CALIFORNIA FOREST STEWARDSHIP PROGRAM WINTER 2007

FORESTLAND STEWARD

WORKING TOGETHER FOR HEALTHY FORESTS

Forest Management Part IV:

Managing risks: fire, pests, disease, and other undesired challenges

Now that you've carefully crafted your management plan, learned all there is to know about your forest community, and started taking the appropriate steps to achieve your goals, what could possibly go wrong?

Well…quite a bit actually. No matter how carefully you plan or how vigilant you are, unexpected events will come along to threaten your forest. Wildfire, drought, insects, disease, climate change, invasive species, and other potential problems (*see the partial list on page 3*) can wipe out all of your well-considered plans and leave you with a very different forest from your original vision.

What can you do to protect your forest from these myriad threats? This, our last issue in the Forest Management series, will explore some of these critical topics. While we can't discuss every potential threat, nor can we go into much depth on any single one, we'll give an overview on a few of the major threats facing your forest and leave you to pursue the topics further.

Fire is always a danger in California and one that most forest-dwellers are well aware of. While fires ***will*** occur, there are things you can do to protect your home and forest.

A number of pests–insects, bacteria, fungi, and other creepy crawlies–are happy to munch on your forest. Some pests can do a lot of damage, others are only unsightly, and some may actually be beneficial. How do you know what you are dealing with?

In addition, we touch on what may become a huge issue in forest management in the future–climate change. While the consequences of these changes are currently unpredictable, it is still important to try to anticipate future threats and be prepared to counter the potential risks.

Never forget that forests are dynamic natural communities, susceptible to all the whims of nature plus a multitude of human-caused problems. You can be sure that your forest will face some unpredictable challenges. Good forest management can help minimize some of the unwanted changes. Careful monitoring and anticipation of threats are key.

If you have a concern about a threat to your forestland, one of the very best places to start is with the list of experts and agencies waiting to help you (*see Technical Assistance on page 10*).

Forests are dynamic natural communities, susceptible to all the whims of nature plus a multitude of human-caused problems.

CAL FIRE & UC Cooperative Extension
Forest Stewardship Program
c/o P.O. Box 162644
Sacramento, CA 95816

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Inside

FORESTLAND STEWARD

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California Forest Stewardship Program
P.O. Box 944246
Sacramento, CA 94244
(916) 653-8286
Fax (916) 653-8957
http://ceres.ca.gov/forest-steward

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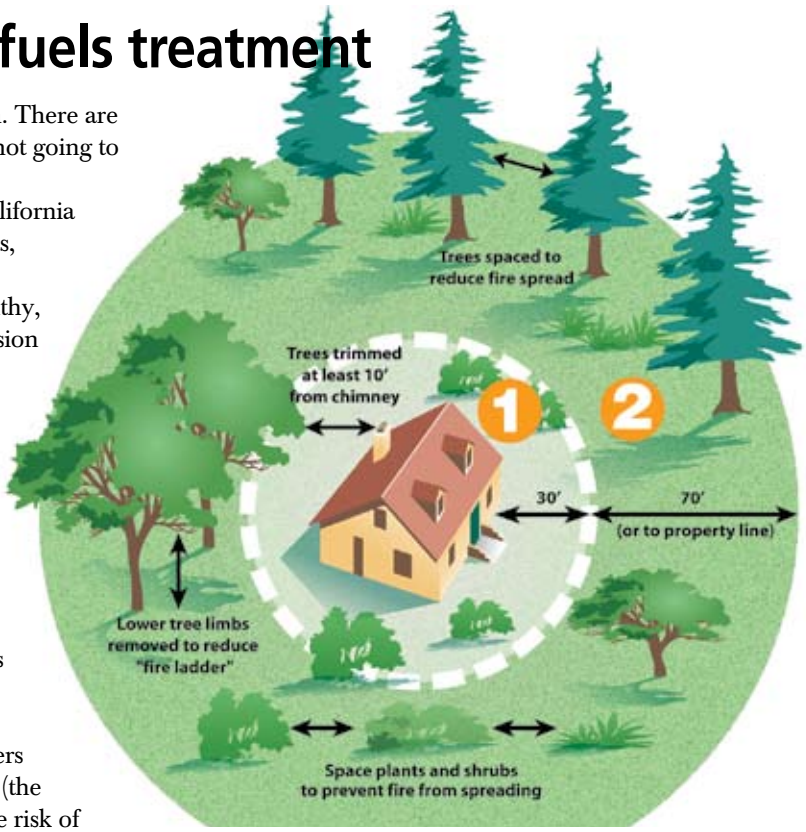
Fire hazard and fuels treatment

Fire is a difficult issue to deal with. There are no easy answers and the problem is not going to go away.

Fire is an integral part of most California landscapes. Many of our native plants, including trees, are adapted to burn periodically; they ***need*** fire to be healthy, reproduce, and survive. Fire suppression activities over the last 100–150 years have largely taken fire out of the system, causing far-reaching changes in habitats and forest health. Many of the forest plant communities are not adapted to today's exceedingly hot fires. During these fires many mature trees succumb from top kill while others have their roots killed due to decades of accumulated debris burning down into the root zones.

