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The Woodland Workbook

Stand Management

Fuelwood Management:

Opportunities and options

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Heating is one of the oldest uses of wood. Even today, fuelwood is a main product of the forests in many parts of the world. With the expected increase in fossil energy prices, have you considered fuelwood as an option for your forest land?

Fuelwood harvesting can not only yield an income but also improve the quality of your woodlot at the same time. It can pay for the cost of removing undesirable trees.

However, taken too far, wood gathering and fuelwood cutting can degrade a woodlot. To get the most out of your woodlot requires planning and management.

This publication will help you decide where and how to manage for fuelwood. It will help you make decisions needed to manage your woodlot productively and efficiently.

We'll explain first the various situations in which fuelwood management is a viable option. This will help you decide whether fuelwood management is for you.

Next, we describe several different management strategies so you can select the best strategy for your situation.

The last section deals with marketing of fuelwood. Here, we review different marketing options and address questions concerning liability and taxation.

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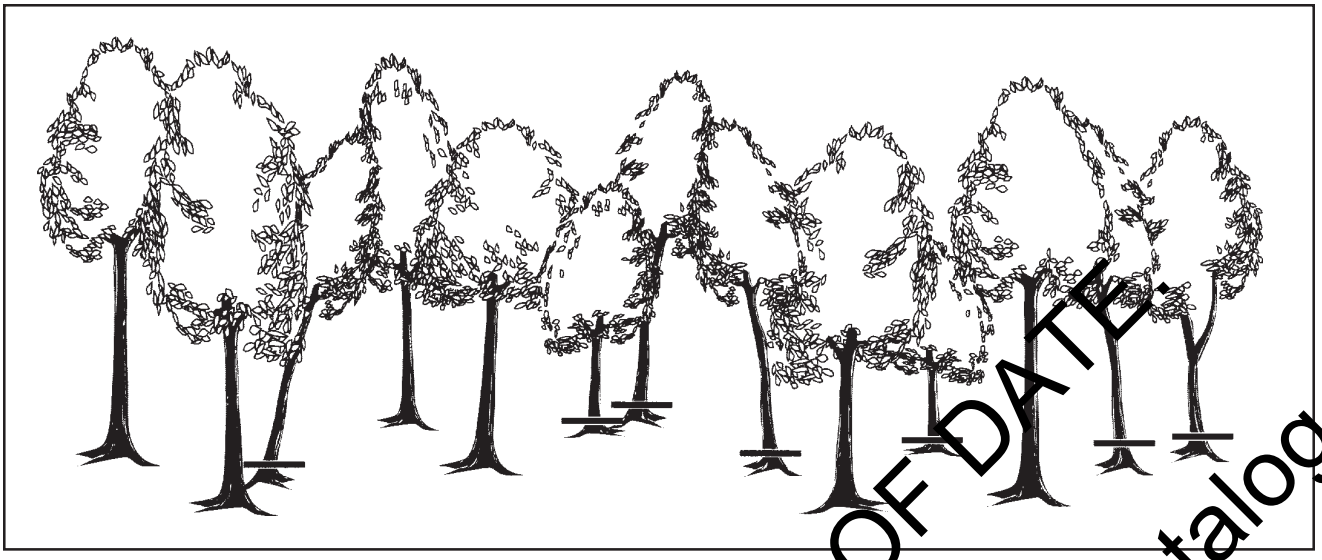

Figure 1.—*Early thinning may not yield saw-log products. However, the trees may be suitable as firewood. (Trees to be thinned are shown with the slash mark at the base.)*

Management situations

There are a number of possible situations that suggest fuelwood as a potential product from your woodlot. They can be grouped into two categories:

1. *Fuelwood as a secondary product.* Even if your goal is saw and veneer logs, there's an opportunity to increase your revenues through firewood sales. Thinnings from young stands, damaged or crooked trees, or logging slash might be a source of firewood.
2. *Fuelwood as a primary product.* Your woodlot currently doesn't allow high quality timber production because of drought, disease, soil conditions, or lack of proper management in the past. Firewood management can be done fairly extensively and, therefore, can be a profitable option on sites where timber production doesn't pay. Alternatively, it can make the conversion to a productive timber stand feasible.

Fuelwood as a secondary product

When your primary management goal is saw or veneer timber production, you have to apply intermediate treatments, like thinnings, cleanings or salvage cuts. Many of these treatments yield little or no marketable timber.

