CALIFORNIA FOREST STEWARDSHIP PROGRAM FALL 2006

FORESTLAND STEWARD

WORKING TOGETHER FOR HEALTHY FORESTS

Forest Management Part III:
Managing existing stands of trees

No matter what your forest goals–improved forest health, increased habitat for wildlife, income from timber, etc.–you will have to decide what steps to take to reach those goals. The management practices discussed in this issue include many of the tools you'll use to create the forest you desire. You will find that the same basic management techniques can be used to achieve a variety of objectives.

Forestland management is conducted over a very long time span, often exceeding the landowner's lifetime. The impacts are far-reaching. Your decisions affect you and your family as well as neighbors. They have repercussions on nearby lands and streams, on water sources hundreds of miles away, on wildlife, fire safety, water quality, and scenic values. Even a decision to do nothing will impact a multitude of resources.

Inactive vs. active management

Inactive management is the conscious decision to be hands-off and let nature take its course. Be aware, however, that this type of management can have as profound an impact on the forest as active management.

Few forests in California are in a "natural" state. Over the years they have been harvested, grazed, bisected by roads, invaded by non-native species, and altered in numerous ways.

In addition, fire suppression over the last 100 years has had a profound effect on our forests, which require fire to keep them healthy and diverse. Fire suppression may lead to overgrown forests that are vulnerable to insect and disease attacks as well as catastrophic fires. Even if you choose an inactive management approach, you should carefully consider fire issues.

Active management can include a number of techniques, or treatments. Many of these are chosen to mimic or speed up natural processes. For example, thinning can relieve overcrowded conditions in the absence of fire and at the same time encourage specific species to grow more quickly. Treatments may be chosen to improve the quality of timber for harvest, to change the species composition for wildlife habitat, to decrease the risk of fire, or for a host of other purposes.

N O T E : This discussion includes terms defined in the two previous parts (Winter & Spring).

No, you didn't miss an issue

Due to a glitch, we have been on hiatus for a few months. We now return to our regularly scheduled newsletter, and continue with Part III of the series on forest management.

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Inside

2 Silviculture
5 Intermediate treatments
6 Regeneration
10 Winter's coming
12 Restoration

FORESTLAND STEWARD

Forestland Steward is a joint project of the CA Dept of Forestry and Fire Protection, UC Cooperative Extension, and USDA Forest Service to provide information on the stewardship of private forestlands in California.

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Using silviculture to meet your forest goals

You've come up with your forest management goals and objectives…now what? This is the point at which you will use all your knowledge of trees and forests to plan the on-the-ground activities necessary to achieve your goals.

The plan of treatments for a forest stand over its entire life is called a silvicultural system. Silvicultural systems are named on the basis of the age classes (whether trees in the stand are the same age [even-aged] or varying ages [uneven-aged]), and the regeneration method used (e.g., clearcutting, seed tree, shelterwood, selection). In addition, there are intermediate treatments that can be done while a forest is young to improve the mature forest.

Each silvicultural system is unique and designed specifically for the particular property and landowner goals. Methods are selected based on the type and condition of the land as well as management objectives. In addition, these systems must be designed and executed properly to minimize long-term damage caused by any entry into the forest stands.

If timber harvest is one of your goals, you'll need to work with a registered professional forester (RPF) to come up with a long-term plan for your forest. The Forest Practice Rules are very specific on how harvesting is done.

Common silvicultural systems are listed below.

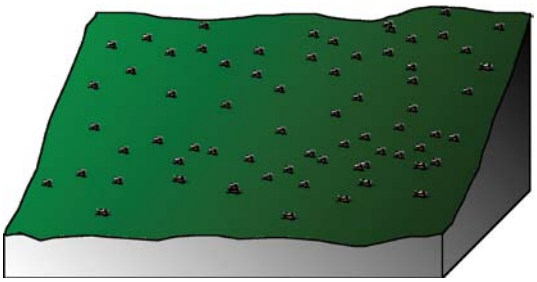
Even-aged management

Trees under even-aged systems are roughly the same age and managed as a group. In a large landholding, even-aged units are often staggered over the landscape so there are many different age classes. In California, units generally cannot exceed 20 acres and typically are regenerated by planting seedlings. Types of even-aged management include clearcuts, seed tree, and shelterwood.

Clearcuts. All trees in a stand are cut at the same time in a clearcut system. Seeds from surrounding trees, root sprouts or, most commonly, nursery-grown seedlings are used to regenerate the stand.

Harvesting practices are especially restricted in sensitive areas such as along watercourses, near wet areas, and habitats with threatened and endangered species.

Clearcutting provides an open environment with plenty of sunlight, thus clearcutting is best for regenerating shade-intolerant species. Site



Clearcuts. *All trees in the stand cut at the same time.*

preparation, the removal of woody logging debris and weed competition prior to planting, is required for successful regeneration.

Besides its use for timber harvest, clearcutting can be the method of choice for a stand that has been severely impacted by past practices. It is often prescribed when the current stand has deteriorated due to high grading. High grading removes the biggest and best trees leaving poorly developed trees behind. In this case it may be better to completely remove the depleted stand and start over.

Clearcutting alters wildlife habitat and may displace species that require mature forests. The plants, shrubs, and seedlings that replace the trees are favored by a different group of species, such as deer and elk. As a stand grows and matures, the wildlife that use it will change. In a large landholding, a series of clearcuts over time can provide a variety of habitat types across the landscape including stands of young, middle-aged, and older trees.

