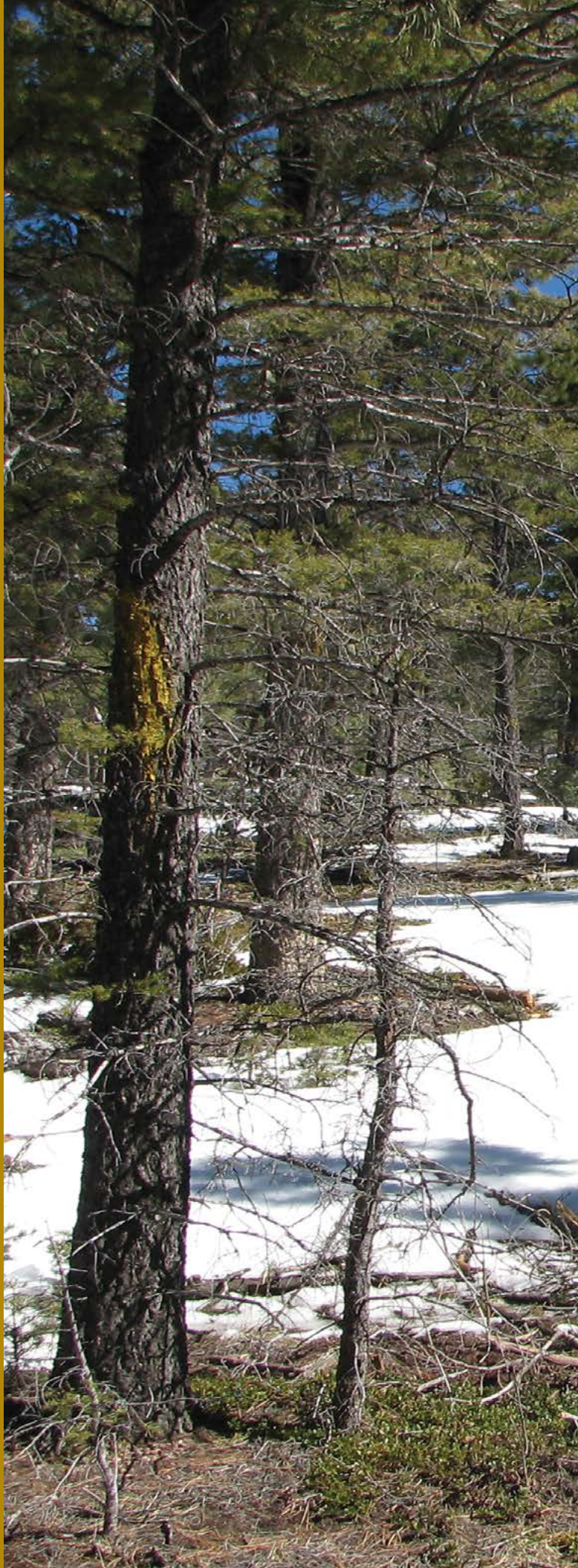


# Forest Products: From Marking to Market





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# Table of Contents

Introduction .....	1
Fundamentals of Forest Stewardship.....	1
Stewardship Plans .....	1
The Forest Products Market.....	2
Marketing Research.....	2
Sale Planning and Preparation .....	5
Planning .....	5
Preparation.....	5
<i>Respect Property Boundaries.</i> .....	5
<i>Sale Layout</i> .....	6
<i>Logistics</i> .....	6
<i>Creating Marking Guidelines</i> .....	7
<i>Marking Trees</i> .....	7
<i>Estimating Wood Volume</i> .....	9
<i>Estimating the Value</i> .....	10
Selling The Forest Product .....	10
Choosing a Selling Method .....	10
Determining Payment Method .....	11
Creating a Sale Prospectus .....	11
Finding a Buyer .....	14
Contract Creation and Administration.....	14
Contract Creation .....	14
<i>Large- and Small-Scale Tree Removal Equipment</i> .....	15
Contract Administration .....	16
<i>Getting Started on the Right Foot – The Pre-work Meeting</i> .....	16
<i>Inspecting the Contractor’s Work</i> .....	16
Pursuing Opportunities to Sell Value-Added Forest Products.....	16
Marketing Basics .....	17
Marketing Strategy .....	17
Keeping a Pulse on the Market .....	19
Conclusion.....	20
References .....	20
Additional Resources .....	21
Glossary .....	22
Appendix A: Tree Volume Sampling.....	24
Appendix B: Sample Sale Prospectus, Bid Form and Map.....	27
Appendix C: Sample Sale Inspection Report.....	30





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For more information, please visit: <http://www.treefarmssystem.org>. For information on Colorado Tree Farmers, please visit: <http://www.treefarmer.com>.



## Introduction

The purpose of this guide is to provide forest landowners the information and tools to help them successfully implement forest stewardship activities utilizing contracted services. The guide focuses on the steps a landowner should take to set up and implement a forest products sale, from developing a forest stewardship plan to overseeing the sale. The information also is applicable to preparing a forestry project for which the property owner pays a contractor for the work to be performed. Landowners who want to cut trees and/or make their own product to sell (i.e. fencing material, furniture, split firewood) also will find pertinent information in this guide. Landowners conducting their first sale or project are encouraged to partner with a professional forester. Please refer to the glossary of forestry-related terms on p. 22-23.

## Fundamentals of Forest Stewardship

Forest stewardship is defined as the wise care and use of forest resources to ensure their health and productivity for years to come. Successful land stewards engage in diverse management activities to help improve the health of their forests for future generations. Land stewards look beyond the trees immediately surrounding their homes and see the forest as an ecosystem, which may or may not be functioning well. Once a forest landowner identifies the forest's needs, s/he can actively work



*A sign designating that the property is in the Forest Stewardship Program.*

to improve forest condition. Active forest management is essential to attain a functioning, sustainable forest ecosystem. Removing trees that can be used as forest products is one tool to obtain a healthy, resilient forest and increase the return on investment. The return on investment ranges from revenue generated through a timber sale to the intrinsic values that reinforce the landowner's long-term stewardship objectives. Identifying the desired return on investment is the first step, followed by planning and then implementing forestry practices to meet forest stewardship goals.

## Stewardship Plans

A forest stewardship plan is a valuable tool for landowners who want to be caretakers of their land. A stewardship plan begins with identifying the landowner's goals.

Common forest stewardship goals include:

- Improving forest resiliency to wildfire
- Improving the growing conditions of trees
- Increasing the number of tree seedlings
- Promoting diverse tree ages and species to minimize insect or disease damage
- Improving wildlife habitat
- Minimizing soil erosion
- Restoring a poorly functioning ecosystem

The next step in developing a stewardship plan is to quantify current forest conditions. This requires gathering information such as type and size of trees, type of ground vegetation, wildlife use, amount of woody material on the ground and erosion concerns. Knowledge of current conditions and the landowner's goals is essential in developing



*Forest stewardship plans have numerous benefits, including improved wildlife habitat for species such as the gray squirrel. Photo: Joy Jackson*



*A professional forester records field measurements on private land.*

a list of recommended forest activities.

Recommended forest stewardship actions may include activities that are beneficial but do not generate revenue. Examples include planting, road maintenance and prescribed burning. Other activities, such as thinning trees, may generate revenue.

The recommendations become objectives that are integrated with the landowner's goals. For example, a recommendation

to remove ladder fuels from under large trees may become an objective to remove all dead and live ladder fuels under trees larger than 9 inches in diameter within four years. The objective is specific, measurable, attainable and has a time limit. All objectives in a stewardship plan are broken down into projects and assembled into a multi-year calendar so the landowner has a plan of action to reach his/her objectives and desired forest condition.

The Colorado State Forest Service encourages private landowners to work with a professional forester to develop a long-term stewardship plan. Trained foresters can add insight and expertise, and help develop the best strategy to meet the landowner's land management objectives.

## **The Forest Products Market**

Selling wood to generate income can be an effective way to meet forest stewardship goals and objectives, while lowering or offsetting treatment costs. Selling wood also can be a challenge, especially if the current market price of timber is low or the economy is struggling. Regardless of economic conditions, there usually are opportunities

in Colorado to sell local wood products to local communities.

The public is becoming more informed about the need for forest management and its connection to the forest products industry. Many people are beginning to realize that healthy forests require management, which often means trees need to be cut. If the trees have some value as a forest product, the cost of improving forest health is reduced. Successful forest products businesses make forest stewardship projects affordable. There is a rising "green" or sustainability movement, in which consumers seek out products that are good for the environment. Sustainably harvested products are the definition of "green."

Localvores is another new term used to describe an increasing demographic of people who prefer to buy locally generated products. The motivation behind this concept is that buying locally supports in-state economies and rural communities, reduces a consumer's carbon footprint and is good for the environment, which drives purchasing decisions.

## **Marketing Research**

Gathering information on potential and current markets is an important, but often overlooked, action for those who grow, produce or sell wood products. This is important information to consider when deciding whether to sell to a potential or specific market. Research can help landowners find a good market fit for their product.

Marketing research starts with learning about the local forest products market. Landowners need to explore what types of forest products can be made from the trees on their property to meet their forest stewardship objectives. Traditional forest products in Colorado include lumber, beams, posts, house logs, paneling, fence poles and posts, firewood, landscape mulch, wood pellets, animal bedding, Christmas trees and live trees for nurseries.



Table 1 is not an exhaustive list of forest products. To learn more, explore the local market to determine what types of wood products are available, who is selling them and in what quantities, and whether sales are up or down. Identify the desired/acceptable tree species, as well as quantity and quality of wood in demand (diameter and lengths, knotted vs. clear, blue-stain vs. clear, straight or crooked, unblemished or with borer holes). Each of these factors is directly related to the revenue forest landowners can expect to receive for their wood.