At the same time, growing numbers of people moving into forested areas (the wildland urban interface) increase the risk of fires, place more lives and property in danger, and complicate efforts to restore fire to the ecosystem.

Learning how to live with wildfire is a big challenge. It requires accepting the fact that wildfire ***will*** happen and finding ways to minimize the damage.



The law requires 100 feet of defensible space around your home and other structures. Zone 1=Lean, Clean and Green Zone. The area 30' around the home requires the greatest reduction in flammable vegetation. Zone 2=Reduced Fuel Zone. Reduction in the remaining 70' depends on steepness and other characteristics of the property.

—from Make Your Home Firesafe: Why 100 Feet? *available at www.fire.ca.gov/education_100foot.php .*

Defensible space and other protective measures for the home

Defensible space is an area around a house or other structure that has been modified to reduce wildfire threat. This is usually done by clearing and separating highly flammable material so there are no paths for fire to travel to the home. California law requires 100' of defensible space around homes and structures.

In addition to creating defensible space, there are numerous other ways to increase the safety of your home including using less-flammable building materials, taking precautions with outdoor equipment, creating easy access for firefighters, etc. (*see the* Homeowner's Checklist *at http://www.fire.ca.gov/education_100foot.php*).

Protective measures for the forest

The first step in creating a safer forest is to survey the forest for fire risk. Look for ladder fuels and appraise surface and aerial fuels. With this information you can decide what fuels modification projects, if any, are appropriate.

Ladder fuels are those combustible materials (both live and dead) that provide a path for a surface fire to climb up into the crowns of shrubs or trees. Standing dead trees with many limbs near the ground are an example of ladder fuels. Pruning and thinning can remove ladder fuels.

Surface fuels are those on the surface of the ground. They include everything from grasses to logs and stumps. Aerial fuels are fuels that are not in contact with the ground. These include limbs, foliage, and branches, as well as any dead material caught up in the branches of other plants. Needles draped over the branches of shrubs are a good example of an aerial fuel.

When assessing your fire risk look at the location, arrangement, and amount of surface, ladder, and aerial fuels.

Different fuels burn at different rates. Pine needles are "flashy" fuels that ignite easily and burn quickly. Other fuels, such as logs, are very difficult to ignite but can smolder for weeks or even months.

There are some trade-offs. For example, you'll want some large woody debris and snags in order to maintain good wildlife habitat. But such dead material also provides fuel for fires so it is important not to have too much.

Resistance to fire

Trees differ in their ability to withstand fire. Resistance comes from a combination of attributes, of which thick bark is the most important. Thick bark protects a tree better than thin bark, as it shields the living cambium from excessive heat. Root depth is also important. A tree with many shallow roots is vulnerable to its roots being charred by hot fires.

The density of the canopy, flammability of foliage, and the branching habits of individual trees can greatly influence how a fire spreads and whether or not it will reach the crowns. Forests with dense canopies tend to trap heat, causing vegetation to become drier. Burning decades of duff accumulation can result in fatal root damage and greatly reduce the natural "seed bank."

Fuels Reduction

Fuel modification projects are designed to reduce the risk of fire by removing and separating fuels. In a fire break or fuelbreak, all vegetation is removed down to bare soil leaving nothing left to burn. Fuelbreaks used to control low-intensity fires (hand lines) are generally a minimum of three feet wide; much wider lines are needed to hold large fires. Often these are strategically placed along ridges. Roads can function as effective fuelbreaks.

Shaded fuelbreaks are strips of land in which vegetation has been modified rather than removed. The purpose is to reduce the amount of combustible material so that when a fire hits the shaded fuelbreak it will decrease in intensity, cool down, and drop from the canopy to the ground. Typically trees are spaced so their crowns no longer touch. Lower branches are pruned. Shrubs and dead and down material are removed to reduce surface fuels. Shaded fuelbreaks are most often placed strategically along roads and around structures.

Thinning is conducted in young stands with small-diameter trees (pre-commercial thinning), or in stands with larger trees (commercial thinning). In both cases the purpose is to reduce the number of trees, leaving a healthier, more vigorous stand in which trees have much less competition for sunlight, water, and nutrients. Combustible material is removed and the effect can be similar to that of a shaded fuelbreak.

Michael De Lasaux, UC Cooperative Extension

In shaded fuelbreaks trees are spaced to slow a wildfire so that firefighters can gain control.

Pruning, removing the lower (live and dead) limbs of a tree, reduces ladder fuels. This is frequently done alongside roads, thus increasing the effectiveness of the road as an existing fuelbreak.

Vegetation management, whether it be pruning, pre-commercial thinning, commercial harvest, etc. generates waste material (slash) that is a potential fuel for fire and must be treated in some manner to reduce fuel loading or its ignition or heat potential.

Regulations

If you sell, barter, or trade the logs you create in your fuels management project you are subject to the Forest Practice Rules. In most cases you will need to hire a Registered Professional Forester. The Forest Practice Rules include a special prescription for "Fuelbreak/Defensible Space" as part of a Timber Harvest Plan.