The advantage to clearcutting is efficiency. It is relatively easy to lay out a clearcut block and there is little to no danger of damaging remaining trees. Another advantage is that temporary road systems are closed. Roads are a significant source of sediment in streams so closing roads after the harvest decreases the long-term production of sediment to streams.

The big disadvantage to clearcutting and other even-aged management systems is visual. The forest changes abruptly from a mature stand to a very young one, and logging debris is clearly evident.

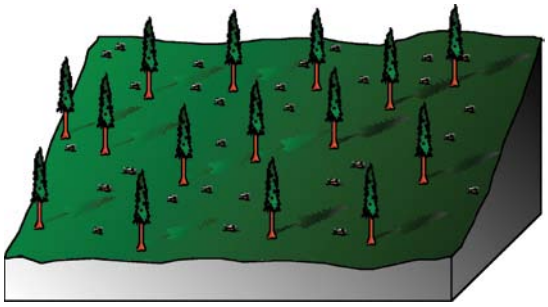
There are many variations of clearcutting and not every tree has to be removed. "Fuzzy clearcuts" may retain smaller or unmerchantable trees to provide some habitat and/or a few trees that will begin to grow quickly when

released from the competition of other trees. Fuzzy clearcuts with islands of mature vegetation provide cover for wildlife as well as structure and diversity in the future stand.

Seed Tree. In the seed tree silvicultural system, the stand is removed except for a few desirable trees left to produce seed. The quality of the seed trees, their distribution, and the timing of the harvest are important considerations here.

The seed tree system is applied generally to shade-intolerant species that regenerate best in full sunlight. Site preparation may be required to remove logging debris and competing plants before the new stand can become established.

Usually the seed trees are removed after regeneration is well established. If you wait too long, however, the young trees can be damaged when the seed trees are harvested. Seed tree silviculture has similar advantages and disadvantages to clearcutting. Natural regeneration by seed trees often results in clumpy distribution of seedlings. Thinning to minimize competition and additional planting to obtain all the desired species may be necessary.

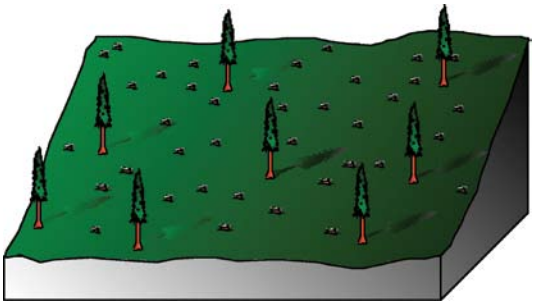


Shelterwood. *Trees are harvested in stages to provide shade to seedlings.*

Shelterwood. The shelterwood system is applied when the species to be regenerated require protection from direct sunlight to establish. Species that naturally regenerate in the shade are favored.

Trees are harvested in stages. Depending on the condition of the stand, two or three cuttings can be used. The initial cutting is to improve the vigor and seed production of the remaining trees and to prepare the site for seedlings. The remaining trees provide shade and shelter for the seedlings.

Subsequent harvests remove the shelterwood trees and allow regeneration to develop as an even-aged stand. Because the mature trees are removed in stages there is less visual impact



Seed tree system. *A few trees are left behind to produce seed. These trees are later removed.*

until the final harvest. As with seed trees, natural regeneration by shelterwood can result in clumpy distribution of seedlings. As they grow, thinning may help minimize competition.

Uneven-aged management

An uneven-aged forest has trees of many age and size classes. Periodic cuttings occur to establish and maintain this structure. Careful logging is crucial to protect residual trees from damage from repeated harvesting operations.

A disadvantage to uneven-aged silvicultural systems is the number of roads that are opened and the frequency with which they are used. Unlike even-aged methods where only those stands being operated on need open roads, with uneven-aged silviculture the entire forest may be visited every cutting cycle–typically every 10 or 20 years–and the entire road system activated for each harvest. Uneven-aged silvicultural systems are mandated for Non-industrial Timber Management Plans (NTMPs).

Single-Tree Selection. In single-tree selection, a forester evaluates every tree in the stand and, in accordance with the landowner's objectives, individual trees are removed. Cuttings can be more frequent than with other systems, providing income to the landowner on a regular basis but at a lower return per harvest.

Single-tree selection rates high in terms of aesthetics. To the untrained eye it can be difficult to know that harvesting was conducted at all.

Single-tree selection systems are more difficult to manage than even-aged systems. Marking individual trees for harvest takes considerable time, and logging must be done carefully to avoid damaging the remaining trees.

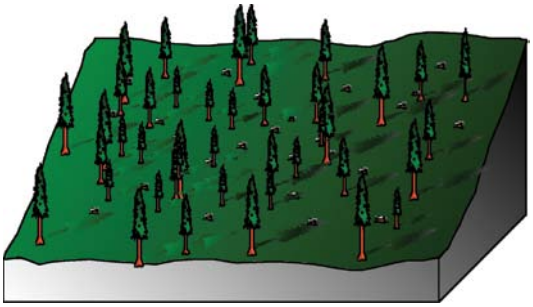
Single tree selection can be used to influence the mix of species in the forest or to improve overall stand health. Seedlings develop wherever

(continued next page)

Silviculture: *the science and art of producing, tending, and harvesting a forest.*

Improve the species diversity of your forest stand by planting desired species in small openings created by clearcutting or group selection harvesting.

