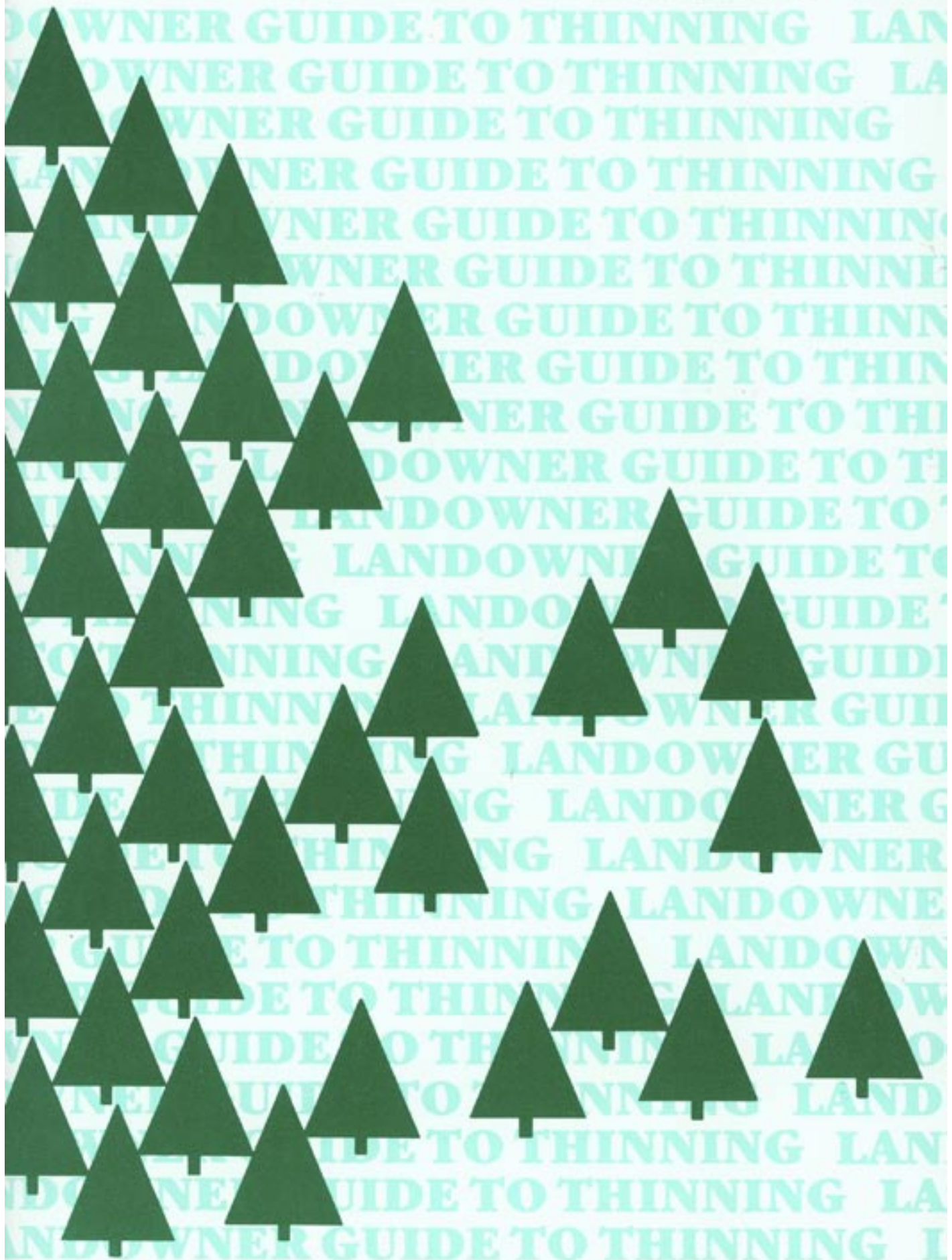


COLORADO STATE FOREST SERVICE COLORADO STATE UNIVERSITY



LANDOWNER GUIDE TO THINNING



Landowners thin trees for many reasons. Increasing land value, improving tree health and vigor, improving wildlife habitat, reducing fire hazards and increasing livestock forage are only some of the reasons. Your reason may differ from those listed but you must still answer the questions, "How do I select the correct trees to cut?"