Because of lack of time or money these treatments frequently don't get done at all or not at the right time. If you can use or sell at least part of the cut and otherwise unmarketable wood as fuelwood, you may be able to make the treatments affordable or even profitable.

We'll describe the most common situations in which you should consider fuelwood harvest: precommercial thinnings, cleaning and improvement cuts, salvage cuts, and logging slash.

Whether the additional work to use or sell the fuelwood is offset by the return from fuelwood sales depends on your special marketing situation. For more information about this topic, see "Marketing" (page 6).

Precommercial thinning

A thinning in which the removed trees are too small to be sold as timber is called a *precommercial thinning.* As plantations and natural stands grow, trees will compete with each other, and the stands become overstocked.

Overstocking results in reduced tree growth, low vigor, and tree death. To avoid this growth loss, you have to thin—that is, remove some trees to give the remaining (crop) trees more growing space (figure 1).

Precommercial thinning is an expensive but necessary operation to ensure quality timber production.

- Instead of leaving them to rot, you can remove the cut trees and sell them as fuelwood to help pay for the cost of thinning.
- Remember to leave pieces less than 2 inches in diameter. This allows most of the plant's nutrients to be recycled into the soil.

Cleaning and improvement cut

Cutting trees to improve species composition and stand quality in sapling stage and older stands are called *cleaning* and *improvement cuts.*

Most stands are a mixture of crop species, perhaps Douglas-fir, and a less desired species, like black oak or maple. Removing not only the oak and maple, but also the low quality Douglas-fir, will turn these woodlots into healthy, growing stands for timber production.

The cut trees may be too small or crooked to be sold to a saw mill (figure 2), but their use as firewood can make the stand improvement a profitable operation. You may want to leave some trees with low commercial value to enhance plant and wildlife diversity.

Salvage

Trees in your woodlot have been damaged by storm, frost, snow, or insects. Not only may many years of work and investment be lost but also the damage may create a potential for fire hazard or the buildup of insect pests.

Because of low quality, small piece size, or small total amount of wood, the only profitable way to use the damaged wood might be as fuelwood.

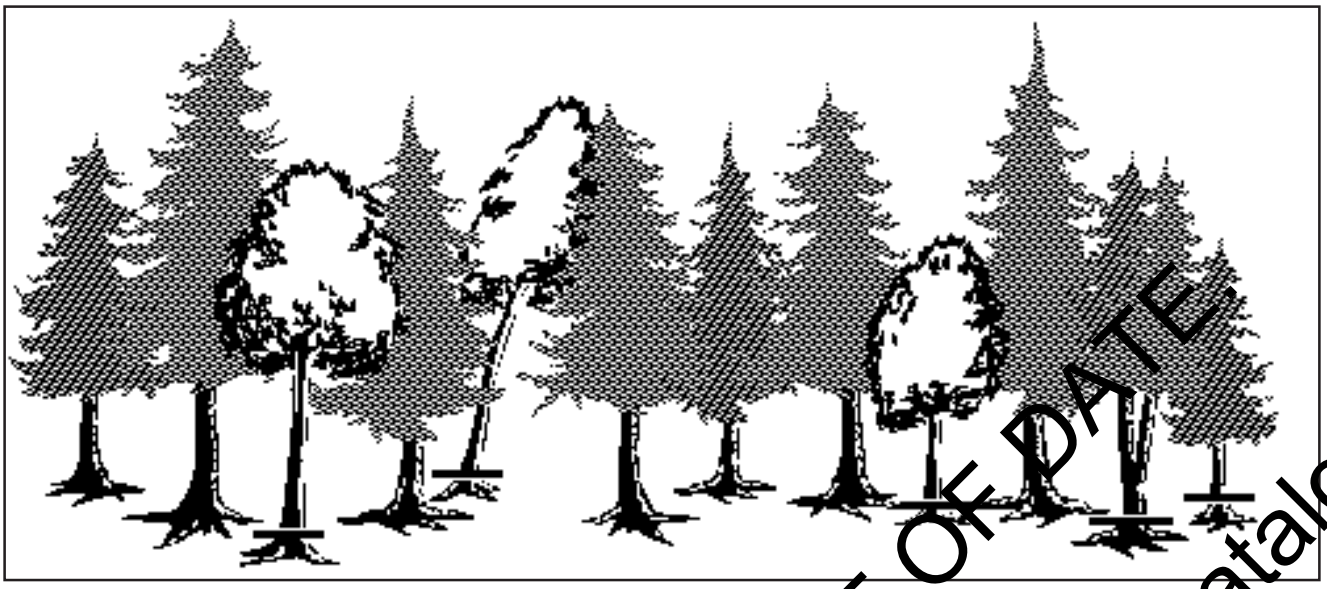

Figure 2.—*Removing low value species or trees for firewood increases stand value. This is an improved cut.*

Slash

Even in a profitable timber harvesting operation, there's room for increasing your revenue. The logging slash could be used as fuelwood. Tops, larger branches, and low quality parts of the stem, which would otherwise be left or piled and burned, can add up to a substantial amount of fuelwood.