Adapted from the UC Cooperative Extension Forest Landowner's Curriculum. Special thanks to artist John LeBlanc for the graphics in this article.



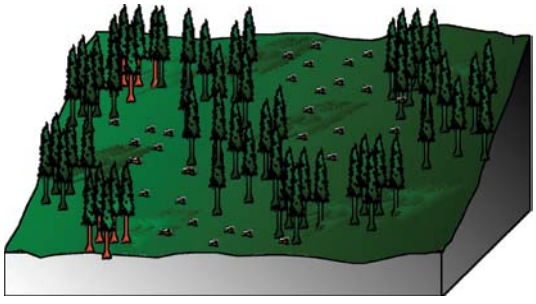
Single-tree selection. *Trees are chosen carefully and harvested singly.*

One way to retain elements of the forest needed by wildlife is with variable retention harvesting. In this system, trees or groups of vegetation are retained to provide shelter and refuge for a variety of animals and plants.

openings are provided. Shade-tolerant species tend to be favored over shade-intolerant ones in stands with dense cover. Larger openings must be provided for shade intolerant species. It may be tempting to high grade (take only the best trees) but this should be avoided. High grading eventually reduces the quality of the trees on the site. A well marked single-tree selection harvest typically removes trees from a wide range of diameters while giving consideration to species composition, stand structure, and habitat.

Group Selection. A group selection silvicultural system involves harvest of small groups rather than individual trees. The openings are less than 2.5 acres in size. Because the openings are small, trees on the edges of the cut typically influence the regeneration of the entire opening. This method is similar to single-tree selection in that harvests are frequent. Its advantage is that it is easier for loggers to avoid damaging the residual stand. Group selection can be used to develop a mix of species including intolerant species that require more light.

Keep in mind that a group selection cut permits single-tree selection harvest of the stands between the groups. Also regulators limit the area covered by groups with any single entry to no more than 20 percent of the total area harvested. So on a 100-acre parcel up to 20 acres could be removed in small groups, each less than 2.5 acres in size, and the remainder (80 acres) harvested under single-tree selection.

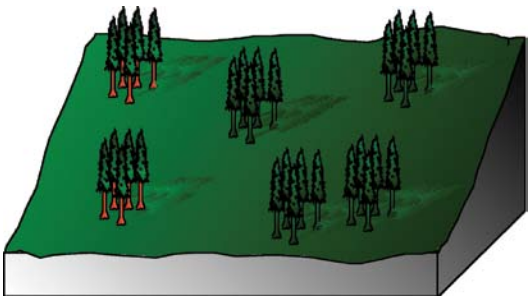


Group selection. *Trees are harvested in small groups less than 2.5 acres in size.*

Special prescriptions

Several special treatments that do not fall into any of the silvicultural systems above are also permitted under the Forest Practice Rules.

Variable Retention. The goal of variable retention is to retain stand structure elements of the current forest that are valued by wildlife, that are easy to protect yet difficult to create. Older trees or groups of vegetation are retained during harvest either as individuals or in groups. Often individual trees of low economic value but high wildlife or scenic value are retained. Animals, plants, and fungi have a place of refuge in the harvested unit. Generally, about 10-15 percent of the original forest stand is retained under this prescription. This is an attractive option for many landowners.



Variable retention. *Valuable elements of the forest are retained to provide refuge for wildlife.*

Special treatment area prescriptions: Methods tailored for special areas. For example, an archaeological site is a special treatment area.

Rehabilitation of understocked areas: Used in areas of commercial timberland that are being underutilized. The area can be harvested if replanted with a specified number of seedlings.

Fuelbreak/defensible space. Used to reduce the danger of wildfire. A specified number of trees or seedlings must be left immediately after harvest. A RPF must describe specific vegetation and fuels treatment to reduce fuels to meet the objectives of the fuelbreak area.

Adjustments along the way: intermediate treatments

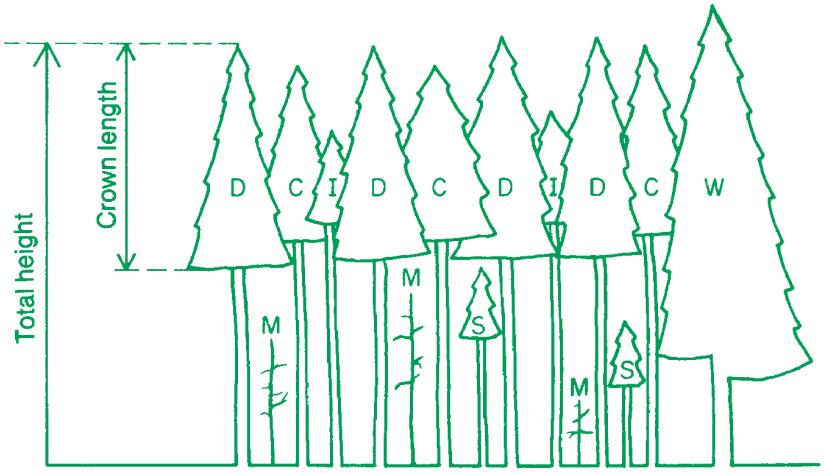
As your forest grows, you may choose to do some intermediate treatments such as thinning, improvement cuttings, and pruning to help achieve the forest you want. These treatments are used to increase the health of a stand, shift species composition, and improve timber quality. Intermediate treatments are considered either commercial or pre-commercial depending on whether the harvested trees are sold for revenue.