There is an exemption that allows a landowner to remove and sell trees within 150 feet of a legally permitted structure when the goal is fuel hazard reduction. An exemption notice must be filed with and accepted by the California Dept. of Forestry & Fire Protection (CAL FIRE).

Working with others

Wildfire generally occurs on a larger scale than a single property so it is useful to work with your neighbors to analyze and find ways to reduce the fire risk to the community. Find your local Firesafe Council at www.firesafecouncil.org/.

Forest Damaging Agents

(partial list in no particular order)

- wildfire
- insects
- animal damage
- soil compaction
- logging damage
- land use conversion
- de-icing salt injury
- human-caused injury
- disease
- air pollutants
- chemicals
- erosion
- avalanches
- drought
- flooding
- hail
- lightning
- nutrient imbalance
- winter injury—snow, ice, frost
- windthrow
- ozone injury
- sunscald
- genetic abnormalities
- parasites
- water pollution
- invasive species
- hail
- mechanical injury

Rogue's gallery of pests, diseases, & troubles

For more information on forest pests and the latest Conditions in California Report, go to the California Forest Pest Council http://www.caforestpestcouncil.org/

Forest pests are an eclectic group. Tree "diseases" can be caused by fungi, bacteria, parasitic plants, insects, mammals, smog, chemicals, extreme temperatures, and other harmful agents (*see list on page 3*).

Not all pests are villains

Most biologically caused diseases are a natural and essential part of a healthy forest. Insects, fungi, and bacteria all break down and decompose organic matter, releasing nutrients and creating soil humus. Insects are an important food source for wildlife; they pollinate forest plants and trees; and predator insects are critical to keep harmful insects under control.

What we consider disease is a disturbance of the normal functions of a tree. When this disturbance occurs sporadically it goes undetected. When it occurs over large continuous areas it may be a problem that should be addressed.

In natural systems there are checks and balances that keep pest species under control. Here a pandora moth has been parasitized by another insect. Donald Owen, CAL FIRE, www.forestryimages.org

Pitch tubes (right) and streamers (below) are produced by a tree in response to boring insects. Pitch alone does not indicate a tree is dead or dying. Donald Owen, CAL FIRE, www.forestryimages.org

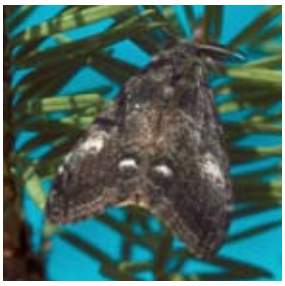
Boom and bust

Insect populations can quickly build into a devastating force. There is a natural boom-and-bust cycle for many populations. Population outbreaks are followed by a crash when the insects consume all available food, are weakened by disease, or devastated by natural enemies.

Insects actually destroy more timber annually than wildfire. However, they usually take their toll on individual or small groups of trees here and there, unlike the spectacular destruction of forest fires.

William M. Ciesla, Forest Health Management International, www.forestryimages.org

The Douglas-fir tussock moth larvae (above) can cause heavy defoliation. Adult moth (right).



Jerald E. Dewey, USDA Forest Service, www.forestryimages.org

While insects may be the identifiable cause of tree injury and death, the ultimate cause is often poor tree condition due to drought or excessive competition for water, light, and nutrients; excessive water; or physical damage to the tree. Trees are constantly challenged by insects but generally only stressed or unhealthy trees succumb.

Fighting trees

Trees are not as helpless against insect attack as one would expect. A healthy tree is able to defend itself from insect attack by producing pitch that drowns, or pitches out, the attackers. If you see pitch streamers, tubes, or granules, that is evidence that the tree is still alive and fighting.

Trees under stress, and those that are older or unhealthy, are more apt to succumb to insect attack. If there are numerous insect attacks with no evidence of pitch or resin, the tree is most likely dying. To be sure, look for beetle larvae under the bark at the site of an attack with no resin flow.

Bark Beetles and Engravers

Bark beetles and engravers are the most serious insect pests in California. They bore through the bark of most pine and fir species. These insects generally attack stressed or weakened trees. They often work together:

engravers may attack first, weakening a tree, followed by bark beetles which can kill the tree.

General reddening of the foliage in the tops of pine and fir trees is the most noticeable sign of successful bark beetle and engraver attack.

Foliage insects

Insects that attack foliage can cause stress or even death by hindering photosynthesis. Most trees can tolerate partial defoliation, though this may make them more susceptible to bark beetle attack. Repeated or total defoliation can kill the tree outright.

Foliage insects can be found while they are feeding. Look for damaged leaves and needles. Egg masses, usually small pouches of webs attached to protected spots on the bark or under branches and leaves, are easily detected.

Insects also affect twigs, buds, cones, and roots. Look for a decline in tree vigor or damage to the specific part.

Fungi: rots, rust, and root disease

Heart rots are the leading cause of wood decay. Look for large, shelf-like mushrooms (conks), on tree trunk or for mushrooms in the soil around the trunk. These are the fruiting bodies of fungi. When you tap on the tree a hollow sound indicates heart rot.