Trees killed by mountain pine beetles (above) can be utilized for a variety of wood products.



Table 1. Summary of Forest Products

Tree Diameter	Timber Sale Product	Measurement Unit	Retail Product
Less than 5 inches	Live transplant	Per foot or each	Tree at nursery
	Poles	Per foot/acre/each	Fence poles and stays, latillas
	Christmas trees	Per foot or each	Christmas tree
5 inches and up	Firewood or POL*	Cord/acre	Firewood, pallets
5 to 8 inches	Posts	Cubic feet or each	Fence posts
9 to 11 inches	Logs	Cubic feet	Lumber, small house logs, paneling, flooring, beams, vigas
12 inches and up	Sawlogs	Board ft, cubic foot or ton	Same as above, but less percentage of waste during the production
No specific size, prefer dead wood	POL*	Ton	Mulch, wood pellets, animal bedding, excelsior
No specific size	Boughs	Weight/truck load	Wreaths, swags

\* Products other than logs (POL)

Mountain pine beetle-killed trees have a blue-gray color in the wood from the blue-stain fungus.



Small-diameter trees, such as this lodgepole pine stand, commonly are referred to as “poles.”



Poles can be utilized for such products as fencing.

Other important considerations when researching current markets:

- Determine the proper balance between potential risks (wildfire, insects, diseases, mill closures) that could diminish the value of the trees vs. waiting for a higher market price.
- Understand the advantages and disadvantages with respect to other sellers. What is the proximity of the property to existing markets? When does the snow melt and the ground become firm enough for equipment? Is the property flat, or does it have rolling hills or steep drainages? Are the roads in good shape? To what extent do the trees have defects?
- Research local timber markets. Does the scale of the planned activity make sense in local markets? If a viable commercial market exists, it may be beneficial to work with nearby neighbors to consolidate efforts, which will generate more product. Conversely, if commercial markets are not available, developing small-quantity markets that meet personal-use demand at a local level may be the best option.
- Redefine the scope of local markets. The local market may extend beyond the county in which the property is located. Additionally, property location may expand the local timber market to include an adjoining state, depending on the product.
- Analyze economic options. Does it make economic sense to sell the trees as logs, or would it be more profitable to bring a portable sawmill or wood splitter on-site to process the wood and sell a higher-value product?
- Attend trade shows and similar events to create networking opportunities, meet people in the forest products industry and observe what the competition is doing.



*A portable sawmill is just one tool that can be used to create higher-value wood products.*

- Consider becoming a certified member of the American Tree Farm System ([www.treefarmsystem.org](http://www.treefarmsystem.org)). Membership allows landowners to expand their network and market wood products as those that are sustainably managed. This designation is highly beneficial because it exemplifies a commitment to forest stewardship.
- Explore Colorado Forest Products™ ([www.coloradoforestproducts.org](http://www.coloradoforestproducts.org)), another marketing tool for selling forest products in Colorado.
- Research government resources, which can provide a wealth of information. The Colorado State Forest Service provides answers to many forest management questions. For more information, visit the Colorado State Forest Service website at [www.csfs.colostate.edu](http://www.csfs.colostate.edu).

Staying current on who is selling what and for how much can be essential in setting up a successful forest products sale. A professional forester can help provide current market information on forest products prices and assist landowners with decisions about the timing, location and economic viability of a timber sale.



## Sale Planning and Preparation

### Planning

Landowners should strive to balance forest stewardship objectives, forest health conditions and management recommendations with the wood products market to ensure that activities will not compromise the integrity of the forest. The following questions should be answered before proceeding with a sale:

- What forest stewardship objectives could be achieved with this sale?
- Can these forest stewardship objectives be met by selling the type of wood that is currently in demand?
- Is the necessary quantity of preferred wood product available on the property to make the sale viable?

Remember, forest products should be the outcome of good forest management; the product itself should not drive forest management.

Assuming the current market is compatible with forest stewardship objectives, it is then necessary to:

1. Determine which products can be made from the trees to be cut and set minimum utilization standards, which specify the smallest piece of wood that the contractor must remove from the sale area. For example, if producing sawlogs, the utilization standard may be a 16-foot long piece of wood that is at least 6 inches in diameter at the small end. Smaller wood pieces may be left on the ground. If producing fence poles, the utilization standard may be an 8-foot long piece of wood that is at least 3 inches in diameter at the large end.
2. Determine the unit of measure that will be used to quantify the product: board foot, cubic foot, cord, etc.

Knowing in advance the product(s) to be generated will dictate how to mark trees and estimate wood volume. For example, when selling more than one product, such as high-quality sawlogs and firewood, it may be beneficial to mark the two products differently and determine the volume of each to obtain a better price for the sale. Those two products also could be sold separately, allowing one sale to be completed before the other.

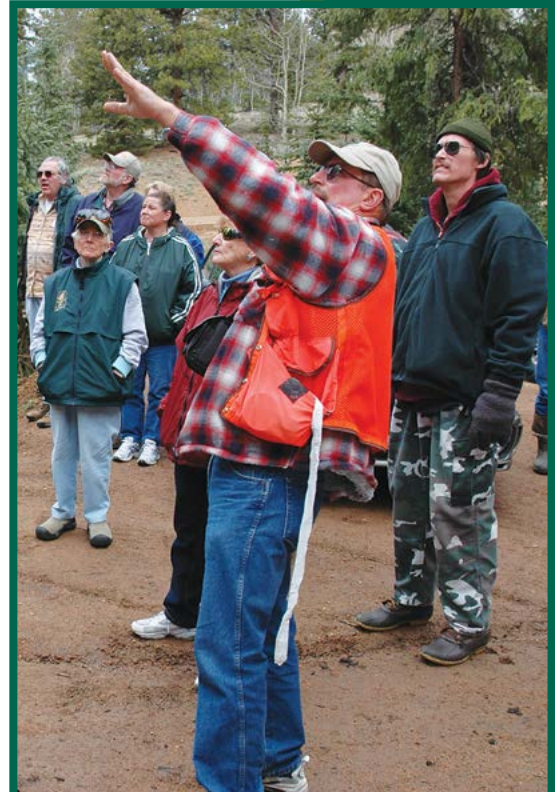
If the current market is not favorable to sell forest products and if (1) the forest management project cannot be delayed until a better market develops, or (2) the project is non-commercial, the landowner should solicit a service work contract. The landowner should still provide service contractors with all the information included in a sales prospectus so they can develop bids. When a service work contract is awarded, a landowner will pay the contractor to remove the trees.

### Preparation

When preparing for a sale or project, consult with local foresters first to learn from their experience. If a stewardship plan already has been completed, the general size, scale and location of a sale area should be identified in the plan. Following are guidelines for preparing for a sale.

#### *Respect Property Boundaries*

Make sure the property boundary is well marked with signage, paint or flagging. Use a different color of paint or flagging for the property boundary than the sale boundary, cutting-unit boundaries or individually



*Professional foresters are a valuable resource when planning a sale or project.*



marked trees. Landowners who do not know the exact location of the property line should clearly mark and agree on property boundaries with neighbors prior to harvesting any trees in the vicinity of the property boundary. Any such agreements should be written and signed by both parties. Hiring a surveyor to identify the property boundary may be necessary; do not assume an old fence or other structure accurately represents the property boundary. Also, if permission is required to drive or use equipment on adjacent property, be sure to document the arrangement in a written agreement.

### **Sale Layout**

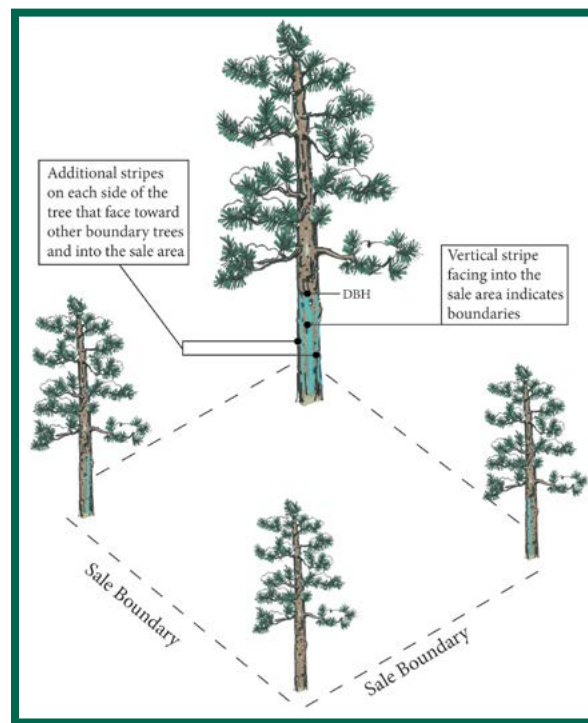
Sale-area boundaries must coincide with the landowner's management objective. The sale boundary may be based on topography, tree density, tree species, etc. For example, if the primary sale objective is to significantly reduce the amount of dwarf mistletoe, the boundary might follow the edge of the dwarf mistletoe infection. While flagging in the proposed boundary, limit the amount of inaccessible sale acreage that includes large surface rocks, loose or wet soils or steep slopes.

Dividing the sale into smaller areas called "cutting units" can be helpful for selling and administering the sale. In areas where large-volume contractors are common, cutting units can be used to establish the progression of the sale. For example, the second unit can be considered off-limits until the first unit is satisfactorily completed according to contract standards. If there are no buyers for the large sale, the landowner may be able to sell the cutting units as individual sales to small-volume contractors.

Here are some additional tips for laying out a sale or project area:

- Heavily flag the sale boundary to ensure visibility.