Thinning. Trees compete for sunlight, water, and soil nutrients. Removing some of the trees in the stand can reduce the competition and accelerate growth in those that remain. There are high thinnings (thinning from above) where dominant and co-dominant trees are removed, or low thinnings (thinning from below) where smaller trees below the dominant trees are removed.

How do you decide which trees to take or leave? The answer depends on your objectives, the species present, site conditions, and other factors. Some rules-of-thumb:

- Thin early in the life of a stand rather than later.
- Consider thinning when tree crowns begin to touch.
- Remove trees with poor form or evidence of damage, insects, or disease are usually removed.
- Remember that trees with less than one-third their total height in live branches rarely respond well to thinning.

One way to gauge the health of a tree is by its crown ratio, the percentage of the total height of the tree that is in live branches. In the figure above, the dominant trees have about a 50 percent crown ratio, the co-dominants about 40 percent, intermediates about 30 percent, and the suppressed trees about 20 percent. Larger crown ratios mean a tree can produce more food from sunlight in a day. Trees with low crown ratios are more susceptible to insect attacks.



D=Dominant; C=Co-dominant; I=Intermediate; S=Suppressed; W=Wolf. Crown classes are used to describe these trees. Dominant trees are the largest in the stand; they receive full sunlight on all sides of their crown. Co-dominant trees are mixed with other trees and receive full sunlight on much of their crowns. Intermediate trees get full sunlight only on a small part of their crown. Suppressed trees receive almost no full sunlight. Mortality represents dead trees. A "wolf tree" has an unusually large crown.

Crown class is just one method used to select trees. The type of tree selected for treatment depends on landowner's goals. Some species, like white fir, can survive as suppressed trees and respond if surrounding trees are removed. Others, like ponderosa pine, do not survive well as suppressed trees and older trees may not respond to thinning.

Improvement cuttings are prescribed to remove undesirable trees and shrubs to favor desirable ones. The choice of species depends on landowner's objectives for timber, wildlife, aesthetic appeal, or recreation. Many trees that have little to no timber value may be left for these other purposes.

Pruning. Pruning is a labor-intensive activity used to improve the health of trees, to remove branches that could cause property damage or injury, and to increase the value of timber. Pruning lower branches can result in knot-free wood. However, there is a balance between letting trees develop full crowns and pruning lower branches to produce clear wood in the lower portions of the tree.

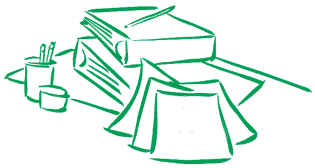
It is very important that pruning be done correctly. This means knowing when to prune, what to prune and how, using the proper equipment, and above all, doing the job safely.

The type of tree you choose for treatment depends on your goals. For purely timber production, wolf trees use up too much space. But as they die and decompose, wolf trees can make excellent snags for wildlife.

Steps to growing a new forest

Planning planning planning

The key to planting success is proper planning. This should begin about a year in advance of the actual planting.



Silvicultural systems are first and foremost the means by which forests are regenerated. Rapid regeneration prevents erosion and speeds up the time from stand establishment to harvest.

The California Forest Practice Act requires that landowners regenerate their forest following timber harvest or leave it in a stocked condition with reserved trees. The Forest Practice Rules require that a stand have a minimum number of trees within five years following harvest, and compliance is monitored by a California Department of Forestry and Fire Protection (CDF) inspector. The exact rules vary by region and site. Planning before harvest will go a long way towards reducing costs and securing adequate regeneration quickly.

A forest stand can be regenerated in two ways: naturally or artificially.

Natural regeneration generally comes from seed produced by trees left in the harvest unit or bordering it. Some trees, e.g. some oaks and redwoods, can be regenerated by sprouting from stumps or roots. Many brush species and trees such as tanoak and madrone are also vigorous sprouters.

Natural regeneration is the least expensive option for a landowner and should be encouraged whenever possible. Natural regeneration requires seed production, successful germination, and seedling growth. Seed production in any given year depends on weather and other factors. If your harvest occurs in a poor seed year, you may need to supplement with artificial regeneration.

Artificial regeneration involves sowing seed or planting seedlings to regenerate the stand. It is used to change species composition, to establish a stand of genetically superior trees, when natural regeneration fails or is inadequate to establish a stand, or to give young trees a better chance of competing against brush, grass, animals, drought, or the myriad other living things in the soil. Artificial regeneration also reduces the risk of a poor seed year or poor germination conditions by using hardy 1- to 2-year-old seedlings.

In California, seed is rarely sown. Experience has shown that most seed is likely to be eaten by animals or damaged by disease. The most successful artificial regeneration method is planting seedlings, which allows for better control of spacing, species, and genetic composition.

The key to planting success is proper planning. This should begin about a year in advance of the actual planting. Seedlings to be planted in the winter need to be ordered from the nursery in the fall.

Dr. Robert Thomas and Margaret Orr © California Academy of Sciences

Getting Ready—Site Preparation

Site preparation is vital. Neglecting this step can lead to seedling losses ranging from 40 to nearly 100 percent; your entire planting investment may be lost. With good site preparation and proper planting techniques a landowner can expect less than 20 percent seedling mortality.