The fungi that cause the rot enter the tree through logging wounds, animal damage, or any injury that opens the inner part of the tree. Preventing injury is the most effective form of control.

The presence of conks indicates significant deterioration inside a tree which could cause it to be structurally unsound. Remove any trees that could fall on people or structures. In the forest, trees with conks should be left to become snags.

Rusts enter the tree through the needles. Rusts require an alternate host plant for the disease to complete its life cycle. Spores can travel hundreds of miles on the wind so the alternate host could be far away.

The most destructive rust in California is the white pine blister rust that infects sugar pine and others in the 5-needle pine group. Symptoms are random flagging (dead, brown-needled branches) in tree crowns. Close examination of these branches show a spindlelike swelling of the branch filled with orange spores. The alternate host for white pine blister rust is currant or gooseberry. Control was attempted by eradicating the alternate host, however, this proved ineffective.

Scott Tunnock, USDA Forest Service, www.forestryimages.org

Douglas-fir beetle larvae (above). Note the small larvae at the end of each gallery.

USDA Forest Service - Ogden Archives, USDA Forest Service, www.forestryimages.org

Damage from a Douglas-fir beetle infestation (left).

Donald Owen, CAL FIRE, www.forestryimages.org

Dry boring dust from red turpentine beetles (left) is an indicator that the tree can no longer defend itself and is dead or dying.

Red turpentine larvae (below).

Donald Owen, CAL FIRE, www.forestryimages.org

Maintaining healthy, vigorous trees is the best defense against insects and diseases.

Root diseases usually affect the whole tree uniformly. If tree leaves or needles are yellowing, dying, or falling for no apparent reason, root problems are usually the cause (but other causes such as mechanical damage to the roots, saturated soils, and foliage insects or rusts should also be considered).

Donald Owen, CAL FIRE, www.forestryimages.org

Annosum root disease center in a stand of white fir.

Root diseases, which spread from tree to tree by root contact, are difficult to detect and even more difficult to control. Look for fruiting bodies (mushrooms) on and around the base of the tree. Bark beetles often successfully attack trees weakened by root disease.

Disease centers, in which a group of trees die, are another good indicator of root disease. Trees adjacent to dead trees are often infected though they do not show symptoms until the next year, when moisture stress finally browns the leaves.

Control root diseases by keeping the stand healthy. Salvage all the affected and surrounding trees because the disease may have spread through root contact.

David Conklin, USDA Forest Service

Dwarf mistletoe is a parasitic plant that is a serious disease of conifers. It can produce witches broom (above), a profuse growth of branches, as well as other symptoms.

Some root diseases become established when fungus spores land on and colonize a freshly cut stump. One particularly serious root disease, *Heterobasidion annosum*, can be prevented by powdering freshly cut stumps with borax, sodium borate. Another control method is to replant diseased stands with a different tree species. Root diseases are typically species specific, affecting only one tree species. Harvesting the affected trees and planting another species could eliminate the disease problem.

Sudden Oak Death is caused by the fungus *Phytophthora ramorum*. Bleeding or oozing of a dark reddish-brown thick sap is the first symptom to appear on true oaks and tanoak.

Eek—a pest!

Be familiar with your forest and notice any changes. If you see some suspicious activity–dead or dying trees, insect outbreak, mushrooms, etc.–you'll want to figure out what is going on.

Collect specimens or take pictures of any potential problems. Diseases may be difficult to identify until they have damaged a tree to an obvious extent. Determine the part of the plant that is affected, any patterns to the damage, etc. If the cause of the disease is not readily apparent, start with the simplest possibilities: animal damage, frost, mechanical injuries, fire.

Generally, the best defense against insects and diseases is to maintain healthy trees.

Chemical or other insect control measures are expensive and often ineffective. While individual trees might be protected with insecticide treatments, only landscape trees are probably worth the cost and effort.

Consider IPM

One approach to controlling forest pests is known as Integrated Pest Management (IPM), a strategy that considers the whole ecosystem. It focuses on longterm reduction of pest damage through a combination of techniques including biological control, habitat modification, changes in cultural practices, and resistant varieties.

With IPM, pesticides are used only after monitoring indicates they are needed according to established guidelines. Pest control materials are selected and applied to minimize risks to human health, beneficial and nontarget organisms, and the environment. Treatments are chosen and timed to be most effective and least disruptive to natural pest controls.

IPM requires constant monitoring to determine whether a pest problem exists, and if the problem is intolerable enough to require treatment. In many cases the "no treatment" option is found to be the preferred, most cost-effective approach.

Develop strategies

Learn about insects and other potential pests found in your area. Talk to your forester or a specialist at UC Cooperative Extension or CAL FIRE (*see list on page 10*). Developing strategies to prevent the occurrence or limit the effects of forest pests can be an exciting management challenge.

–Loosely adapted from the Forest Stewardship Series 16: Forest Pests and Diseases; DANR #8246.

Dead or dying: how can you tell?

Trees die even in healthy forests; it's part of the cycle of life. But if you notice large numbers of previously healthy trees with brown needles or other signs of disease or damage, there may be a problem.