- Use tree-marking paint to mark the sale boundary, particularly for leave-tree marked sales. At a minimum, the sale boundary should have a unique boundary mark facing into the sale area; for example, a vertical paint stripe extending from breast height to the ground and facing into the sale area. To make it easier for others to follow a boundary line, add a vertical stripe on each side of the stripe facing into the unit. Additional stripes should face toward the adjacent trees with boundary marks (see Figure 1).
- Accurately calculate acreage, preferably with a global positioning unit.
- Protect survey caps, bearing (witness) trees, scored rocks or rock piles associated with surveyed corners.



*Figure 1. The above illustration is an example of how to mark your sale boundary using vertical paint stripes on leave-trees. (© CSFS)*

### **Logistics**

To improve the success of the contractor working the sale or project, account for the small details, as they are integral in the logistics of cutting and moving trees. Be sure to:



- Identify safety issues and local regulations related to product hauling (access to public roads and bridges, weight limits, etc.)
- Flag the location of new or temporary roads and the main skid trails where logs can be dragged.
- Determine the number and location of desired landings (there often is a trade-off between skidding distance and the need for new road construction). The size of identified landings will depend on topography, type of equipment used, number of products being sorted, type



*Heavy equipment uses skid trails to retrieve and move logs to landings.*

and frequency of trucking, etc. Ideally, roads and landings should be located on stable soils that are slightly sloped and in a sunny location to avoid traffic on wet or muddy surfaces, which can cause increased erosion and soil damage. Recognize that roads and openings for landings often can serve multiple purposes, including objectives related to wildfire protection, wildlife habitat and recreation access.

- Identify sensitive areas and needs (streamside zones, water crossings, wet or unstable soils, unique or rare plants, cultural sites, wetlands, heavy wildlife use areas, etc). A particular area may need to be closed seasonally, equipment use

may need to be restricted or the area may be deemed completely off limits to tree cutting and travel.

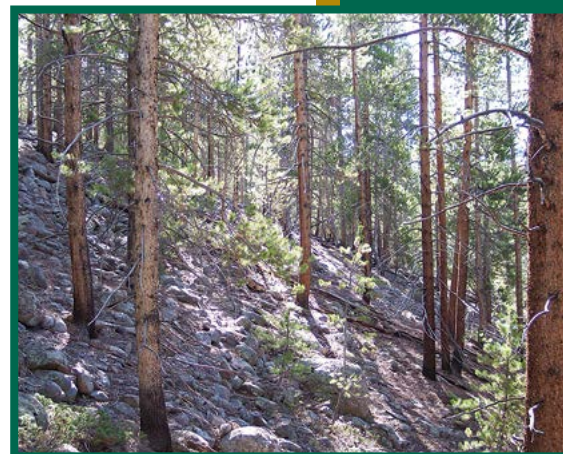
### *Creating Marking Guidelines*

Marking guidelines describe what type of trees are to be cut, or what type of trees must be left standing, based on management objectives. Consider these options:

- Remove a certain percentage of trees or reduce the number of trees to achieve a particular tree density (such as trees per acre or basal area per acre).
- Include criteria for retaining or cutting trees with diseases or defects.
- State the desired spacing between crowns or groups of trees.
- Retain some trees for wildlife habitat purposes and “character” trees for aesthetic appeal.
- Exclude areas where access is limited by steep slopes, damp soils and very rough ground or exposed rock.
- Include any species-specific and tree age/size class specifications.
- Include a description of what the area should look like after work is completed (desired future condition).

### *Marking trees*

It is important to consider the intended method of tree removal while marking trees. For example, if the intent is to remove the center tree in a clump of trees, make sure the tree can be easily cut without getting hung up in one of



*Steep hills and large rocks can affect access to the sale area.*



## Marking Guideline Example

The purpose of thinning project X is to reduce the amount of tree competition in the stand and promote tree species and age diversity.

- Mark trees to be cut
- The minimum diameter for a marked tree is 5.0 inches at dbh
- Approximately one-third of the trees over 5-inches dbh in the sale area are to be removed
- Retain trees that have pointed, single tops and are free of disease
- Favor young trees growing in the open, rather than those growing under the canopy of larger trees
- Save living Douglas-fir and aspen, and retain standing dead aspens with woodpecker holes

The desired results are (1) a 5-percent increase in the percent of trees between 5-7 inches dbh and (2) a 10-percent decrease in the overall number of lodgepole pine trees.



*The paint marks on the trees should be located at chest height and face the same direction.*

the surrounding trees. It is crucial to mark trees in the most practical manner possible. Poor selection may cause excessive damage to surrounding trees that were to be retained. Damage to surrounding trees also occurs when space is insufficient for equipment to work. The less time it takes a contractor to remove the trees from the property, the more profitable the sale.

- The amount of labor involved should be considered to determine whether trees will be marked to keep or cut. If a large number of small trees need to be

removed to favor the few big trees, it may be preferable to mark the trees that will be retained because it requires less paint and time. Contractors will ask “what type of mark” was used. The mark type refers to which trees were marked, rather than whether a diagonal line or horizontal line was painted on the trees.

- Leave-tree mark: KEEP the marked trees
- Cut-tree mark: CUT the marked trees
- Sale-boundary mark: only mark the trees along the perimeter of the sale because all the trees within a certain diameter range, as indicated by the marking guidelines, are to be cut, or all trees of a particular species are to be cut, or all trees are to be cut.

- Use paint made specifically to mark trees because it will last longer outdoors, and choose a different color than the one selected for the sale-area boundary. Also, use one color for leave-tree sales and a different color for cut-tree sales to reduce confusion.
- Consistently mark trees on the same side so that a person looking at the sale area sees all the marked trees. Paint the tree at chest height or eye level with a large enough mark so that it can readily be seen from a distance. When using a mechanical harvester, it is desirable to encircle the tree with a paint mark so the mark can be seen from any direction. If the area is harvested in the winter when snow is on the ground, consider marking trees high enough for equipment operators to see the marks above accumulated snowpack.
- Marking trees at ground level on the downhill side is optional and is a good way to verify that the correct tree was removed after the tree trunk no longer is on-site.



## Estimating Wood Volume

Selling wood for a fair price requires knowledge of the quantity and quality of the products to be sold. Limited knowledge often equals little or less revenue. With the proper



*Placing a paint mark at the base of a tree helps verify that the correct tree was removed.*

equipment and know-how, landowners can perform the measurements themselves, or they can contract a professional forester who is not associated with a potential buyer to perform the work. Appendix A includes additional information about tree-volume sampling.

- To estimate wood volume, gather the following information from a sample of the trees to be cut:
  - Tree species
  - Tree height – either merchantable top height or total height
  - Tree diameter at breast height (4.5 feet above the ground on the uphill side of the tree)
  - Defects such as forks, crooked tops, visible rot, etc.
  - Live or dead
- Choose one of the following methods to gather a volume sample:
  - Measure a percent of trees as marking occurs. For example, every fifteenth tree marked is then measured as part

of the volume sample. This is done for cut-tree marks only.

- Measure a sample of trees after marking the sale; again, only measure trees to be removed.
  - Apply point sampling techniques using a prism, angle gauge or Spiegel relaskop® to determine which trees should be measured.
  - For fixed plots, use a logger's tape to locate the edge of the plot. Fixed plots are a handy method to determine the quantity and volume of trees less than 5-inches dbh, or when it is difficult to see tree trunks because of live branches.
- Required tools:
  - Equipment to measure height (clinometer, rangefinder, hypsometer, etc.)
  - Equipment to measure diameter (diameter tape, Biltmore stick, etc.)



*Clockwise from top, a clinometer, diameter tape and logger's tape are used to measure the height and diameter of a tree.*

- Equipment for point sampling (prism, angle gauge or Spiegel relaskop®)
- Retractable 75-foot tape with feet divided into tenths (logger's tape)
- All-weather notebook or paper with clipboard to record measurements
- Regional volume tables for each tree species (using Table 2, board feet can be converted to cubic feet or cords and vice-versa)

## Estimating the Value

With calculated volumes by species and size in hand, landowners can compare what they have to offer with other ongoing or completed sales in the area to determine how much revenue the sale may generate. Keep tabs on who is selling what and for how much. Use this information to help set the asking price or minimum price for the sale. From the buyer's perspective, tree species, wood quality, volume per acre, access and operability, performance standards and contract specifications have a bearing on the perceived product value.