This tree thinning guide is a *starting* place for tree management. It will help determine:

	pg.
1) tree spacing	2
2) tree selection	6
3) character trees	9
4) priority selection system	12
5) clean-up alternatives	14
6) wildlife piles	17
7) how to cut a tree	18
8) suggested cutting requirements	20
9) evergreen tree or species identification key	23

TREE SPACING

Like all plants, trees need room to grow. A healthy tree is a fast-growing tree, but competition for nutrients and water intensifies as trees grow closer together. Often, this results in low-vigor trees which become susceptible to insects, disease and fire. Proper spacing:

- 1) increases the overall health and vigor of the stand
- 2) helps individual trees resist insect and disease attacks and
- 3) reduces forest fire hazards

Spacing benefits more than the tree. Wildlife can be more easily observed, and additional sunlight hitting the soil encourages the growth of ground plants and flowers. Tree density affects property values which are highest at 140 trees per acre. (If density is more than 140 trees per acre, land value decreases in proportion to the additional trees.)



The general rule: Less space is needed between small trees . . .

Desired spacing varies with tree size. Larger trees need more room to grow. To find the optimal distance between trees, it is necessary to find the average tree diameter.

If you have small trees the spacing needed is *less* than is you have large trees.

Once you have calculated the optimum space between trees it becomes apparent how many trees need to be thinned. In selecting trees to keep, be careful not to develop "square" patterns or "rows". Remember, the average spacing is *only* a guide. After selecting which trees to remove, some of those remaining may be closer together or farther apart than the guide. The idea is to use the spacing guide as an average.



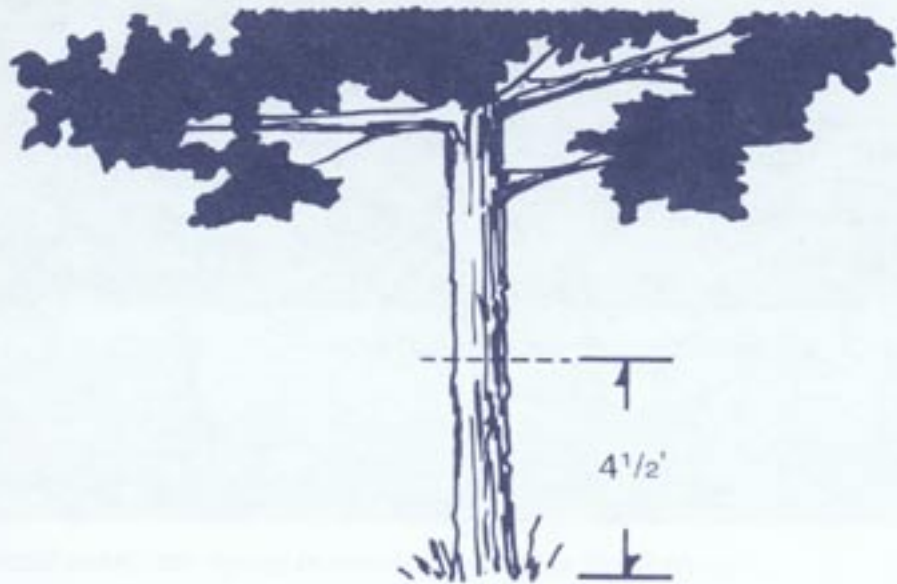
... while larger trees require more room to grow.

Determine the average tree diameter by the following steps:

- 1) Select five to ten typical trees on your property.



- 2) Measure in inches the circumference of each tree at 4½ feet above ground level (Foresters call this measurement the diameter at breast height or "DBH").



- 3) The diameter = circumference in inches X 0.31831
(EXAMPLE: a tree with a 25" circumference = 7.95 inches in diameter.)