For example, a typical conifer tree contains only 70% of its wood in the trunk; 10% is in the top or the branches. Using this "waste" improves the profit from the harvest—but remember to leave pieces less than 2 inches in diameter.

All these situations are treatments that can be part of high quality timber production. With relatively little cost, perhaps for supervising firewood cutters, you can considerably improve the profitability of these operations.

For more information on thinning, see EC 1183, *Managing Hardwood Stands for Timber Production*, and PNW 184, *Thinning: An Important Timber Management Tool*.

Fuelwood as a main product

There are several situations where fuelwood can be the main product of forest management. We'll describe three: a stand in poor condition, a tree nurse crop, and low quality sites.

Poor stand condition

If a stand is currently in a condition in which high value timber production is impossible, fuelwood management may be the only viable option to get some revenue from your land. The quality of the stems may be very poor or, alternatively, the stand might consist mostly of an "unmarketable" species.

A thinning or cleaning can provide firewood and give the remaining trees more room to grow. When all the trees have grown to the desired size, you can harvest them and sell or use them as fuelwood. Then reforest with a high value, timber-producing species. EC 1186, *Converting Western Oregon Red Alder Stands to Productive Conifer Forests*, discusses this option for stands of red alder.

Nurse crop

When your regeneration of crop trees fails because of frost or heat stress, a nurse crop can provide the cover necessary to allow plantation establishment.

This nurse crop is normally a frost-hardy or drought-tolerant species. It might not be suitable for high quality timber, but you could very well use it as fuelwood. For example, Pacific madrone might be used as a nurse crop for Douglas-fir on hot, dry slopes. We'll discuss how to choose a proper species in the next section.

Low site quality

Some sites in your woodlot may simply be unsuitable for producing high value timber. Temperature (too high or too low), water (too much or too little), or nutrients (low or unbalanced) can be a limiting factor for species selection or management. Nontraditional timber species, such as Pacific madrone, may be your only choice if you want to use your land for wood production. Managing for fuelwood can be done extensively and, therefore, still pay off on these marginal sites.

Many low quality sites already support a stand of hardwoods that will sprout when cut. It may be more profitable to manage these stands for firewood under the coppice system (see page 4) than convert to conifers.

To determine whether your effort is worth the money, see EC 1146, *Forestry Financial Analysis 1: An Introduction for Landowners*, and EC 1147, *Forestry Financial Analysis II: Worksheets for How-To-Do-It.*

Which species to choose

After you've decided that you want to concentrate on fuelwood management, the most important question is which species to choose for stand regeneration. The most important factors in matching the species to your location are:

- the site conditions like temperature, summer moisture, and drainage, and

Table 1.—*Characteristics of hardwood species*[a]

Species	Region[b]	Heating value	Moisture requirement	Early growth rate Seedlings	Sprouts	Shade tolerance
Ash	Valley bottoms	med.	high-stagnant	mod.	mod.	intol.
Aspen	Eastside	low	med.	mod.	fast	intol.
Bigleaf maple	CR, low Casc.	high-med.	mod.	very fast	mod.	tol.
Black oak	SW	high	low	slow	mod.	med. intol.
Cottonwood	Valley bottoms	low	high,moving	mod.	very fast	intol.
Madrone	SW, WV	med.	low	slow	fast	med. tol.
Red alder	CR, low Casc.	med.-low	high	very fast	very fast	intol.
Tanoak	SW	high-med.	mid-high	slow	fast	tol.
White oak	WV	high	low-mid	slow	mod.	med. intol.

[a]med. = medium, mod. = moderate, tol. = tolerant, intol. = intolerant
[b]Casc. = Cascades, CR = Coast Range, SW = Southwest Oregon, WV = Willamette Valley

- species characteristics like growth potential, disease problems, and heating values.