As you monitor the trees in your forest, note any dead or dying trees and try to determine the cause. If the tree is a hazard to life or property, you will want to remove it.

It's relatively easy to determine if a tree is dead–look for a uniform color change throughout the ***entire*** crown. If any green remains, the tree is still alive.

Determining if a tree is dying is a bit trickier. A tree attacked by bark beetles may be dying but still green. It takes careful inspection and expertise to make sure.

On the other hand, there are a number of diseases or abiotic factors, such as winter damage, that can cause needles to look dead even though the tree will recover and green up with new growth in the spring. If there is no new growth at that time, the tree is dead.

Conifers naturally shed old needles each year in the fall. The quantity shed varies from year to year depending on conditions. Trees that are drought stressed may lose more needles. Look for green needles on the tree as a sign that the tree is still alive.

When in doubt, the best way to tell if a tree is alive is to cut into the inner bark (phloem), the living part of the bark just next to the wood. A live conifer has cream-colored, moist inner bark whereas in a dead tree it will be brown.

If the inner bark is dead around the entire circumference of the trunk, the tree is dead. In some cases, part of the inner bark may be alive while another part is dead. This may be due to a non-lethal injury from which the tree can recover, or the tree may be in the process of dying.

According to the Forest Practice Rules a dying tree is one that meets at least one of the following criteria:

- Fifty percent or more of the foliage-bearing crown is recently dead (as indicated by a uniform change in color over that part of the crown). Note: dead tops with no foliage do not count toward that 50%.
- Successful bark beetle attacks with indications of dead cambium and brood development distributed around the circumference of the bole (trunk).
- Seventy-five percent or more of the circumference of the lower bole is girdled by wildlife.
- The tree is designated by a Registered Professional Forester as likely to die within one year.

Ladd Livingston, Idaho Department of Lands

Normal needle cast on a ponderosa pine in fall. The appearance of dead needles can be alarming but look for new needles in the spring.

Donald Owen, CAL FIRE, www.forestryimages.org

Redbelt on ponderosa pine. These needles are the victim of winter damage. Although the crown of the tree has an overall brown cast, closer inspection reveals that needle bases are green. The damage is minor and the tree is neither dead nor dying.

–*adapted from* Identifying Dead and Dying Conifers on Private Land in California *by Don Owen, CAL FIRE Tree Notes #30. Available at http://ceres.ca.gov/foreststeward/pdf/treenote30.pdf. All photos from www. forestryimages.org*

Dead tree =
A uniform change in foliage color throughout the entire crown of the tree.

Dying tree =

- *Fifty percent or more of the folliage-bearing crown is recently dead (as indicated by a uniform change in color over that part of the crown).*
- *Successful bark beetle attacks with indications of dead cambium and brood development are distributed around the circumference of the bole.*
- *Seventy-five percent or more of the circumference of the lower bole is girdled by wildlife.*
- *The tree is designated by a Registered Professional Forester as likely to die within one year.*

Species Spotlight

Aspen—more than just a pretty tree

The first thing you notice about aspen trees is their beauty–the leaves dance and shimmer in the mildest breeze and in the fall they turn lovely shades of yellow to red.

Perhaps its defining characteristic is aspen's intolerance of shade.

But beyond their good looks, aspen are valuable in their own right. Because the groves allow light to filter through to the ground, they support a lush understory of plants, which in turn supports a wide diversity of birds and other animals. A veritable oasis for a large number of species, aspen are considered "keystone species"–without aspen the whole community would fail.

Aspen groves have other valuable qualities. They act as natural firebreaks because the understory generally has a high moisture content. And they play important roles in riparian habitats where they provide shade and help stabilize stream banks and steep slopes.

Although a minor component of forests in California, aspen provide more than their share of benefits.

At risk in the West

Aspen are the most widespread deciduous tree in North America. However, in the West they are in decline. Unexplained aspen die-offs have been reported in Utah, Arizona, and Colorado.

In California the declines appear to be largely due to competition from conifers and excessive browsing by livestock. Changes in the fire regime due to suppression activities over the last 100+ years have allowed conifers to overtop and shade out mature aspen trees. Domestic livestock grazing can take a huge toll on suckers (root sprouts) needed for regeneration.

Understanding aspen

Aspen is a disturbance-adapted species. Disturbance is required to maintain the open habitat needed for survival and to stimulate suckers for regeneration.

Perhaps its defining characteristic is aspen's intolerance to shade. The requirement for sunlight explains why they cannot coexist with conifers, which grow to overtop and shade out the aspens. Without periodic fires to clear out conifers and open up the habitat, aspen can be eliminated from the environment.

Aspen reproduce primarily by suckering. While a single tree can produce over a million seeds in a good year, aspen seldom reproduce from seed because of the strict germination requirements of bare mineral soil, full sunlight, and constant moisture during the first year of growth. These conditions rarely occur in California.