**Table 2. Example of volume table**

<b>Rocky Mountain Region Engelmann spruce</b> Gross merchantable volume (cubic feet) to a 4-inch top, excluding stump and top						
		Total	Height	(feet)		
DBH						
inches	20	30	40	50	60	70
5	.9	1.3	1.8	3.1	3.7	4.5
6	1.4	2.3	3.1	4.4	6.0	6.8
7	2.1	3.5	4.5	5.7	7.1	9.3
8	2.6	4.9	6.4	7.8	10.2	11.7
9	3.1	5.3	7.4	10.5	11.8	15.0
10	3.7	6.6	10.2	11.3	15.3	17.3
11	4.4	8.2	11.1	14.8	18.6	21.5
12	6.0	10.0	14.0	17.3	21.3	24.8
13	7.0	10.5	16.8	19.7	24.2	27.8
14	7.0	12.6	18.0	22.5	28.9	33.3
15	8.1	14.9	19.8	26.7	30.2	36.7
16	9.3	15.8	21.5	28.7	35.8	43.2
17	10.5	18.6	24.9	31.3	38.1	43.7
18	10.9	18.9	28.1	34.9	43.9	49.5
19	12.3	21.8	28.9	37.8	46.3	55.1
20	13.7	23.1	32.4	42.4	52.2	58.7
Diameter classes are full-inch, the 20-inch class includes 20.0 to 20.9 *For a complete table, please refer to the Forester's Field Handbook						

## Selling the Forest Product

After a sale area is prepared and the wood volume has been estimated, it is time to share the information with prospective buyers. If a buyer has already been identified, it is not necessary to advertise the sale. However, if a buyer still must be located and a price

**Table 3. Calculating volume by the log**

<b>Scribner Decimal C log rule</b>										
Dia	Length of Log (feet)									
(in.)	6	8	10	12	14	16	18	20	22	24
Contents in Board feet										
6	5	5	10	10	10	20	20	20	30	30
7	5	10	10	20	20	30	30	30	40	40
8	10	10	20	20	20	30	30	30	40	40
9	10	20	30	30	30	40	40	40	50	60
10	20	30	30	30	40	60	60	70	80	90
11	20	30	40	40	50	70	80	80	90	100
12	30	40	50	60	70	80	90	100	110	120
13	40	50	60	70	80	100	110	120	130	150
14	40	60	70	90	100	110	130	140	160	170
15	50	70	90	110	120	140	160	180	200	210
16	60	80	100	120	140	160	180	200	220	240
17	70	90	120	140	160	180	210	230	250	280
18	80	110	130	160	190	210	240	270	290	320
19	90	120	150	180	210	240	270	300	330	360
20	110	140	170	210	240	280	310	350	380	420
Diameter given is the measurement of the small end of the log, not including the bark. (excerpt from USDA Forest Service Misc. Publication 225)										

negotiated, a few options are available to disseminate information about the sale and potentially generate a higher sale price.

## Choosing a Selling Method

Three basic selling methods are available to landowners:

- Negotiated – if the landowner already has selected a buyer, the sale information is shared with the buyer at that time and a price and contract specifications are negotiated.
- Written, sealed bids (silent bids) – a bid sheet and sale prospectus are provided to any potential buyers. The bid sheet includes:
  - Name of the sale
  - Minimum bid amount set by landowner, if applicable
  - Space for bidder's contact information
  - Space for the bid amount and bidder's comments
  - Date and time bid is due



- Mailing address, fax number, e-mail address (where bid should be sent)
  - Bid deposit: the seller can require a bid deposit from the successful bidder to hold the sale. If the deposit is not received within a reasonable amount of time, usually 7-10 days, the seller can offer the sale to the next bidder of choice. The deposit is applied to the sale price.
  - Past work references (optional)
  - A statement indicating that late bids will not be accepted and that the landowner has the right to refuse a bid statement
  - Space for the contractor's commercial liability insurance information (workers' compensation, general liability, vehicle liability, etc.)
- Oral auction – an auction can be used for a high-volume, high-quality forest products sale with substantial interest from buyers. The time, date and place of the auction should be included in the sale prospectus provided to potential buyers. If oral bidding is used, only contractors who meet the business requirements specified by the landowner should be allowed to participate in bidding. References from past jobs and proof of insurance can be required on an “intent to bid” form.
- Payment by unit refers to the price to be paid per cord, board foot, ton or piece. The Scribner Decimal C log rule (Table 3, page 10) is one method used to calculate the board-foot volume from logs and determine the per-unit payment. Prices vary for different types of products. Price categories can be based on the variety and abundance of tree species, quality of wood or quantity of product types. It is important to state in the contract who will be responsible for determining the number of units removed from the sale. The responsible person may be the landowner, a sawmill operator, the contractor or an independent third party.

## Creating a Sale Prospectus

The sale prospectus basically is an outline or abbreviated version of what will later become the contract. The information collected in the forest, as well as key contractual information, is assembled into a sale prospectus to share with potential buyers. It is a good practice to simultaneously write the sale prospectus and blank contract. The sale prospectus should include:

- Sale name – be creative! Unique and creative sale names are helpful with project management, especially if more than one project or sale is simultaneously implemented, or if more than one project or sale is recommended. For example, “Ponderosa Fuelbreak” might be confusing for recordkeeping purposes if every project or sale is named “Ponderosa Fuelbreak.” However, using creative sale and project names such as “Abert’s Choice,” “Raspberry Hill” or “Ponderosa Fuelbreak Phase II” allow multiple contracts with the same objectives to occur simultaneously while avoiding confusion with sale or project administration.
- Location, physical and legal description of the property.

## Determining Payment Method

There are two types of payments – lump sum and payment by unit.

- Lump-sum payment is the most common method used by private landowners. The price paid for the sale is based on estimated volume, not actual volume. If there is less or more volume than estimated, the price remains the same. The seller should encourage potential buyers to carefully inspect the sale area to arrive at their own volume estimate prior to making an offer.

- Time(s) when the sale area can be visited by prospective bidders. Some may refer to this as a “show-me” or “pre-bid site inspection.” Can bidders walk the sale area at their convenience or does the landowner prefer to set up a specific meeting place, date and time to show the sale area? Showings usually occur at least 4-5 days prior to the bid date to give potential buyers time to calculate their offers.

- Sale particulars
  - Number of acres and purpose of the sale
  - Type of product to be sold
  - Volume estimate in the units appropriate for the product
  - Specifications or scope of work for individual cutting units, if more than one unit is included in the sale

- Selling method – sealed bid or auction– when conducting a sealed bid, include the date and time deadline for bids; when conducting an auction, include the auction location, date and time.

- Length of contract – number of months the buyer has to obtain the forest product. Allow some leeway for bad weather or other times the sale area may be closed.

- Contract specifications
  - Product definition – the minimum length and small-end diameter of a piece of wood that must be taken as product.
  - Type of mark – leave-tree, cut-tree or sale-boundary mark.
  - Stump height – generally not to exceed 4 inches to 6 inches on the uphill side. The smaller the tree,

the lower the stump; the rockier the ground, the higher the stump.

- Slash treatment – describes what to do with limbs, tree tops and other wood that does not meet the product definition.
  - Lop and scatter – specify the maximum height of the slash; a common height is 18-24 inches. Lower slash depths may be desirable in highly visible or sensitive areas. From the standpoint of decomposition and aesthetics, scattering the slash well is just as important as lopping.
  - Piling – a good option if the project produces a significant amount of unusable wood, particularly if it is in an area with heavy foot traffic or livestock use. Piles may be made by hand or with a piece of equipment that



*Slash from this piñon pine sale was lopped and scattered.*

has brush forks or a brush rake. Equipment blades do not work well to build piles because soil is pushed into the piles. At some point, preferably in the winter months with snow on the ground, the piles should be burned following state or county smoke permit requirements. Remember to specify the required size and





*A skidder with a brush rake on the front is an efficient way to build slash piles.*

location of piles to minimize scorching of residual trees. (Note: Piling decreases sale profits due to the additional labor involved.)

- Chipping/mastication – may be desirable to meet some land-management goals and objectives. Chips should either be piled or thinly broadcast across the ground, taking care not to pile chips under trees.



*The slash pile on the left will be burned. The wood pile on the right did not meet the wood products definition and will be used for firewood.*

- Expectations for any road building, road maintenance and rehabilitation of roads and trails used by the contractor. For more information, obtain a copy of forestry best management practices to protect water quality in Colorado at <http://csfs.colostate.edu/>. Also see *Colorado Forest Road Field Handbook*,

at <http://csfs.colostate.edu/pdfs/csfs-first-rd-hndbk-www.pdf>.

- Policies related to working hours, use of Jake brakes, preparedness for wildfire suppression, gate access, etc.
  - Restrictions that may be seasonal or related to other activities on the property, such as hunting or grazing.
  - Other terms specific to resource protection and the property or project.
- Performance deposit amount – funds used to resolve any contract performance deficiencies, which are returned to the contractor if and when the work is satisfactorily completed. The amount can be established as a percentage of the sale value, but should always be enough to reasonably repair resource damage and re-market the sale. For smaller sales or sales with low-value wood, the performance deposit can be more than the actual sale amount.
  - Access and operability – evaluate the road and access system. Does a usable road system currently exist, or does it need to be upgraded? Will the contractor need to contend with large surface rocks or steep slopes? What are the potential equipment limitations?
  - Payment schedule – consider whether it is appropriate to offer payment plan options. Can the contractor pay for the sale in installments, or will only full payment in advance be accepted? Which forms of payment will be accepted (i.e., cash, money order, personal check, etc.)? For lump-sum sales, payment should always occur before any wood is removed. Sale payment by unit usually occurs after the units have been measured by the designated person or mill.



*An unmaintained road may need to be upgraded before use to keep people and equipment safe.*

- Amount of insurance required of contractor – State of Colorado statutes require workers’ compensation for all businesses with paid employees. Contractors also should have commercial general liability insurance that covers operations on the premises, fire damage, independent contractors, personal injury, etc. If the contractor does not have the proper insurance and an accident occurs, the landowner may be liable. In addition, landowners should check with their homeowner insurance carrier about contractors working on the insured property.
- Statement – contractors must comply with all applicable local, state and federal laws.
- Seller’s contact information.
- Attachments:
  - Sale map
  - Bid or auction form

Refer to Appendix B for a sample sale prospectus, bid form and map.

## Finding a Buyer

After the sale information is organized into a sales prospectus, it can be shared with prospective buyers. Refer to the names and contact information collected while researching the wood market. Drop off a sales prospectus at local natural resource agency



*It is beneficial to show interested contractors the sale area and give them an opportunity to ask questions. Photo: Terrie Craven*

offices in the area. The person who ultimately buys the timber sale may contact these offices for information on local sales. While there, ask for names of potential contractors. Scan the local newspaper for people buying or selling wood products. Mail or e-mail the sale information, along with a map and bid form, if applicable, to the list of contractors. Also consider placing an advertisement in local newspapers and other media outlets.