A seedling faces a great number of difficulties on its way to becoming a tree. There is the constant threat that rodents or rabbits may gnaw it, deer or livestock browse or trample it, or frost action heave it from the soil. Seedlings are susceptible to being burned, drowned, shaded, or starved. Whether artificially planted or naturally germinated, seedlings need all the help you can give.

The greatest challenge of all is making sure seedlings get their full share of soil moisture and nutrients. This is especially critical in California with its Mediterranean climate characterized by long, rain-free summers. Soil moisture is severely limiting here. All the moisture that seedlings will have for survival and growth is in the soil.

Site preparation can limit the dangers a seedling will face in its first, most critical, years of survival. Consider every likely threat to the new stand and try to minimize it. Post the area, fence out livestock, and remove brush piles that harbor rabbits and rodents. You can reduce competition by removing as much brush and grass as possible. Management of competing vegetation does not necessarily end after planting. When brush is especially vigorous, you may have to repeat some treatments either by hand, herbicides, or with machines to ensure seedling survival.

If you are using natural regeneration, you will need to prepare a seedbed that favors germination. All site preparation techniques should be planned and carried out to minimize loss of valuable topsoil.

Mechanical Preparation is accomplished with various devices attached to a bulldozer or tractor. Be aware that soil compaction can be an issue when using heavy equipment. However, where soil compaction exists, deep ripping can actually improve soil productivity depending on soil type.

Brushy areas may require crushing, chopping, or brush raking. Logging residue (slash) must be cleared from the site to facilitate planting and weed control, and to minimize fuel loads and fire risk. Brush rakes, a specialized blade, can uproot and push brush and logging debris into piles, or windrows, where they rot or are burned. A careful operator will scrape up very little soil, which is important for soil productivity.

Unburned windrows may serve as habitat for small animals. Depending on landowner objectives, this can be an asset or a liability. Landowners who wish to encourage wildlife such as quail or rabbits might want to leave the windrows. This is likely to result in some seedling loss, mainly from small rodents.

Controlled Fire. Used with care, controlled fire can be an effective way to reduce slash or large brush piles and provide better planting conditions. Controlled burning also reduces fire hazard by consuming fuel. Burning alone may not achieve complete site preparation, in part because fire can encourage the regeneration of some competing shrub species. Post-planting treatment of brush may therefore be necessary on some sites.

In addition, cool, low intensity fires are best since intense fire may have undesirable effects on physical and chemical soil properties. If fires burn too hot, soil nutrients may be lost and the soil become less permeable to water, causing erosion as water runs off the surface rather than being absorbed into the soil. This, combined with a lack of plants to hold the soil, increases the chance for serious erosion and lessens the chance for a plantation's survival.

A professional forester and local fire officials must be consulted before attempting controlled burning. Controlled burns require a fire permit and a plan to control the fire should it escape. You may be required to submit a written Smoke Management Plan or Air Pollution Control Plan. In some areas, the Air Resources Board may collect a per-acre fee for burning. If the fire escapes, the landowner may be held legally liable for all suppression costs and damages related to the fire.

While there are some disadvantages to using fire as a site preparation tool, it can be highly efficient and cost effective when used carefully. Fire is the tool of choice for site preparation in many commercial operations where steep slopes preclude use of mechanical site preparation and heavy slash requires treatment.

Chemical Site Preparation. Herbicides are often used to reduce competition from weeds, especially in follow-up treatments. Herbicides can be sprayed over large areas quickly from the air or more slowly but under closer control from the ground. Some herbicides are injected directly into the stems of unwanted plants.

It is critically important to use the correct herbicide, at the proper rate, and at the right time. By Federal law every herbicide must be registered with the Environmental Protection Agency. In California, pesticides must also be registered by the California Department of Pesticide Regulation. The regulations require that all herbicides be labeled with proper use and warning information that explains how to safely and effectively apply the product. You are required by law to read and follow the instructions on the label. Your County Agricultural Commissioner can provide information on the registration of different chemicals used in the forest and any legal considerations that may apply. Laws vary by county. Some counties do not allow aerial application.

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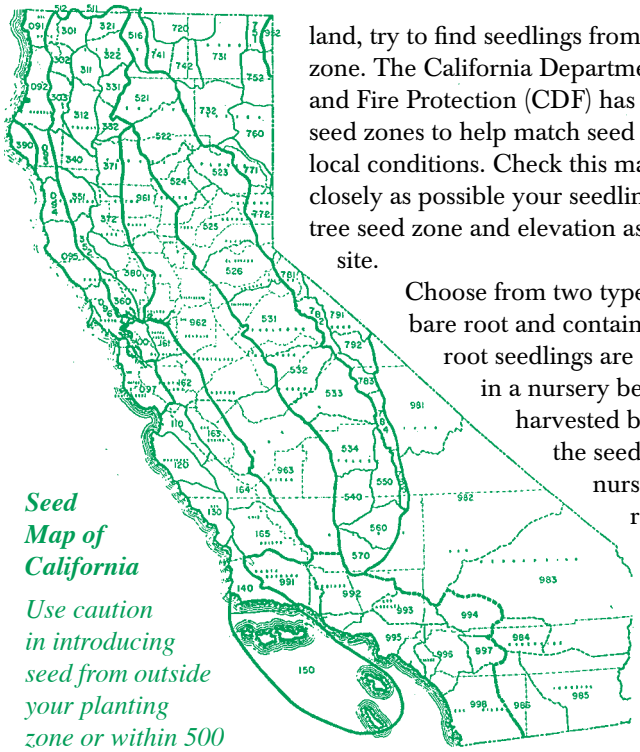
A seedling faces a great number of difficulties on its way to becoming a tree. Rodents may gnaw it, deer or livestock browse or trample it, or frost heave it from the soil. It is susceptible to being burned, drowned, shaded, or starved. Whether planted or naturally germinated, seedlings need all the help you can give.

