a single species is not the answer. Natural systems are resilient and most do not require expensive and time consuming plans to help them along. As land managers, we must understand the naturally occurring cycles and manage within them. We should then use those tools that natural systems have provided, such as fire. As a resource component, fire should be used as a determinant for the proper amount of coarse woody debris.