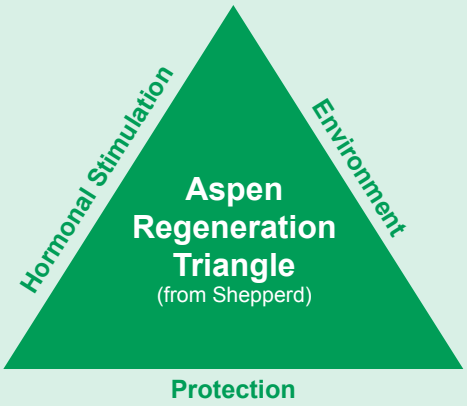
Instead, most aspen regeneration occurs vegetatively through sucker growth, up to 500,000 stems per acre.

Aspen stands are composed of one to several clones interconnected through their extensive root system. All the trees in a clone are genetically identical. Not all trees are attached; some may lose their connection over time.

Aspen is susceptible to a number of damaging agents. Its living bark is highly vulnerable to fungal diseases. Root disease, insects, and physical factors like snow damage and windthrow can also harm the trees. Aspen survive the effects of these multiple threats by rapidly reproducing new stems.

Aspen management

If regeneration of aspen communities is among the management objectives for your forestland, you will need to determine the state of



- ***Hormonal stimulation*** causes suckers to grow from the roots of existing trees. This occurs when trees are stressed in some way: insect defoliation, disease, fire, climatic events, etc., or when a parent tree dies.
- Aspen need an appropriate ***environment*** to survive. This includes full sunlight to the forest floor and warm soil temperatures in the root zone.
- New suckers must be ***protected*** from damage by browsing animals, insects, diseases, and climatic events.

existing aspen clones and what, if anything, needs to be done to maintain and enhance them.

The first step is obvious: look at the aspen on your property to determine their condition, including size, vigor, age, and successional status. The Aspen Regeneration Triangle (*see diagram*) can provide a model for management decisions.

Aspen Regeneration Triangle

The Aspen Regeneration Triangle illustrates the three major factors needed for aspen regeneration. These are: 1) hormonal stimulation of suckers, 2) an appropriate environment, and 3) protection. While all three factors are required, they do not necessarily have to be provided by management activities.

The Aspen Regeneration Triangle can help you evaluate the current condition of an aspen grove, identify what is lacking, and determine what steps need to be taken.

The following questions should be asked (*from Shepperd 2004*):

1. Is the aspen stand in decline as evidenced by abundant dead trees, downed logs, or holes in the overstory canopy? If not, the stand may be adequately stocked and in hormonal balance and therefore not attempting to regenerate.
2. Are aspen suckers or saplings present in the stand? If so, the stand may be naturally regenerating and not in need of management intervention.
3. If the stand is in decline and no successful suckers are present, are there browsed or clipped sprouts in the understory? If present, fencing the stand will probably allow them to release and grow. If no suckers are evident, competing trees or dense understory vegetation may initiate suckering without cutting any aspen. Another possibility in declining clones with no suckers may be that the area is a root rot epicenter, which cannot be remedied by management action.

Hormonal stimulation. There are many techniques available to cause aspen to sucker including cutting trees, ripping roots, and prescribed burns.

Prescribed burns must be done carefully to avoid charring the roots close to the surface.

If suckers are present then hormonal stimulation is probably not an issue.

Environment. Removing any conifers encroaching on the aspen stand may allow enough sunlight in to regenerate the stand. This will often stimulate suckering as well.

Protection. If there is adequate hormonal stimulation (as evidenced by suckers) and no conifer encroachment, the problem may be excessive browsing by domestic or wild animals. One remedy, although expensive, is to put up fencing. If domestic livestock are the culprits, it may be possible to control browsing timing and intensity.

For more information about aspen regeneration in your forest, talk to local forestry specialists (*see Technical Assistance list on page 10*).

Resources:

Shepperd, W.D. 2004. *Techniques to Restore Aspen Forests in the Western U.S.* Transactions of the Western Section of the Wildlife Society. 40:52–60. http://www.tws-west.org/transactions/Shepperd%20aspen%20restoration.pdf

Shepperd et al. 2006. *Ecology, biodiversity, management, and restoration of aspen in the Sierra Nevada.* Gen. Tech. Rep. RMRS-GTR-178. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station 122 p. http://www.treesearch.fs.fed.us/pubs/24485.

Resources

Everything you ever wanted to know and more

One relevant example (see page 12):

Skinner, Carl N. 2007. ***Silviculture and Forest Management Under a Rapidly Changing Climate.*** *USDA Forest Service Gen. Tech. Rep. PSW-GTR-203. http://www.treesearch.fs.fed.us/pubs/25889.*

For those who love to delve into the science and mystery of forestry, there is a treasure trove of information awaiting you at Treesearch, a repository of online publications from the USDA Forest Service.

With well over 16,000 publications, Treesearch is billed as "the largest freely available collection of online forestry research in the world."

All publications are available in their entirety so all you need is the free Adobe Acrobat Reader to download and enjoy. Search by author, keyword, station, or date.

Treesearch contains all Forest Service publications from January 2004 to the present and older ones are being added to the database.

