

Excerpt from California Pest Council  
Newsletter – February 2017:

## *After the Deluge - What Does It Mean for California Forests?*

With precipitation 110-257% of normal in many locations throughout California, people are wondering if recent trends in tree mortality observed in the southern and central Sierra Nevada will subside. The answer to this question is more complicated than it might seem. Certainly the moisture is helpful, yet in the most heavily impacted areas (e.g., the lower elevations of the southern Sierras), little effect will be observed as the majority of the most susceptible trees (ponderosa pines) have already been killed. Moreover, it is not known how California's forests will fare as the interplay of factors governing the interactions between individual site soils and topography, the water status of each tree, and the fluctuating bark beetle populations are not completely understood.



When trees have sufficient resources (e.g., water, nutrients, and light), they use the carbon they produce via photosynthesis to satisfy competing demands to support survival and growth. In general, they devote this carbon to growing new roots first, followed by shoot growth to perform photosynthesis, then stem growth, and then production of the chemical compounds they use for defense against invaders like bark beetles. The ability of each tree to perform each of these functions may be compromised to varying degrees by how badly the drought has already damaged it. Some trees may regain these functions in full, while others may never reach former levels of growth and defense.

While the increased precipitation is good, optimism must be tempered with caution. The direct effects of a wetter than normal winter on beetle populations are largely unknown. For some bark beetles, like pine engraver or California five-spined ips, an immediate decline in population is expected. Others, like mountain pine beetle, are capable of causing widespread tree mortality for several years after drought. Western pine beetle, the species responsible for much of the tree mortality in the southern and central Sierra Nevada, falls somewhere between these two extremes. Since it has multiple generations per year and initiates flight at the beginning of the growing season (i.e., before trees have time to respond to increases in growing space), it is anticipated that it will continue to cause some elevated levels of tree mortality, but then populations are likely to rapidly decline. Although it is hoped that more water will help quell further beetle outbreak expansion (especially in areas where outbreaks are relatively small), tree mortality will probably continue to progress in many areas for some period of time. Additionally, California's urban and wildland forest health depends not only on native pest populations, but also on invasive pests (eg., sudden oak death, shot hole borer), some of which can thrive during times of excessive moisture. As bark beetle-caused tree mortality subsides in our forests, some of these other pests will likely increase in activity.