You can get clues for species selection by looking at species already growing on or near the site. Look for their growth and signs of diseases or problems like windthrow or root rot. Be especially careful when you introduce a new species to your site.

Important characteristics of most hardwood species used as fuelwood are listed in table 1 at the top of the page.

Western Oregon grows many other hardwoods in addition to those described in table 1. Most are abundant in local areas.

The sprouters, like Pacific madrone, myrtle, chinkapin, and canyon live oak, are most adaptable to fuelwood management.

New introduced exotics like hybrid pines—for example, Knobcone-Monterey pine (see EC 1193, *Using Knobcone-Monterey Hybrid Pine in Western Oregon)* also show some promise.

All conifer species can be used for fuelwood production (table 2). However, their major use is for timber production. In most conifer stands, firewood will only be harvested when low quality trees are removed or the stand is thinned.

For more detailed information, see *Silvics of Forest Trees of the United States* and talk to the Extension forestry agent who serves your county.

Harvesting and regeneration strategies

All timber management strategies can be modified to accommodate fuelwood management. Because of their low regeneration costs, the coppice, shelterwood, and seed tree methods are most frequently used for fuelwood production.

Uneven-aged management can provide a continuous firewood supply on a small woodlot. The coppice method is limited to sprouting species; the seed tree and shelterwood methods, and uneven-aged management, involve regeneration from seed and planting.

Coppice method

This is the oldest forest-management practice used by mankind. It's simply the repeated cutting and resprouting of trees. Therefore, it clearly requires a sprouting species (see table 1).

However, the practice can't be carried on indefinitely. After several cutting cycles, sprouting vigor decreases, and the incidence of rot increases. Bigleaf maple, cottonwood, and ash are especially susceptible to rot.

Sprout cutting can be done most of the year. The best harvesting time to start sprouting is during the dormant season. Avoid cutting during the active growth period of June and July.

When you harvest, cut the trees back to the stump with a low, clean, and angled cut, so rainwater can run off (figure 3 on the next page). This reduces the chance of disease entry.

The sprouts have extremely fast initial growth because they start with the root, stem and food reserves of the parent tree. This rapid growth requires a high nutrient supply. New sprouts do have a higher than average frost sensitivity.

Sprouting usually results in a jungle of stems. After the second or third growing season, remove some stems from the stumps. This provides more space and resources for the remaining stems and enhances their growth. Unthinned sprouts will also produce fuelwood, but they'll require more time to reach a usable size.

When you thin sprouts, leave one sprout for every 6 to 12 inches of circumference (figure 4). The best stems to leave are those that start low on the stump, preferably sprouting from the base. They're less likely to break off the stump or to succumb to the rot present in the old stump.

Table 2.—*Heating values of conifer species*

Species	Heating value
Douglas-fir	med.
Grand fir	low
Hemlock	med.-low
Juniper	med.
Western larch	high-med.
Lodgepole pine	low
Ponderosa pine	med.-low
Western redcedar	med.-low

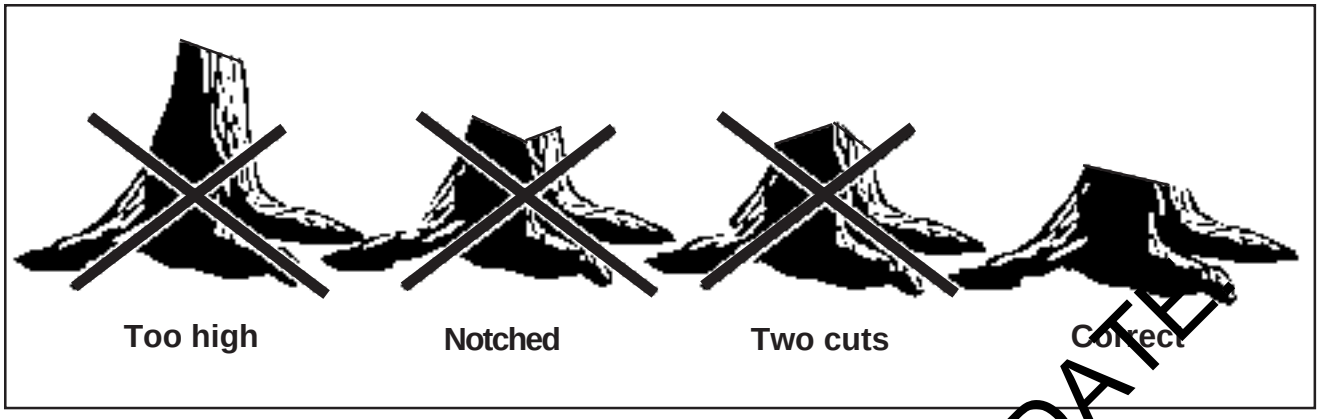

Figure 3.—*To encourage sprouting, cut stumps low with a single cut. A slight angle proves water drainage from the stump and can reduce rot.*