Selecting the seedling stock

Seedling survival depends on how well the seedling is adapted to the characteristics (elevation, aspect, moisture, soil conditions, etc.) of the site it is planted on. If possible, contract with a nursery to grow seedlings from seed collected on your land. The trees currently growing there are best adapted to the unique conditions of your property.

If you are not able to use stock from your



Seed Map of California

Use caution in introducing seed from outside your planting zone or within 500 foot elevation of your planting location.

Seedlings are available from numerous private nurseries and the CDF Nursery—call 530-872-6301. Generally, these nurseries can supply appropriate stock by knowing the county, nearest town, and elevation of your planting site. Large orders can be contracted 1 or 2 growing seasons in advance of planting.

land, try to find seedlings from the same seed zone. The California Department of Forestry and Fire Protection (CDF) has established tree seed zones to help match seed and seedlings to local conditions. Check this map and match as closely as possible your seedlings with the same tree seed zone and elevation as your planting site.

Choose from two types of seedlings–bare root and containerized. Bare root seedlings are grown outdoors in a nursery bed and are harvested by carefully lifting the seedling from the nursery when their root regeneration capacity is at its maximum. The bare roots of the seedlings must be kept moist and cold and must be planted while dormant to avoid damage to the roots.

Bare root seedlings. Nursery catalogs list bare root planting stock as 1-0, 2-0, 2-2 or some other combination of two numerals. The first numeral refers to the number of years the tree spent in the seedbed. The second is the number of years spent in a transplant bed. Therefore, 2-2 stock is 4 years old and quite large. Trees that come directly from a seedbed (1-0, 2-0, 3-0) are called seedlings. Those that come from a transplant bed are called transplants. A rule of thumb is to use transplants on harsh sites and seedlings for easier sites. Transplants cost considerably more because they take more time and labor to produce. Your particular site conditions determine the stock type you need. Typically 2-0 or 1-1 are planted to regenerate most stands.

Planting stock should be evaluated when received from the nursery. Trees must be dormant, and the buds firm with no evidence of new growth or shoot elongation. White root tips should be less than 1/4 inch. If you strip back the bark of the stem and root system on a couple of trees, the inner bark should be moist and glistening white. Mold or a sour odor suggests improper storage. If they are yellow, brown, or have brown spots, the stock is badly damaged and has little survival potential.

Proper care of your planting stock will increase their chances for survival. Keep the roots moist, the trees cool (between 32° and 36° F) and out of the sun. Plant as soon as possible after receiving your seedlings. If you must store them for more than 3 days, heel in your seedlings by planting them temporarily in a trench in a cool, shaded place. You can store the trees this way for 7 to 10 days.

Containerized seedlings. Containerized seedlings have been grown from seed in a plastic container filled with a special soil mixture. Containerized seedlings are usually produced in a greenhouse under a carefully controlled environment. These seedlings can be planted during the growing season because their roots remain encased in the growing medium.

Containerized seedlings are usually more expensive than bare root stock. However, they can be grown in a shorter time, 4 to 8 months, thus reducing the lead time involved in the planning process. Containerized seedlings may be easier to plant in rocky soils where it is difficult to open a hole for larger bare root seedlings. Evaluation of containerized stock is similar to bare rootstock except that container stock does not need to be dormant.

Timing for planting

The best time to plant depends on the type of planting stock, soil condition, climate, and your location in the state. Before planting, the soil moisture should be at field capacity (the maximum water the soil can store against the force of gravity) to a depth of at least 12 inches. This will require about 2 to 4 inches of rainfall for most soil types. The soil temperature at 3˝ depth should be 40° F or higher and on a warming trend with additional rain expected in the season. These moisture and temperature requirements are essential for root growth.

Many landowners report best survival when seedlings are planted during a light rain or drizzle. Avoid planting during extended warm and dry periods, or when frost or extreme winds are likely. At higher elevations, plant when the snow is gone and the chance of frost is minimal.

In the Sierra Nevada, Northern California, and the eastern side of the Coast Range, planting conditions are usually optimal in late winter to early spring. On the warmer west side of the Coast Range planting can begin as early as late fall–once the rains have saturated the soil–and can continue through to late winter.

How many trees?

Determine the number of seedlings to plant by the size of the planting area and the spacing you will use.

Spacing is a function of the products you expect to harvest (landowner's objectives). Timber is usually grown at spacings from 8 x 8 feet (680 trees per acre [tpa]) to 12 x 12 feet (300 tpa). Closer spacing is necessary if poor survival is expected. Christmas trees are planted closer, commonly 5 x 5 feet (1240 tpa) or 6 x 6 feet (1210 tpa). Eucalyptus for firewood is planted at 6 x 6 feet (1210 tpa) to 7 x 7 feet (890 tpa).

Planting techniques

Various hand tools and machines are used for planting. Planting bars, hoe-dads (western planting tool), and mattocks are used with easily worked soil. The hoe-dad is generally the most effective in rough terrain with rocky soils. Power-driven augers can dig holes in compacted or hardpan soils. Planting machines are limited to fairly level sites with careful site preparation and are cost effective only for large areas.