Each publication has a page of information and an abstract, a link to download the pdf, and the opportunity to evaluate the document. For those of us who prefer to read our publications the old-fashioned way, there is also a contact to order a hard copy. The publications are free and in the public domain so they can be copied and distributed as you wish.

A small sample of recent publications to tantalize you:

- Silviculture and forest management under a rapidly changing climate (see sidebar).
- The effect of mechanical fuel reduction treatments in the wildland-urban interface on the amount and distribution of bark beetle-caused tree mortality.
- A field guide to insects and diseases of California oaks.
- Thinning and underburning effects on ground fuels in Jeffrey pine.
- Gap-based silviculture in a Sierran mixed-conifer forest: effects of gap size on early survival and 7-year seedling growth.
- Evidence of a new niche for a North American salamander: *Aneides vagrans* residing in the canopy of old-growth redwood forest.
- Connecting southern Californians with nature.
- Truffle abundance in riparian and upland mixed-conifer forest of California's southern Sierra Nevada.

A listing of all available titles from the Pacific Southwest Research Station can be found at http://www.treesearch.fs.fed.us/pubs/psw/ . Treesearch home is at http://www.treesearch.fs.fed.us/.

Technical Assistance

Many agencies are available to provide technical assistance, referrals, information, education, land management plan assistance, and advice.

California Stewardship Helpline
1-800-738-TREE; ncsaf@mcn.org

California Dept of Forestry & Fire Protection
Forest Landowner Assistance Programs
Jeffrey Calvert
916-653-8286; jeff.calvert@fire.ca.gov

Forestry Assistance Specialists
Jill Butler (Santa Rosa) 707-576-2935
Gary Whitson (Fresno-King) 485-7500 x107
Ed Cranz (Placer) 530-889-0111 x128
Mary Huggins (S. Lake Tahoe) 530-541-1989
Patrick McDaniel (Ama/El Dorad) 530-647-5288
Dale Meese (Plumas) 530-283-1792
Alan Peters (Calav/Tuol) 209-754-2709
Rick Carr (Yuba/Nevada) 530-265-2661
Jim Robbins (Fortuna) 707-726-1258
Herb Bunt (Red Bluff) 530-528-5108
Brook Darley (TGU) 530-538-5199

California Association of RCDs
916-447-7237
staff@carcd.org

California Dept of Fish & Game
Marty Berbach
916-327-8839; mberbach@dfg.ca.gov

Natural Resources Conservation Service
Jerry Reioux
530-792-5655; jerry.reioux@ca.usda.gov

U.C. Cooperative Extension Advisors/ Specialists
Mike DeLasaux, Plumas-Sierra counties
530-283-6125; mjdelasaux@ucdavis.edu
Greg Giusti, Mendocino-Lake counties
707-463-4495; gagiusti@ucdavis.edu
Richard Harris
510-642-2360; rrharris@nature.berkeley.edu
Gary Nakamura
530-224-4902; gmnakamura@ucdavis.edu
Yana Valachovic, Humboldt-Del Norte counties
707-445-7351; yvala@ucdavis.edu

USDA Forest Service
Jim Geiger
530-752-6834; jgeiger@fs.fed.us

Calendar

May 2–3, 2007
California Board of Forestry Meeting
Location: Sacramento
Contact: 916 653-8007
Notes: http://www.bof.fire.ca.gov/board/board_current_docs.aspx

May 4–6, 2007
Traditional Ecological Knowledge, Restoration Forestry, Ecological Woodlot Stewardship, Permaculture, Small Diameter Utilization & Natural Building Workshop
Location: White Oak Farm in Williams, Oregon
Cost: $425
Contact: Jenny at Lomakatsi Restoration Project, 541-488-0208 or jenny@lomakatsi.org

May 6–12
Wildfire Awareness Week
Theme: "Why 100 feet?... Because defensible space is YOUR responsibility."
Notes: CAL FIRE will kick off the week with a ceremony at the State Capitol in Sacramento on Monday, followed by an event each day in a different location of the Wildland Urban Interface. For information on events go to http://www.fire.ca.gov/education_WAW.php

June 5–7, 2007
California Board of Forestry Meeting
Location: Fort Bragg
Contact: 916 653-8007
Notes: http://www.bof.fire.ca.gov/board/board_current_docs.aspx

June 4, 11, 18 plus 25 & July 2
Forest Stewardship Workshop
Location: Sonora
Sponsors: UC Coop Extension, CA Forest Stewardship Program, CAL FIRE, Tuolumne County RCD
Cost: $50/person includes lunches for field trips, handouts and an aerial map of your property
Contact: Sherry Cooper, (530) 224-4902, slcooper@nature.berkeley.edu
Notes: Register online at http://cetuolumne.ucdavis.edu. Classroom times from 8:30–12; field trips from 9–5. To be held at Tuolumne Co. Ambulance & Fire Admin Training Room (*see article at right*).

July 10–12, 2007
California Board of Forestry Meeting
Location: Burney
Contact: 916 653-8007
Notes: http://www.bof.fire.ca.gov/board/board_current_docs.aspx

June 4–July 2, Sonora

Forest Stewardship Workshop Series

Would you like to better understand your forest, develop goals for its improvement and protection, and begin a plan to achieve your goals in an ecologically and economically sustainable manner? If so, register for this workshop designed to assist present and prospective family forest landowners like you!