Younger trees generally sprout more vigorously than older trees. Sprouting of stumps with a diameter less than 10 inches will be vigorous. As stumps get larger than about 18 inches in diameter, sprouting of most species drops dramatically. Bigleaf maple and Pacific madrone are exceptions.

The harvesting cycles in a coppice method are relatively short, 6 to 15 years. Therefore, the wood produced is of small size, 4 to 8 inches in diameter.

Timber and coppice fuelwood production can be combined in a method called *coppice with standards.* In this method, you leave some healthy, good quality sprouts or seedlings through several fuelwood cycles.

These trees, called *standards,* can become high quality timber. This allows you to combine both timber production on long rotations and fuelwood production on short rotations on the same piece of land. The standards may also provide esthetic and wildlife benefits.

Figure 4.—*Cut stumps produce many sprouts. After 2 to 3 years, sprouts should be thinned to leave one sprout per 6 to 12 inches of stump circumference.*

Seed tree method

As the term implies, this method requires leaving a few trees as a seed source. Three to ten trees per acre are usually sufficient for regenerating a site. Distribute the leave trees evenly over the area; they should have good enough form, vigor, and quality to ensure sufficient, genetically superior seed production.

Vigorous trees are also important to avoid problems of windthrow or sunscald. After 2 to 5 years, when the regeneration is established, you can harvest the seed trees.

Shelterwood method

In this method, the leave trees act both as seed source and as protection or shelter for the seeds and seedlings against adverse temperature and moisture condition. The overstory is removed in two (or more) steps.

In the first step, you remove half to three quarters of the canopy (figure 5a on page 6). This improves seed production and moderates the light and temperature conditions in the understory for improved seed germination, seedling establishment, and growth.

After 2 to 8 years, when a good crop of regeneration is established, remove the rest of the overstory (figure 5b on page 7).

Uneven-aged management

Many conifer stands in eastern or southwest Oregon have been managed in an uneven-aged fashion. This management applies not only to timber production but also to ensuring a continuous supply of firewood.

Uneven-aged management may be of special interest if your woodlot isn't large enough to contain stands of many different age classes. By selecting individual or small groups of trees for firewood cutting in a yearly or every-2-years cycle, you can ensure stand openings for regeneration as well as sufficient growing space for the residual trees.

Because of the frequent entries, uneven-aged management requires good access to the stands as well as careful harvesting operations. It's easy to damage the residual stand.

Species requirements

Successful implementation of either seed tree system, the shelterwood system, and uneven-aged management requires that you meet the regeneration requirements of the species.

Some species—alder, for instance—require more light than the shelterwood method provides. All species require a reduction in competition from understory shrubs, herbs, and grasses for optimal growth.