Whichever technique is used, care of seedlings is of paramount importance. Always keep the roots moist, with no more than one hour worth of stock in the planting bag at one time. Each seedling should be planted erect at the depth it was planted in the nursery. The roots must be properly placed, pointing downward in the planting hole. Kinked roots or roots planted in a "J" shape will strangle themselves in a few years. Air pockets around the roots should be eliminated by firming the soil.

Every planting effort should be followed by regular regeneration surveys. To do this, a landowner visits new planting sites as often as possible to check seedling survival, plan for any replacement trees, and assess the need for releasing trees from competing vegetation. At a minimum, the site should be inspected at least once a year for the first three years, and every other year until year 10. The Forest Practice Rules require stocking reports following a harvest that uses even-aged silviculture until the harvested stands achieve required stocking levels.

Planting success

Planting represents a large investment that is carried over the life of a stand. It is in your best interest to:

1. Plan regeneration operations carefully.
2. Prepare your planting site.
3. Take proper care of your planting stock.
4. Closely supervise the planting crew.
5. Follow through with regeneration surveys that indicate where replanting and brush maintenance is necessary.

The success of your planting effort depends on each of these steps. It can only be as successful as the weakest link of these five steps.

—Adapted from the Forest Landowner's Curriculum

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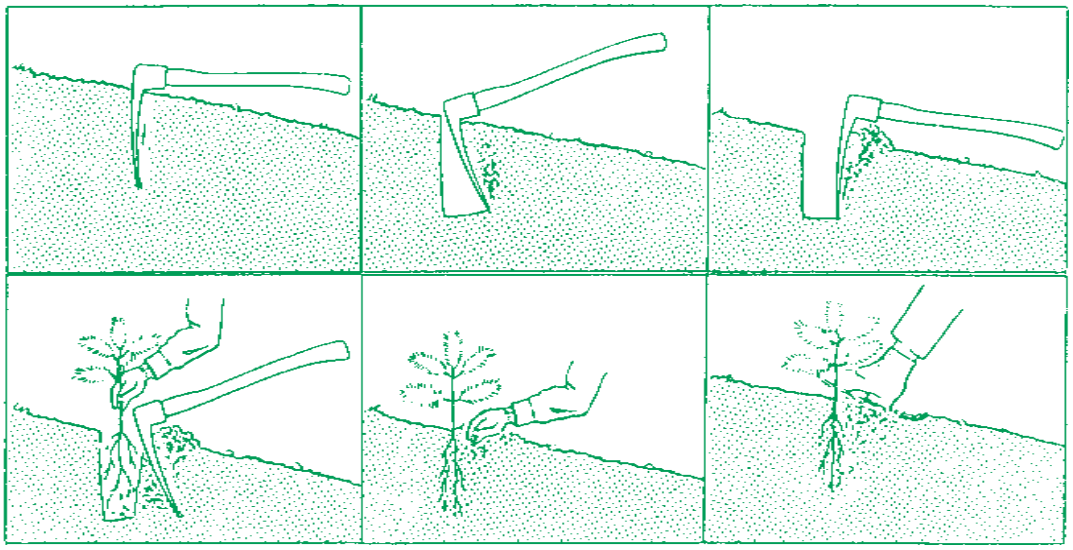

Planting technique

Seasonal Stewardship

*The **Handbook for Forest and Ranch Roads** and the **Forest and Ranch Roads DVD** or **video** are all available for sale from the Mendocino County Resource Conservation District at **http://mcrcd.org/pubs.html** or **707-468-9223**. These are invaluable resources for all forest landowners.*

Winter is coming…get ready

Each year at this time it is vitally important that you prepare for the coming rains. Do the maintenance and erosion work necessary to protect your property and waterways.

Roads

Before the rains come, inspect all the roads on your property and make sure they are ready for winter. Winterizing includes all the necessary activities needed to protect waterways from excess sediment.

- Make sure road surfaces drain correctly, and that ditches and culverts are open and free flowing.
- Construct waterbars where necessary on unsurfaced roads.
- Clean trash barriers, culvert inlet basins, and pipe inlets of debris and sediment.
- Clear plugged ditches and trim heavy concentrations of vegetation that impedes ditch flow.
- Excavate all potentially unstable fills and sidecast that could be delivered to a watercourse.
- Close seasonal and temporary roads.
- Get the *Handbook for Forest and Ranch Roads* by William Weaver, Danny Hagans, and Pacific Watershed Associates for more info (*see sidebar*).

Hazards

- Develop a hazard plan before a major storm strikes
- Identify hazardous trees, unstable soils or rock faces, or flashy stream crossings.
- When the soil is saturated with water landslides can occur, especially drainage headwall zones above steep gradients and large stream inner gorge areas.
- Consider alternate transportation routes in case of road failures or flooding.