Interested contractors should have the opportunity to walk the sale area and ask questions before the bid is due or the auction is held. The prospectus should let the potential buyer know if the seller has established a single showing or the prospective buyer should make an appointment to see the sale area.

A negotiated sale involves only one buyer. An oral auction involves multiple acceptable buyers who are determined prior to the auction using the criteria on the Intent to Bid form. When using the sealed bid option, the landowner reviews bids only after the bidding period has closed and selects the buyer from the bids received. Late bids should not be accepted. It is not mandatory to award the sale to the highest bidder, if circumstances warrant otherwise. Examples that contribute to such a decision may include the lack of liability insurance or poor performance history. Be sure to promptly contact the successful bidder/buyer to make arrangements to sign the contract, collect the performance deposit and the first payment, and set a date to meet on the property. Use discretion regarding the form of payment that will be accepted. If liability insurance is required, obtain a copy of the coverage.

## Contract Creation and Administration

### Contract Creation

The Colorado State Forest Service strongly recommends using written contracts. A written contract thoroughly explains and

*(continued on page 16)*





### *Large- and Small-Scale Tree Removal Equipment*

- A. Operator and chain saw
- B. Tree shearer cuts and removes trees
- C. Tractor with skidding winch to move cut trees
- D. Grapple skidder
- E. Logging tongs for hand-piling logs
- F. Processor removes limbs, cuts logs to length and stacks logs
- G. Delimber in background, loader in foreground





(continued from page 14)

describes expectations, and is beneficial to both parties in the event of a dispute. Some considerations when drafting a contract:

- Be as specific as possible and cover all items provided in the sale prospectus.
- Set reasonable, measurable and attainable standards or expectations in the contract. If unsure about how to set a standard, ask a professional forester who works with forest products contractors to review the standards and expectations.
- Request a sample contract from the Colorado State Forest Service to help develop a contract that meets individual needs.
- Review the contract and sale area with the buyer prior to signing a contract agreement.
- Make sure the required payment, performance deposit and proof of insurance are all received before work begins.

## Contract Administration

Track progress of the work to ensure that it is being completed according to the conditions specified in the contract. Frequency of visits to the sale is partially determined by the contractor's rate of production and quality of work. A contractor with a crew will complete tree removal much faster and will require more frequent visits than a solo contractor.

### *Getting Started on the Right Foot – The Pre-work Meeting*

Before the contractor fires up a chainsaw or piece of equipment, walk the entire sale perimeter with the contractor to make sure s/he can identify the boundary location. Next, help the contractor line-out the first unit to be cut. Review the main skid trails and show the contractor where logs can be decked. If a delimber is used, indicate where piles of limbs should be located for safe

burning later. Review the location of any new haul roads. If predetermined trails, roads or deck sites do not work due to the type of equipment the contractor is using, work together to find an amiable solution that does not compromise forest resources. Document any of these changes.

### *Inspecting the Contractor's Work*

- To minimize miscommunication, make a commitment to be on-site at some point when the contractor is working. Let the contractor know what is going well and what can be improved, and provide specific examples.
- Follow up a sale inspection with a written report to protect both parties. A sample inspection sheet to document sale progress is located in Appendix C.
- It is best to have a contractor work in a logical and agreed-upon progression within the sale area, because it makes it easier for the landowner to track progress. For example, require the contractor to complete the first cutting unit before beginning the second unit. Maintaining a concentrated, uniform approach makes it easier to monitor progress and resell the product if the first contractor should default.
- Promptly return the performance deposit after all work has been completed to contract terms and specifications. If work was not properly completed, keep the necessary amount of the deposit to correct the deficiency and return the remainder with a clear explanation as to why a portion of the deposit was withheld.

## Pursuing Opportunities to Sell Value-Added Forest Products

Selling timber to a contractor is a useful tool for forest landowners. The wood will have a second use as a product, the cost of the sale is recovered or reduced and the landowner is



closer to meeting a forest stewardship goal. Forest landowners also may opt to utilize the wood themselves or hire a contractor to cut and process the wood into a “value-added” product to sell.

Despite common misconceptions, Colorado has plentiful markets for wood products. Like all markets, barriers and challenges must be overcome in order to be competitive. This is true for any business or individual selling a product or service. With foresight, experience and application of the principles and concepts discussed below, forest landowners can improve their wood products sales and sustainably manage their forest property.

Creating a value-added product to sell adds another dimension to forest stewardship. Forest landowners can determine how the wood removed from the property will benefit others, while experiencing the direct benefits of improved forest health. It is an opportunity to link personal interests to forest stewardship. The landowner who is an avid birder may want to make bird houses or perches. The canoeist may be interested in making paddles and oars. The landowner may know of an unmet need in the community for a particular product that could be sold at a lower retail price because it is locally produced.

Selling a wood product often takes more than a sign by the driveway. Successful sellers utilize the concepts of marketing, which involves a variety of activities.

## Marketing Basics

Marketing is the totality of efforts and activities that convert a product or service into sales. Successful marketing identifies and meets a customer’s wants, needs and perceptions. Marketing focuses on people who not only buy products or services, but also buy expectations and solutions to problems. A common mistake by small and large businesses (or forest landowners) is trying to sell what they want to make, and

not make what consumers want or will buy. Another misconception is that marketing is a cost that you incur. Successful marketing is an investment that leads directly to increased sales, revenue and profit. Finally, marketing is not a one-time event, but a continual process of planning and evaluation. Whether the physical product is firewood or turpentine, it is important to consider the four main elements of marketing: product, price, promotion and placement.

- Product – this seems fairly straight forward, but the product is more than just the physical, take home item. The product is a package that contains customer services, such as delivery, special orders and the “feel good” experience that creates customer satisfaction.
- Price – product pricing should cover the direct and indirect costs associated with production and distribution. Depending on the product, the landowner may need to follow the pricing strategies of the competition, as is seen in the price of fuel at gas stations. Conversely, the landowner may have more liberty in pricing because of a distinct product difference.
- Promotion – a creative flair is helpful in promoting a product. What will catch the eye of a potential customer? Once their attention is captured, what makes your product better than the next? What will lure them in? Capitalize on the real reason clients are buying your product; it may be more service related or ideology related. Promotion is done person-to-person and through advertisements, tradeshow, brochures and websites.
- Placement – refers to the distribution system. How will the product reach the consumer? Will the product be distributed to retail stores or delivered directly to customers? Strategic product placement results from having knowledge of the location and buying habits of the targeted customer.

## Marketing Strategy

Applying the four main marketing elements – product, price, promotion and placement – creates a marketing strategy that will allow landowners to successfully sell their forest products.



*Preparing firewood for shipment to retailer; wrapper has the Colorado Forest Products™ logo.*

Even if only one physical product is being sold, separate strategies should be created for different types of customers. All customers buy firewood to put in a fireplace or stove, but one customer may choose a retailer based on different factors than another. If

the landowner wants to capture a different audience segment of the firewood market, the product may be different for each (for example, rounds vs. split wood). Prices will depend on the amount of processing. Some customers may look for firewood on the internet, while others find the firewood in the newspaper or ask a friend. Some customers may be willing to transport the wood in their trucks, while others may want the wood delivered and stacked.

Customer groups are defined by age, income, education, location and other characteristics. Clearly identifying customer groups and determining how they prefer receiving information is essential to any successful marketing strategy.

Product positioning and branding, whether it takes advantage of a physical characteristic, such as product dimensions, or a real or perceived attribute, such as being local, green, sustainable or convenient, is the essence of value-added marketing. The importance of knowing the targeted customer cannot be over-emphasized. It is essential for determining how to package and promote the product, what price can be charged and how the buyer will find the product.

## Product Branding

Product branding is a form of product positioning. Formal national and international forest and wood products certification programs are examples of product branding in which forest landowners and forest products manufacturers can participate. Colorado Forest Products™ and Tree Farm® are trademarked certification programs that can benefit forest landowners. These programs have a brand, logo or artwork for use on products or promotional materials to inform customers that the products are made in Colorado. For example, branding a wood product as a certified Colorado Forest Product ([www.coloradoforestproducts.org](http://www.coloradoforestproducts.org)) may improve recognition, consumer perceptions and sales, because people will immediately associate it with their local community or the state. Today's informed consumers are beginning to understand the importance of being good stewards of their nearby forests.





## Product Positioning

Creating a favorable image of a product in the minds of consumers is essential. Sellers who can positively position a product in relation to a competitor's product have the advantage. For example, a savvy landowner may not just be selling firewood, but may instead be selling heat (a service). Heat creates comfort; therefore, the landowner could claim to be selling "Comfort by the Cord." Convenience represents an underutilized market approach for landowners selling their own wood products. Allowing consumers to purchase wood products without driving long distances to get them is an attractive convenience. Another example includes selling post and poles for fencing or dimension stock for furniture, as well as the hardware to build the fence or furniture. Pre-drilling and pre-fitting wood components is another way to add convenience – and value – and can be done with simple, inexpensive woodworking equipment.

## Keeping a Pulse on the Market

Once the business is up and running, monitoring the market should be part of the regular routine. Track economic indicators, changes in government regulations, and social and environmental trends. Most importantly, constantly monitor and evaluate the attitudes and feelings of existing customers. Adjusting to trends in the market can give wood producers an advantage over their competition.

- WHO...is the customer?
- WHAT...kind of people and preferences make up our customers?
- WHEN...and how often do they buy my product or service?
- WHERE...do my consumers or customers live?
- WHY...do my customers buy, or not buy, my product or service?

The answers to these five simple questions should form the basis for making decisions in a changing market.