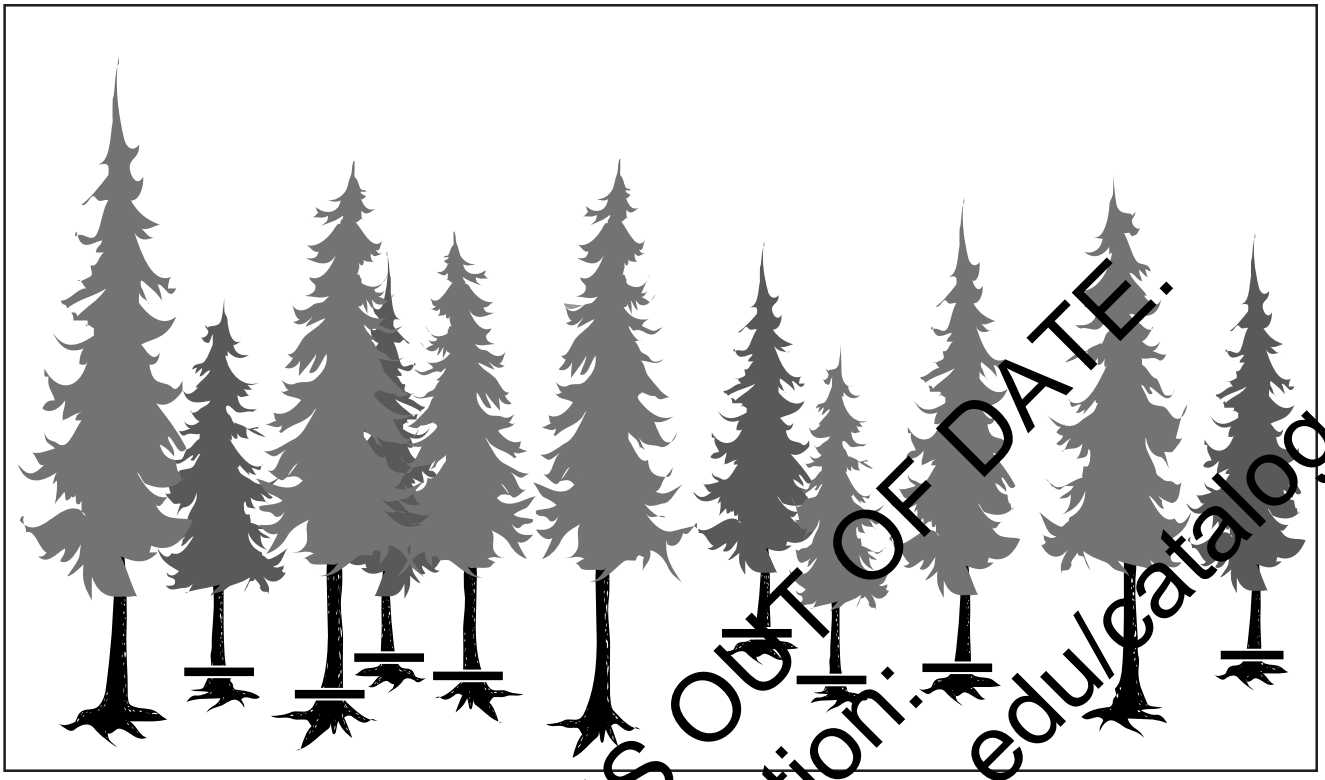

Figure 5a.—*In a shelterwood, half to two-thirds of the trees are harvested in the first cut (above). The remaining trees provide seed and shelter for the new stand (see figure 5b at the top of page 7).*

Most prefer a mineral soil seed bed for germination. A reduction in competition and exposure of mineral soil can usually be accomplished in the logging process if the need is recognized in advance.

General considerations

Harvesting notice

When you plan to sell firewood or use power-driven equipment (such as a chainsaw) in the harvesting operation, you have to file a harvesting notice with your local Oregon Department of Forestry service forester.

Measurement units

The common unit of sale is the cord, defined as 124 cubic feet of stacked wood (4 × 4 × 8 feet). Because of the air spaces between the pieces of wood, a cord actually contains about 80 cubic feet of solid wood.

There's more solid wood in a cord that contains split wood or a mix of diameters than a cord of uniform diameter pieces. There's more wood in a cord of stove-length pieces than in a stack of 4-foot bolts.

An 8-foot pickup truck bed has space for one-half to two-thirds of a cord. However, when you fill your truck, you need to consider the weight limitations of your vehicle. A cord of green Douglas-fir weighs about 8,000 pounds.

Marketing

Opportunities for marketing your fuelwood are mainly determined by the location of your forest land in relation to the customers. The urban centers provide a concentrated market, high demand, and high prices. Rural areas have a dispersed market and often abundant resources.

Distance to market will determine transportation costs and so affect profitability. Distance may also affect the form of product you can sell. Most residential consumers want split, stove-length wood. If you sell directly to the consumer, you'll have to supply wood of this size. If you're far from the market, it may be more cost-effective to cut and transport bigger pieces to a yard close to the retail market.

Take the time to investigate markets. Look at newspaper ads and notice boards to determine the current market situation. See EC 1130, *Developing a Marketing Strategy for Woodland Owners: Initial Considerations,* for more information on marketing strategies.

There are three basic marketing options: stumpage sales, stacks of 4- to 8-foot-long wood, called *wood bolts*, on the roadside, and sales of finished firewood products.

Stumpage sales

Stumpage sales are the least work-intensive for the landowner. A contract is drawn between you and the buyer, who is cutting and transporting the wood. You only need to supervise the logging operations. However, your low labor input is reflected in lower prices. Since most consumers don't have professional equipment for logging and transportation, you need a good road system to assure access to the stands.

