WHAT TO REPLANT AFTER THE TREES DIE

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Background: California, and the Sierra Nevada in particular, is experiencing an unprecedented die off of trees on both private and public lands. Aerial detection surveys done in 2016 showed that over 102 million trees have died since 2010 coinciding with four years of drought, including over 62 million in 2016 alone.

The hardest hit species has been ponderosa pine (*Pinus ponderosa*), but many incense cedars (*Calocedrus decurrens*), sugar pine (*Pinus lambertiana*), white fir (*Abies concolor*), and some oaks have experience mortality as well. At higher elevations, Jeffrey pine (*Pinus jeffreyi*) and lodgepole pine (*Pinus contorta*) have also died.

Die off of trees at this scale is a result of two intertwining factors, the historic drought and the overstocked condition of our forests and woodlands which leads to wildfire and insect epidemics. Western pine beetle *(Dendroctonus brevicomis)* is the primary culprit this time, though mountain pine beetles *(Dendroctonus ponderosae)* and pine engravers *(Ips paraconfusus)* have also been active.

Tree death and removal: Removing dead trees from your landscape is important, especially around the home, to prevent damage to homes and infrastructure. Dead trees will also eventually fall to become large fuels on the forest floor leading to more intense fires.

Assessing the landscape: It is important to assess what is left after tree removal before considering replanting, as there is often a lot of live vegetation remaining. If you have a significant number of trees left, you may not need to replant. Make a survey of your property; map what is growing and where.

Ponderosa pines grow well only in sunny conditions and do not tolerate shade. You may find young pines growing in sunny gaps created by canopy trees dying. Incense cedar and white fir tolerate shade and are often found growing in the understory. Oaks may be doing well where nearby conifers have died. Oaks have the ability to drop leaves during drought and can also re-sprout if their tops are killed. So, even oaks that look dead may be able to rebound.

Nurturing existing trees: You may want to promote the smaller trees left after the dead ones have been removed. Thin trees out so that available sun and soil moisture is focused on the healthiest individuals. (Some watering of these trees in the summer may help counter stress caused by increased solar radiation.) Consider clearing out shrubs, grass and other competition. Digging up natural conifer seedlings and moving them is not recommended as this can harm the tree's already developed root system.

Replanting trees: If you have fewer living trees than you want, or would like more pine then you currently have, replanting native conifers is a good strategy. Native trees are best adapted to our local climates. Planting individuals and species from slighter lower elevations may be a good way to hedge against warmer temperatures in the future.

Native shrubs and plants are generally hardy and come back on their own without planting. Shrubs can re-sprout while native herbaceous plants generally store seed in the soil and should be able to regrow during non-drought conditions.

Options for tree planting include large nursery tree saplings for visual screening or wind breaks, small container-grown seedlings which are much less expensive, and bare root seedlings for planting many trees on large acreages. Oaks should be grown from acorns gathered locally in the fall.

Where to plant trees: Planting trees in the right location is one of the most important factors in their long term success. Take care to plant trees to not create future problems:

- Spacing – It's important not to plant trees too densely or you may create a need to thin them out in the future. Trees should be planted at least 10-14 feet apart.
- Defensible space - All new landscaping will need to conform to defensible space requirements. Trees and flammable vegetation should be kept at least 10 feet from the home and thin within 30 feet. In the 30-100 foot zone, trees should be widely spaced so their crowns will not touch when they are mature. Trees can fill in to a more natural looking forest 100 feet from the home.
- Power line clearance - Trees should be planted at least 10 feet from power lines. Trees planted too close to power lines will eventually need to be trimmed or topped.
- Road right of way - Trees should not be planted within the road right away so there is no interference with snow clearance, maintenance or construction projects.
- Sun availability – Plant pines where there is now a lot of sun because trees were removed. The potential for future solar energy generation should also be assessed before planting. Do not plant sugar pine on the driest sites.
- Views – Consider future views and don't plant trees that will block these desired views.

For more information about tree mortality visit http://cecentralsierra.ucanr.edu/ or http://ucanr.edu/barkbeetle/ or call University of California Cooperative Extension Central Sierra office at 530-621-5502.