*The Forest Products Business Guide: Business Plan Strategies for Start-up and Existing Business Owners* is a helpful resource that contains information and worksheets pertaining to products and services, marketing, management and finances. It can be found on the CoWood page of the Colorado State Forest Service website at [http://csfs.colostate.edu/cowood/library/Introduction-to-BusinessPlan\\_workbook.pdf](http://csfs.colostate.edu/cowood/library/Introduction-to-BusinessPlan_workbook.pdf).



*Small-diameter wood can be utilized to create small buildings.*



*After two growing seasons, aspen trees and other vegetation regenerate on this skid trail.*

## Conclusion

Active forest stewardship helps landowners better understand nature's delicate balance and develop a greater appreciation for the land in their care. Tree knowledge expands from "trees should be green" to tree species identification, tree vigor and recognizing symptoms related to a particular disease, wildlife use or insect. Property features, such as a steep hill, a seep and a fox den, are viewed from new perspectives. It is rewarding to see the benefits of forest stewardship that occur almost immediately. Other benefits become noticeable over time. Sometimes, the changes are not fully appreciated until photos from years past are shared.

Preparing a forest products sale or forest improvement project takes time and attention to detail – it also is an effective way to get to know the property. Landowners who familiarize themselves with the land will know what improvements are needed, and researching the timber market prior to a sale will reduce uncertainties and difficulties later. Landowners who are familiar with their land will be in a better position to meet their forest management objectives. Forest products sales are the outcome of good forest management. The sale of product itself should not drive forest management decisions.

It is important to network with other people in the forest products industry and stay current on the local forest products market. Relationships built through networking will help simplify the sale process and maximize value and return on investment. Utilize the knowledge and services of a professional forester as needed.

The forest is much larger than the individual properties held within it, which means networking is important not only from a sale perspective, but from a stewardship perspective as well. The actions public and private landowners take now can have a positive impact on the forest and reduce the severity of natural disturbances, such as those that have had a dramatic impact on Colorado's forests. Forest products derived from stewardship activities equate to income for the landowner and surrounding community.

## References

**Forest Product Marketing**, by Dr. Steven Sinclair. Published by McGraw-Hill in 1992.

**Foresters Field Handbook**, compiled and edited by Dennis Lynch, Ph.D., Department of Forest Rangeland and Watershed Stewardship, Colorado State University, 2005 Edition.

**Marketing Forest Products**, by Jean Mater, S.M. Mater, and C. Mater. Published by Miller-Freeman, Inc. in 1992.

**Marketing for Wood Product Companies**, by Bob Smith. Virginia Cooperative Extension. Virginia Tech University.

**Opportunities for Making Wood Products from Small Diameter Trees in Colorado**, by Dennis L. Lynch and Kurt H. Mackes. US Department of Agriculture, Forest Service. Rocky Mountain Research Station, 2002.

**Value-Added Wood Products: Manufacturing and Marketing Strategies**, by Ed M. Williston. Published by Miller-Freeman, Inc. in 1991.



## **Additional Resources**

### **American Tree Farm System®**

The American Tree Farm System® (ATFS), a program of the American Forest Foundation's Center for Family Forests, is committed to sustaining forests, watersheds and healthy habitats through the power of private stewardship. Its mission is "To promote the growing of renewable forest resources on private lands while protecting environmental benefits and increasing public understanding of all benefits of productive forestry."

<http://www.treefarmssystem.org>

### **Colorado Forest Products™**

Colorado Forest Products™ is a consumer awareness/product branding program funded and administered by the Colorado State Forest Service. The program provides a means to enhance marketing efforts for wood products derived from forest restoration and fuels reduction activities in Colorado forests. Those who make forest products can join the organization free by filling out a license agreement.

<http://www.coloradoforestproducts.org>

### **Colorado State Forest Service**

The Colorado State Forest Service (CSFS), a service and outreach agency of the Warner College of Natural Resources at Colorado State University, provides technical assistance, outreach and education to private forest landowners to help them identify and meet their individual land-management objectives, while improving overall forest condition.

<http://csfs.colostate.edu>

### **Colorado Wood Utilization and Marketing Program**

The Colorado Wood Utilization and Marketing Program (CoWood) is a program of the Colorado State Forest Service that is supported by forest products and forest management professionals, educators and researchers in the Colorado State Forest Service and Warner College of Natural Resources at Colorado State University.

The CoWood website offers information about business planning, wood products opportunities in Colorado and wood characteristics of forest tree species.

<http://www.csfs.colostate.edu/cowood>

### **Foresters Field Handbook**

The foresters field handbook provides basic information on maps and compasses, tree inventories, how to measure tree diameter and height, sale design, dealing with tree diseases or insects, fire and weather, livestock and wildlife, and watersheds. It contains volume tables for tree species in Colorado, conversion tables for measurements and much more. The handbook is available through the Colorado State University Extension online store.

<http://www.csuextstore.com>

### **Forest Products Utilization Handbook**

Updated in 2010, this handbook provides details about extracting trees from the forest, sorting logs, processing logs, drying wood and wood characteristics. The handbook is available through the Colorado State University Extension online store.

<http://www.csuextstore.com>

## Glossary

**Angle gauge** - A small, hand-held instrument used to determine which trees should be measured in a point sampling and basal area.

**Basal area** - Cross-sectional area of a tree trunk measured at breast height (approximately 4.5 feet above the ground), inclusive of bark and expressed in square feet. Basal area per acre is a common expression of timber density or stocking. The higher the number, the greater the number of trees in a given area.

**Bearing (witness) tree** - A tree with survey information on it that indicates where a surveyed corner is located in relation to the tree. The information may be on a metal sign or scribed into a blaze at the base of the tree. These trees should not be cut down.

**Board foot** - A unit of measure representing a piece of wood that is 12 inches x 12 inches x 1 inch.

**Table 4. Conversion Factors**

Multiply	By *	To Get
board feet	0.083333	cubic feet
cords	128	cubic feet
cubic feet	12	board feet
cubic feet	0.0078125	cords
cubic yards	27	cubic feet
hectares	2.47105	acres
<i>* Multiplier does not consider air pockets between pieces of wood</i>		

**Borer holes** - Holes in the interior of the tree created by wood-boring beetles or the larvae of the beetles.

**Cord** - A volume measurement for firewood that is 4 feet x 8 feet x 4 feet.

**Crown** - The upper portion of a tree, where the branches are located.

**Cruise** - Collection of current, on-the-ground forest information for a specific purpose.

**Cubic foot** - A volume measurement of 1 foot x 1 foot x 1 foot.

**Cultural site** - Human-related materials 50 years or older that may have historical significance. These may be the remains of log cabins, bits and pieces of old mining operations, trees marked

by Native Americans, etc. that retain their significance if not disturbed.

**Cut tree mark** - Trees designated with a paint mark or other means, such as flagging, to draw attention to the tree, which will be cut down.

**Delimber** - A large piece of mechanical equipment that removes tree limbs. Whole, cut trees are skidded to the delimber at the landing. Limbs are knocked off and the tree top is cut off at a given diameter.

**Desired forest condition** - Determines how a landowner would like the forest to look and function in the future (generally 10 years or more in the future). The forest condition may address trees, soils, wildlife, ground vegetation and fuels.

**Diameter at breast height (dbh)** - The diameter of a tree measured 4.5 feet above the ground on the uphill side.

**Diameter-limit cut** - Trees to be cut or left in place, based on the diameter of the tree.

**Goal** - A broad statement indicating what someone wants to accomplish.

**Ladder fuels** - Live or dead vegetation that allows a wildland fire to climb from the forest floor into the tree canopy.

**Landing** - Location near a road where recently cut logs are taken to be loaded onto a truck/trailer and removed from the property.

**Loader** - Piece of equipment used to transfer logs from a deck onto a trailer for product removal.

**Localvores** - An increasing demographic of people who prefer to buy locally generated products.

**Log deck** - A neatly stacked pile of logs created to simplify loading for transporting purposes.

**Log measurement** - A method for determining the volume of wood from a sale after the trees have been cut into logs. Log measurement often occurs at the mill that receives the logs.

**Logger's tape** - A spring-loaded, retractable measuring tape worn on the hip. It is available in 25-foot length increments. The tape is available with linear measurement markings in inches or tenths of feet, and may offer a diameter (dbh) tape on the opposite side of the measuring tape.



**Lop and scatter** - Unused tree debris cut into small pieces (4 feet or less) and scattered across the ground to accelerate decomposition. This is a good slash treatment option if the thinning is light or the amount of branch material is minimal (lodgepole pine is a good example).

**Legal description** - Based on the rectangular system of surveys, the description begins with the portion of the section(s) owned in a particular township and range, followed by the principal meridian. The legal description also may be the lot, block and subdivision name in a particular county. The legal description for a property is found in the Deed of Trust.

**Minimum utilization standards** - The dimensions of the smallest piece of wood the landowner requires the contractor to remove from the sale as a product. Smaller material becomes slash.

**Objective** - A pathway to meet a goal. An objective needs to be specific, measurable, attainable, realistic and time-limited.

**Prism** - A small, hand-held glass instrument used to determine basal area and the trees that must be measured during point sampling.

**Professional forester** - A person working for a natural resource-based organization with a four-year bachelors degree or advanced degree in forestry or a related discipline, from a Society of American Foresters-accredited college.

**Sale prospectus** - A summarized, printed statement that describes a forest product sale and is distributed to prospective buyers.

**Skid trail** - The path taken by mechanized equipment or draft animals to move logs from where they are cut to where they will be loaded onto a truck or trailer.

**Skidding** - Using a piece of equipment or draft animals to move a log from its original location to a log deck. The front end of the log usually is elevated off the ground, while the back end drags on the ground.