Keep in mind that the buyers are mainly interested in easily accessible wood and not in proper silvicultural treatments. Be sure to give them clear instructions or mark the cut trees yourself by spray painting or flagging. Sample contracts are available from your Extension forestry agent.

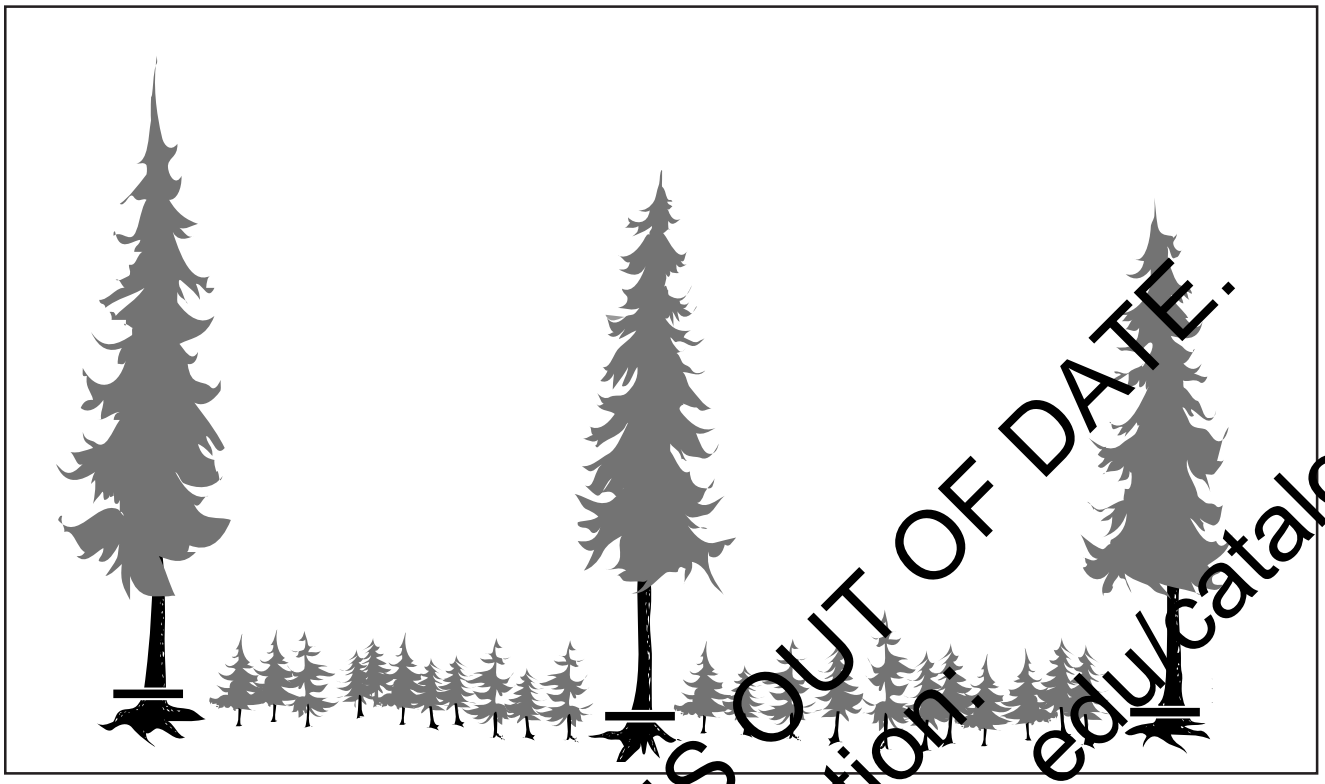

Figure 5b.—*Shelterwoods are useful on frost-prone or hot and dry sites because the overstory moderates the environment of the seedlings.*

For more information on contracts, see EC 1192, *Contracts for Woodland Owners and Christmas Tree Growers.*

Wood bolts

The second option is to sell fuelwood in wood bolts on the roadside. Wood bolts are stacks of 4- to 8-foot logs. This obviously means more labor for you, but you can demand a higher price for the stacked wood.

You can either do the work yourself or hire a contract logger. Check in the newspaper or consult your Extension forestry agent for available contract loggers.

It may be safer and cheaper to let an experienced logger do the felling, skidding, and bucking. If your have the skill and time, you may choose to do the work yourself to avoid the cost of a logger.