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 (Butte) 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
530-683-6125; 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
Sandra Stone
707-562-8918; sstone01@fs.fed.us

Calendar

January 9–11, 2007
California Board of Forestry Meeting
Location: Sacramento
Contact: 916 653-8007
Notes: For an agenda, go to http://www.bof.fire.ca.gov/board/board_current_docs.aspx

January 31–February 2, 2007
California Forestry Assoc. Annual Meeting "The Role of Managed Forests in Meeting California's Clean Air and Renewable Energy Needs"
Location: Monterey, CA
Sponsor: California Forestry Association
Contact: Eleanor Anderson, (916) 444-6592, eleanora@cwo.com
Cost: TBA
Notes: Registration deadline TBA

February 7–8, 2007
California Board of Forestry Meeting
Location: Sacramento
Contact: 916 653-8007
Notes: http://www.bof.fire.ca.gov/board/board_current_docs.aspx

February 8, 2007
Oak Woodland Planner's Workshop
Location: San Luis Obispo, CA
Sponsor: UC Integrated Hardwood Range Management
Contact: Sherry Cooper, 530-224-4902; slcooper@nature.berkeley.edu
Cost: $20 due by Feb 2.
Notes: http://danr.ucop.edu/ihrmp/

February 13–14, 2007
Forests, Carbon and Climate Change Conference
Sponsor: Oregon Forest Resources Institute
Location: Corvallis, OR
Contact: OFRI 971-673-2944
Notes: http://www.oregonforests.org

March 5–9, 2007
Sudden Oak Death Science Symposium
Hyatt Vineyard Creek, Santa Rosa, California
Cost: $250
Notes: http://nature.berkeley.edu/comtf/sodsymposium/index.html

March 7–8, 2007
California Board of Forestry Meeting
Location: Sacramento
Contact: 916 653-8007
Notes: http://www.bof.fire.ca.gov/board/board_current_docs.aspx

Grant Writing Workshops

The Fire Safe California Grants Clearinghouse offers a one-stop shop that simplifies the process of finding and applying for grants to improve California's community wildfire preparedness. They are currently sponsoring workshops on grantwriting. For more information go to http://www.grants.firesafecouncil.org/.

January 8, 10am–1pm
Sonoma-Lake-Napa CDF Unit Office, 1199 Big Tree Road, St. Helena

January 9, 10am–1pm
Sierra National Forest Supervisor's Office, 1600 Tollhouse Road, Clovis, CA

January 12, 10am–1pm
San Juan Oaks Golf Club, 3825 Union Road, Hollister, CA

January 13, 10am–1pm
Silverado Community Center, 27641 Silverado Canyon Road, Silverado, CA

January 15, 10am–1pm
Ventura County Fire Training Center, 102 Durley Ave., Camarillo, CA

March 26–29, 2007
2007 California Interagency Prevention/ Mitigation/Education Conference
Location: Rancho Cordova, CA
Contact: Jeff Tunnell at (707) 275-1443 (jtunnell@fs.fed.us); Marty O'Toole at (805) 370-2364 (marty_o'toole@nps.gov)
Notes: http://www.fs.fed.us/r5/fire/management/prev_conf/. You must register no later than March 1. Limited to the first 200 registered persons.

March 26–30, 2007
Fire Behavior and Fuels Conference: Fire Behavior Fundamentals and Applications
Location: San Diego, CA
Sponsor: International Assoc. of Wildland Fire
Contact: 650-890-2348, jawf@iawfonline.org
Cost: TBA
Notes: http://www.iawfonline.org/conferences.shtml

Interested in a forest stewardship workshop in your area?

Forest Stewardship workshops will be offered throughout the state by UC Extension Forestry this year. Times and locations are not yet available. Please contact Sherry Cooper if you are interested in attending one of these excellent workshops, 530-224-4902.

For more information on these 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.

If restoration is your goal

(below) Revegetating with seedlings. (below right) Bioengineering project using living willows to stabilize the streambank.

Restoration is an important goal for many landowners. But restoration is a very open-ended concept that means different things to different people. Be specific in defining your forest restoration goals. Your goal may be:

- a healthier forest
- a forest with a specific type of wildlife habitat
- a pre-European forest condition
- a native forest without exotic species

The better you can define your vision of restoration, the better you will be able to meet your goals. Here are some types of restoration projects:

Forestry restoration. If you have lands that have been heavily cut, your focus might be establishing a healthy, mature forest. You might do this through a series of selection cuts or thinnings that allow the forest to increase in volume.

Riparian restoration. This could include a number of overlapping projects. Some might focus on keeping stream temperature down by planting trees to provide shade canopy. Those trees can also help improve bank stability. In some cases, you might put large woody debris or large rocks in strategic locations to protect banks from erosion or to help create pools for fish. Bioengineering projects use living material, such as willows, to stabilize streambanks and filter sediment.

Erosion control. Projects to reduce erosion often focus on getting water into its original drainage. Water is often diverted by roads or skid trails. Erosion can also occur on areas denuded of vegetation.

Oak-woodlands restoration. This would include projects such as preventing conifer encroachment and planting oaks.

Control of exotics. This type of activity aims to reduce or eliminate a species that is not native such as star thistle, broom, etc. You might aim to eliminate the exotics on your entire property or a portion of it.

Habitat manipulation for a particular species, type, or group of species. You might wish to encourage certain species (such as deer and elk) or a specific type of species (waterfowl) to utilize your land. Or you might wish to discourage certain species for ecological or personal reasons. This can be done by manipulating the kinds of trees and shrubs in the forest, the availability of snags, downed woody debris, year-round water, or other critical habitat elements.

Recovery after wildfire. This could include a range of projects like planting trees, spreading grass seed, erosion control, etc.

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My suggestions are _____

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Organization _____

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City, Zip _____Phone _____

e-mail_____

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