**Slash** - Tree debris created by cutting trees and shrubs. Slash generally consists of tree branches and wood too small or defective to make a product.

**Spiegel relaskop®** - An instrument used in point sampling to determine which trees to measure, as well as the basal area. It also calculates tree diameter, tree height and slope.

**Stand** - A group of trees that are unique from another group of trees. One stand of trees may all be aspens, while another stand may be a mix of tree species that are very dense. Stands usually are visible in aerial photos and in general are five acres or more.

**Streamside zone** - The area along a stream for which a different management strategy has been developed to protect water quality. The zone also may be used to protect certain types of vegetation specific to areas located near the stream.

**Stumpage** - The product value of a tree standing in the forest.

**Tree-marking paint** - Paint made specifically for marking trees, which does not fade quickly in the elements. Paint not made specifically for tree marking may not last more than a couple of months outside.

**Value-added product** - Logs processed into a product that can be sold for more money than the log. For example, firewood rounds can be sold for a higher price than the whole log that will be used as firewood.

## Appendix A

### Tree-Volume Sampling

Several methods can be used to obtain the estimated merchantable volume for a forest product sale. Three methods are presented here: percent cruise, point sampling and fixed-plot cruise.

The purpose of each cruise type is to obtain an estimated sale volume. Volume is determined by measuring the diameter of the tree at diameter at breast height (or dbh, 4.5 feet above the ground on the uphill side) and determining the height of the tree. These two numbers are entered into a volume table for the particular tree species. Volume tables are available for many species of trees and regions of the Rocky Mountains. Be sure to use the most appropriate table. Volume tables for Colorado can be found at the LandHelp website under “Timber Volume Calculations.”

If the sale is comprised of mostly sawlog-quality trees with few defects, the accuracy of the cruise will be more important than a sale comprised of poorly formed trees. Measure and record the exact diameter and height for each sample tree. Note any forks, crooks and rot in trees in a high-value sale.

In a lower-value sale, exact measurements are less critical, so less time is spent gathering data. A spreadsheet can be used to record the number of trees that fall into a particular diameter and height range (for example, the 6.5–7.4-inch diameter range and 25–34 feet tall). Only trees that are close to the diameter class break or height class break need to be measured.

After completing the cruise, the information is either entered into a software program that generates the estimated volume, or volume tables are used to calculate the average volume. To use a software program or table properly, a person must know if the values associated with, for example, the 10-inch diameter class includes trees with a measurement of 10.0–10.9 inches or a

measurement of 9.6–10.5 inches. The same is true with height.

### Percent Cruise

The percent cruise may be appropriate if a cut-tree mark is used. The cruise takes place congruently with the tree marking. If the landowner wants a 10-percent cruise, every tenth tree marked would also be cruised (measured). Necessary cruising tools include: tally counter; diameter tape or cruising stick; clinometer; and logger's tape.

The tally counter keeps track of the number of trees marked, so one can determine which trees to cruise. The diameter and height is measured for every tenth tree. If the cruise is for a small, very high-value sale, every fifth tree may be measured. If it is a large, low-value sale, every twentieth tree marked may be measured.

After calculating the average volume, the number is multiplied by 10 if every tenth tree was measured, or by 20 if every twentieth tree was measured, etc. The resulting number is the estimated volume for the entire sale area.

### Point Sampling

Point sampling, also known as variable-plot cruising, may be used for sales utilizing any type of tree mark. The sale is marked first, and then a grid of plots is penciled onto a map of the sale area. The size of the grid will depend on the uniformity and value of the product. For example, if the sale area is a sea of thick lodgepole pines and the trees are basically the same size, the number of plots needed would be much less than in a stand of open-grown lodgepole pines of various sizes and densities. A plot in which no trees will be removed is considered a plot with zero trees.

Tree sampling for a point-sample cruise is based on slope, a tree's diameter and distance from the plot center. The plot radius varies according to the DBH of the tree. Only trees to be cut are measured. Necessary cruising tools include a prism, angle gauge or relaskop to determine which trees are in the plot, a



diameter tape or cruising stick to measure diameter and a clinometer and logger's tape or hypsometer to measure tree height.

The average volume calculated from the cruise is multiplied by the number of acres in the project area to obtain the estimated total volume.



*A prism is a tool used to determine which trees are in the point sampling plot.*

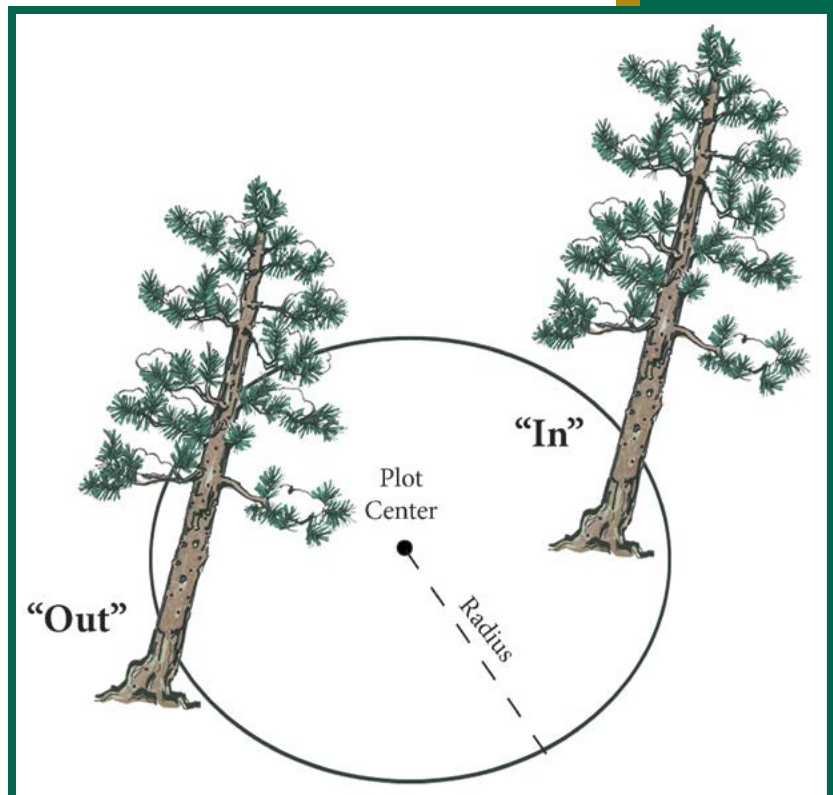
#### **Fixed-Plot Cruise**

The fixed-plot cruise also may be used for sales with trees that have any type of mark. It is a popular option in piñon pine or juniper trees, where the bole of the tree is covered by branches. It also is a common method to measure regeneration and areas with many trees that have a dbh of less than 5 inches.

The fixed plot generally is circular (Figure 2), but also can be rectangular. The size of the plot is constant and the area equates to a percentage of an acre (i.e., 1/100th of an acre, 1/20th of an acre). All trees to be cut within the circle or rectangle are measured for diameter and height.

Cruising tools include a diameter tape or stick, clinometer and logger's tape.

The average volume calculated from cruise is multiplied by the number of acres in the project area to obtain the estimated total volume.



*Figure 2. On a fixed-radius plot (top), sample trees are determined to be "in or out" at ground line. If the measured distance from plot center to the central axis of the tree at ground line is equal to or less than the plot radius, the tree is tallied as a sample tree. If this distance is greater than the plot radius, the tree is not tallied. (© CSFS)*

**Table 5. A list of fixed-plot sizes (in acres) and the specific radius for each**

Plot Size	Plot Radius	Plot Size	Plot Radius	Plot Size	Plot Radius
1/1000	3.7 feet	1/150	9.6 feet	1/4	58.9 feet
1/500	5.3 feet	1/100	11.8 feet	1/3	68.0 feet
1/400	5.9 feet	1/50	16.7 feet	1/2	83.3 feet
1/300	6.8 feet	1/20	26.3 feet	1	117.8 feet
1/250	7.4 feet	1/10	37.2 feet		
1/200	8.3 feet	1/5	52.7 feet		

### Cruise Accuracy

The minimum accuracy standard for variable-plot and fixed-plot cruising generally is 20-percent error at 1 standard deviation. This means that 66 times out of 100, the difference between the actual volume and estimated volume will be within 20 percent. If the timber will make good lumber, the landowner will want a higher accuracy cruise to ensure that fair compensation is received for the product. The landowner may choose to improve accuracy by keeping the standard deviation at 1 and lowering the percent error to 10. A standard deviation of 2 means 95 times out of 100 the difference between the actual volume and estimated volume will be within the acceptable margin of error. This improved accuracy is reserved for only the very best timber; otherwise, the cost to cruise the timber will greatly exceed the revenue.

Use the following formulas and example to determine the percent error of a volume sampling or the number of plots needed to meet the statistical accuracy desired.

**Table 6. Assuming that five plots have been taken, the plot information is as follows:**

Plot #	Tree Count	Deviation from mean	(Dev) <sup>2</sup>
1	4	0	0
2	7	3	9
3	2	2	4
4	5	1	1
5	3	1	1
n=5	Mean = 21/5= 4.2 trees/plot		Sum = 15

Based on Table 6, the following equations would apply:

- $\text{Dev}^2/n-1 = \text{standard deviation (SD)}$   
so...  $15/4 = 3.75$
- $\text{SD}/\text{Mean} = \text{coefficient of variation (CV)}$   
so...  $3.75/4.2 = .89$
- $(\text{Number of standard deviations})^2 \times (\text{CV})^2 / (\% \text{accuracy})^2 = \# \text{ of plots needed}$
- Assuming the sale is not high-value, a 1-standard deviation and 20-percent error is used with the following results:
- $(1)^2 \times (.89)^2 / (.2)^2 = 1 \times .79 / .04 = 19.8$  or 20 plots total need to be taken.
- If the land owner prefers a 10-percent error at 1-standard deviation, 79 plots would be needed.
- The number of plots needed usually decreases as more plots are taken, so in this instance, the landowner may add 10 more plots for a total of 15 and redo the calculations to see if the percent error is 20 percent or less.