Finished firewood

If you want to sell stove-sized wood, you fell, skid, buck, and split the wood, and transport it to a concentration yard or to the retail customer. Remember: a retail license is required if you set up a retail yard or office.

This is the most labor-intensive option, but you receive the highest prices for your wood. As we explained under *Wood bolts*, you can either do the work yourself or hire a contractor. If you plan to sell directly to the customer, advertise in the local newspaper or hang signs on bulletin boards.

Plan ahead

In all three of these options, plan ahead by estimating how much wood you can sell or use each year. Having an established clientele base allows you to plan the amount of wood you sell and use each year. Try to match this with the amount of wood cut in stand treatments or to fulfill your financial needs.

Which of the above marketing options fit you best? The main factors to consider are:

- distance to a market,
- the amount of your own time you plan to invest,
- the amount of volume you plan to harvest,
- the equipment you have available, and
- the availability of contract loggers.

Consider all of these factors before you make a decision. You can also use a combination. For example, on easily accessible ground, let the customers cut the trees themselves. On the less accessible ground, hire a logger for the felling and logging and do the splitting and bucking on the roadside yourself.

Taxation

Harvesting forest products is subject to Oregon and Federal taxes. Consult Oregon's Forest Products Harvest Tax (see EC 1151, *Oregon's Forest Products Harvest Tax)* to determine your tax liability.

Insurance

Finally, in some of these marketing options, you may allow someone else to work on your land. If this is the case, be aware of your personal liability and consult your insurance agent to determine your needs and proper amount of coverage.

If you work yourself, be sure to use safety equipment and follow the safety recommendations of the machine manufacturer.

For more information

In July 1992 the OSU Extension Service publications warehouse was destroyed by fire. We are replacing our supplies. The publications listed may be available in the office of the OSU Extension Service that serves your county. Check with that office for current prices.

You also may call Agricultural Communications at Oregon State University, (503) 737-2513, to learn the availability and current price of the publications.

Cleaves, David A., *Developing a Marketing Strategy for Woodland Owners: Initial Considerations*, Extension Service Circular 1130 (Corvallis, 1984) 75¢.

Elwood, Norman B., *Converting Western Oregon Red Alder Stands to Productive Conifer Forests*. Extension Service Circular 1186 (Corvallis, reprinted 1992) $2.00.

Elwood, Norman E., and McMahon, Robert O., *Forestry Financial Analysis I: An Introduction for Landowners*, Extension Service Circular 1146 (Corvallis, reprinted 1992) $1.00.

Elwood, Norman E., and McMahon, Robert O., *Forestry Financial Analysis II: Worksheets for How-to-do-it*, Extension Service Circular 1147 (Corvallis, reprinted 1993) $4.50.

Emmingham, William H., *Using Knobcones and Monterey Hybrid Pine in Western Oregon*. Extension Service Circular 1193 (Corvallis, reprinted 1993) $1.50.

Emmingham, W.H., and Elwood, Norman E., *Thinning: An Important Timber Management Tool*, Pacific Northwest Extension Publication PNW 184 (Oregon State University, Corvallis, Reprinted 1992) $1.00.

Hibbs, David E., *Managing Hardwood Stands for Timber Production*, Extension Service Circular 1183 (Corvallis, reprinted 1993) 75¢.

Mukatis, W.A., and C.F. Sutherland, Jr. *Contracts for Woodland Owners and Christmas Tee Growers*, Oregon State University Extension Service Circular 1192 (Corvallis, reprinted 1992) $2.00.

Oester, P.T., and W.H. Emmingham, *Using Precommercial Thinning to Enhance Woodland Productivity*, Oregon State University Extension Service Extension Circular 1189 (Corvallis, reprinted 1990) $1.25.

Sutherland, Charles F., Jr., *Oregon's Forest Products Harvest Tax*, Extension Service Circular 1151 (Corvallis, reprinted 1992) 75¢

Other publications

Fowells, H.A., *Silvics of Forest Trees of the United States*, Agricultural Handbook 271, USDA Forest Service (Washington, DC, 1965).

The Woodland Workbook is a collection of publications prepared by the Oregon State University Extension Service specifically for owners and managers of private, nonindustrial woodlands. The Workbook is organized into separate sections containing information of long-range and day-to-day value for anyone interested in wise management, conservation, and use of woodland properties. It's available in a 3-ring binder with tabbed dividers for each section.

For information about how to order, and for a current list of titles and prices, inquire at the office of the OSU Extension Service that serves your county.

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