The workshop will take place on five consecutive Mondays. The first three sessions will be in the classroom and will consist of presentations on topics such as forest ecology, forest resource evaluation, water quality, forest management planning, fuel and fire management and forest roads. The remaining two sessions will consist of field trips to look at innovative management approaches and problem solving.

Cost will be $50 per person, which includes lunches for field trip days, handouts, and an aerial map of your property.

The workshop series is conducted by University of California and sponsored by the California Department of Forestry and Fire Protection, Forest Stewardship Program.

To receive a flyer for the Sonora workshop, contact Scott Oneto, (209) 533-5695, sroneto@ucdavis.edu, Ken Churches (209) 754-6477 cdcalaveras@ucdavis.edu, or Sherry Cooper, (530) 224-4902, slcooper@nature.berkeley.edu.

Details on future workshop locations and dates will be developed soon. To be put on the mailing list for future workshops contact Sherry Cooper, (530) 224-4902, slcooper@nature.berkeley.edu.

For more information on these calendar events call the number provided or the Forest Stewardship Helpline, 1-800-738-TREE. To submit an event, contact Sherry Cooper, 530-224-4902; slcooper@nature.berkeley.edu. Find a more comprehensive calendar at the Forest Stewardship website http://ceres.ca.gov/foreststeward.

New moniker, same mission

The California Department of Forestry and Fire Protection (CDF) has replaced the "CDF" moniker with "CAL FIRE."

According to Ruben Grijalva, CAL FIRE Director, "Over the last 100 years our mission has become increasingly complex and the length of our full department name reflects that. The use of CAL FIRE incorporates all aspects of our department –fire protection, resource management, and the Office of the State Fire Marshal."

The department's mission has not changed…CAL FIRE will be used to reflect the full services provided by the California Department of Forestry and Fire Protection.

Forest management under new conditions

Over the last 100–150 years, California has experienced a warming trend which is expected to continue into the foreseeable future.

When we talk about California forests we usually start with the basics: California has a Mediterranean climate with warm, dry summers and cool, wet winters…

The climate–temperature, precipitation, soil moisture, snow pack, and other parameters–sets the stage for what can live in a given location.

Plants and animals live in communities that consist of associations of species that are generally stable and have adapted to the local climate and to one another. Forest managers rely on that stability and on past experience of how the forest community operates to make management decisions.

What would happen if the climate changed dramatically?

The geological record shows a history of extreme fluctuations in climate. There have been numerous ice ages as well as warm periods lasting thousands of years. There is now evidence that climate can change very abruptly from one extreme to another, sometimes in decades.

Over the last 100–150 years, California has experienced a warming trend which is expected to continue into the foreseeable future. Without going into the possible causes of these changes–whether natural oscillations or human-caused–there are reasons for concern from a forest management perspective. All models point to a rapid climate change that could have profound impacts on forest communities as we know them.

Warming temperatures may threaten species, such as pikas, that rely on a limited habitat.

Dr. Lloyd Glenn Ingles © Cal Academy of Sciences

Warmer temperatures mean longer, drier summers as well as changes in seasonal water availability due to smaller snowpacks and rapid snowmelt. Decreased soil moisture could stress trees making them more susceptible to insect attack and disease. Standing dead trees would increase the danger of wildfire, as would the longer fire season.

Insect emergence is often temperature dependent. Warmer temperatures would lead to earlier emergence and, in some cases, more broods per year. This could result in severe outbreaks that could kill healthy trees, which in turn could result in more fuel for fires.

Ecological communities are associations of species that share similar habitat requirements. However, each species has its own unique set of tolerances so even small changes in climate could change these associations. Plant communities as we know them could dissolve and reorganize in new and novel ways, resulting in new ecological relationships and interactions, such as competition, for both plants and animals. Some species might not be able to make the transition to a changed community structure. Generalist species might be expected to fare better than those that are highly specialized.

Some other possible ramifications of rapid climate change:

- Pests and invasive species might move into new communities if existing barriers such as cold winters no longer restrain them.
- Local tree varieties might become less genetically suited to the changed environment and less able to regenerate.
- Pollinators and their host plants could be endangered if timing of emergence and flowering becomes out of synch.
- Current forestry practices would have to change, e.g., tree spacing, harvest schedule, etc.

Sound forest management requires creative, proactive strategies to respond to potential risks. The possible magnitude of the threat to California forests makes climate change a crucial management concern.

–for more discussion see Skinner, Carl N. 2007. Silviculture and Forest Management Under a Rapidly Changing Climate *(see page 10).*

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❑ To save on printing costs and paper, we encourage you to get the internet version of Forestland Steward. Check here for an email copy of each issue instead of a hard copy.

Send to CAL FIRE, Forestry Assistance, P.O. Box 944246, Sacramento, CA 94244-2460. Phone: (916) 653-8286; Fax: (916) 653-8957; email: jeff.calvert@fire.ca.gov