NOTE: Substituting volume per plot for trees per plot may provide a more accurate result for multi-product sales because a plot with two large trees may be comparable in volume to eight smaller trees on a different plot. Use species-specific volume tables to determine the total volume for each plot and proceed through the same calculations



## Appendix B

### Sample Sale Prospectus

#### TIMBER SALE PROSPECTUS: “SAWMILL GULCH TIMBER SALE”

The Grand Junction District of the Colorado State Forest Service is offering the following timber sale for bid. Sealed bids will be accepted until June 1, 20XX. Contact the CSFS Grand Junction District (contact information below) for bid forms and to arrange for a showing of the sale area.

Sale Location:	Sections _ and _, Township _ south, Range __ west, _____ County, CO. Sale is located on private land approximately ___ miles north of town name. Haul route is along the _____ Road.
Product Description:	Approximately 40 acres of live Douglas-fir sawlogs. Area has been marked as a partial cut. Average diameter: 17”  Average height: 60’
Estimated Volume:	1,250 tons or approximately 250,000 board feet
Volume Determination:	Trees to be cut have been marked prior to sale. The sale volume has been premeasured. Purchaser may elect to use state-certified weight scales to determine actual weight hauled.
Utilization Standard:	16-foot piece, 6-inch top, 50-percent sound
Operating Season:	June 15 through October 30, and November 15 through March 15.
Contract Duration:	Two years maximum.
Minimum Bid:	\$10 per ton.
Performance Bond:	\$2,000
Specified Roads:	No road-building required.
Other Conditions:	Slash to be piled at landings. Stumps should be 6-inches or less on uphill side. Log-hauling permits for _____ County and USFS roads have been obtained by landowner.
Contact Information:	Access to the sale area is controlled by private roads behind locked gates. Please contact the CSFS to arrange a showing of the sale area: (insert contact information)

## Bid Form Example

### FOREST PRODUCT BID FORM

(Service Contract Bid Form)

NAME: (Business and/or individual) \_\_\_\_\_

ADDRESS: (e-mail address optional) \_\_\_\_\_

PHONE: \_\_\_\_\_ DATE: \_\_\_\_\_

SALE NAME

(Project name)

MINIMUM BID

(n/a for service contract)

LUMP SUM BID

(or \$ per acre, ton, etc.)

Road's End

\$300

\$ \_\_\_\_\_

Please list types of business insurance currently in effect:

*(May also request a list of the type of equipment to be used on the job or planned method to remove the wood.)*

REFERENCES: (optional)

COMMENTS: (from bidder)

Return To:

Landowner's Name

Mailing address

Fax number (optional)

E-mail address (optional)

The landowner retains the right to reject any and all bids.

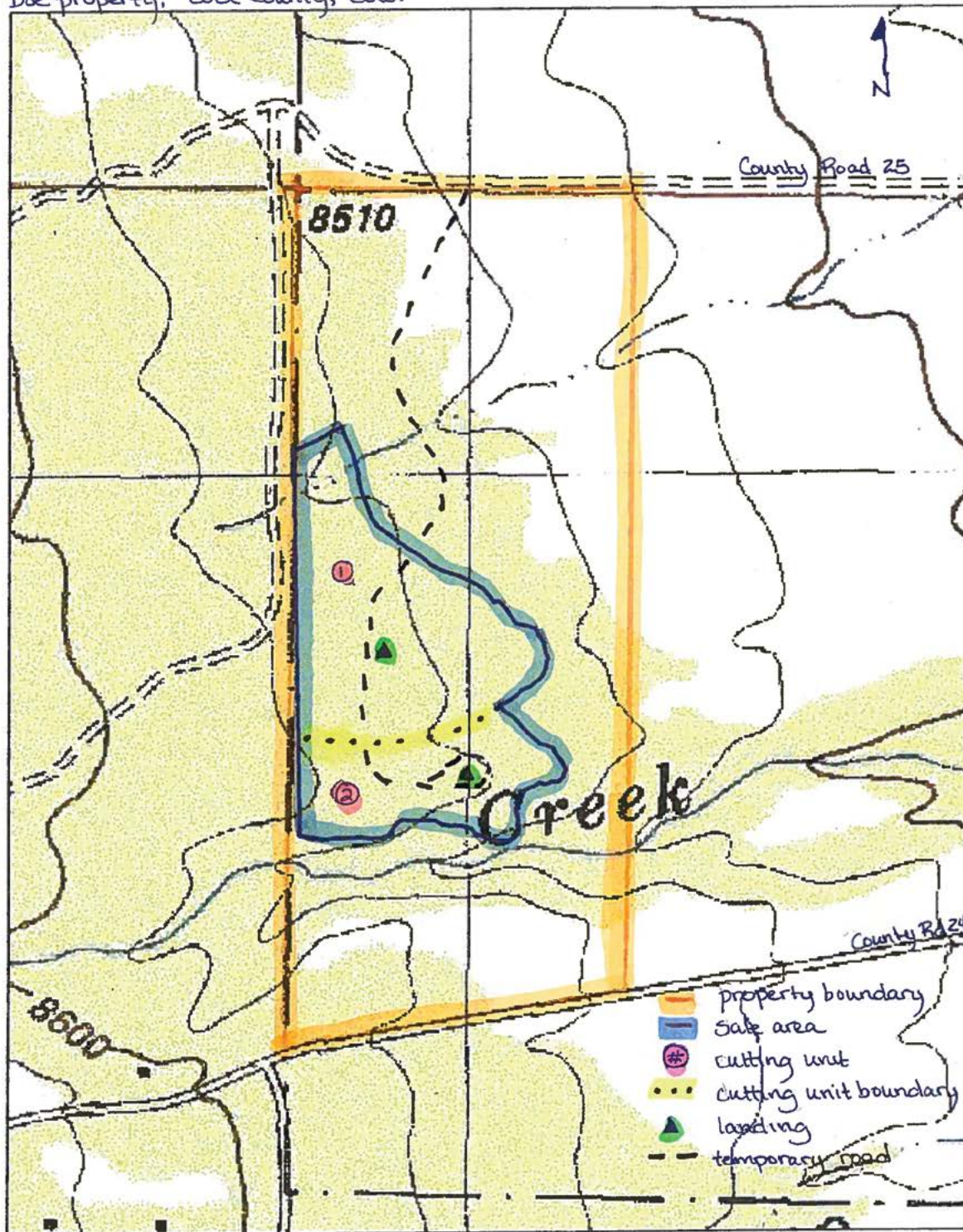
BIDS DUE NO LATER THAN: \_\_\_\_\_ Date \_\_\_\_\_, \_\_\_\_\_ Time \_\_\_\_\_



## Sale Map Example

BIG TOE #3 TIMBER SALE ~ 25 acres

Doe property, Cool County, Colo.



## Appendix C

### Sample Sale Inspection Report

PROJECT NAME: \_\_\_\_\_ INSPECTION DATE: \_\_\_\_\_

CONTRACTOR: \_\_\_\_\_ TIME: \_\_\_\_\_

LANDOWNER: \_\_\_\_\_ LAST INSPECTION DATE: \_\_\_\_\_

PROJECT WORK	Not Applicable	Satisfactory	Not Satisfactory	Past Problem Corrected
<b>A. UTILIZATION and/or CONTRACT SPECIFICATIONS:</b>				
1. Minimum tree and product specifications were met				
<b>B. TRANSPORTATION:</b>				
1. No excessive damage from wet-weather hauling or access				
2. Required maintenance performed				
3. Temporary roads/trails – constructed per contract specs				
4. Temporary roads/trails – closed per contract specifications				
<b>C. CONTROL OF OPERATION:</b>				
1. Contractor representative is available and supervising operation				
2. Following operations plan and conducted safely				
3. Refuse/trash properly disposed of				
4. Existing improvements protected				
5. Work on schedule				



<b>D. CONDUCT OF LOGGING or MASTICATION/MULCHING:</b>	<b>Not Applicable</b>	<b>Satisfactory</b>	<b>Not Satisfactory</b>	<b>Past Problems Corrected</b>
1. Stump heights meet contract specs				
2. Skid/access trails approved and properly cleared				
3. Amount of damage to residual trees is within the specs				
4. Landings - appropriate locations, construction and size				
5. Slash treatment is current and as required by contract specs				
<b>E. BEST MANAGEMENT PRACTICES:</b>				
1. Stream course protection – meets contract specifications				
2. Erosion – no excess damage due to weather, equipment				
3. Erosion – proper/current control measures installed				
4. Erosion – streams, wet meadows and springs avoided				
<b>F. FIRE PRECAUTIONS:</b>				
1. Fire plan is being used				
2. All logging equipment inspected and meets contract specs				
<b>G. GENERAL:</b>				
1. Payments/invoicing on schedule and meet contract specs				

Landowner: \_\_\_\_\_ Company Representative: \_\_\_\_\_

COMMENTS, SKETCH MAPS and ADDITIONAL INFORMATION:

A photograph of a person wearing a tan vest, plaid shirt, and tan pants, walking away from the camera through a snowy forest. The ground is covered in snow with patches of brown forest floor visible. Several tall, thin evergreen trees are scattered throughout the scene. In the background, a red pickup truck and a dark SUV are parked among the trees. The lighting suggests a bright day with shadows cast on the snow.

# Colorado State FOREST SERVICE

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