4) Total the diameters and divide by the number of trees measured to obtain the average tree diameter.

EXAMPLE: tree

$$\#1 = 7.95$$

$$\#2 = 6.5$$

$$\#3 = 8.7$$

$$\#4 = 7.6$$

$$\#5 = 8.1$$

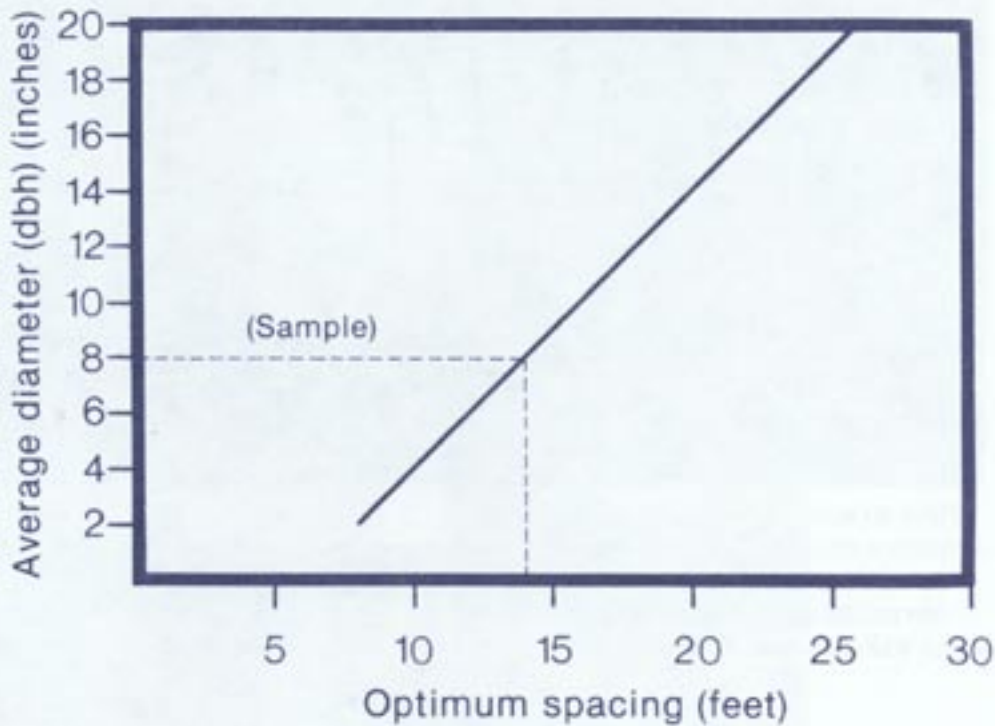
Total diameters = $7.95 + 6.5 + 8.7 + 7.6 + 8.1 = 38.85$.

Divided by 5 trees = $38.85 / 5 = 7.77$ " average tree diameter.)

$$\frac{\text{total of trees' diameter}}{\text{number of trees}}$$

5) Find 7.77" or 8" on the chart below. The space between trees should be about 14 feet.

(The rule of thumb is that the average tree diameter plus six equals the average spacing in feet.)



Once you have calculated the desired distance between trees. Now you must select *which* trees to keep.

TREE SELECTION

Deciding which trees to remove can be the hardest part of thinning. Often the tree's health determines the selection process. A healthy tree generally has a single, pointed top, a straight trunk, and full foliage of typical color. It is free of insects, disease, and animal or mechanical damage. If all your trees show healthy characteristics, simply find the best tree, use the spacing guide to select another tree at the proper distance and continue choosing trees.



Where to start in this confusing mass of branches and needles? The first look at a stand can seem like an impossible maze — but taking a close-up view of individual trees will help sort things out.



Look up — a dying top of a tree usually indicates a good candidate for removal.

A closer look at your trees may show they require more specific selection. Do some trees have poor form, broken or double tops, or thin crowns? Do they show signs of insect activity? Are there trees with dead tops, fire scars or disease problems? Trees like these should be removed first.



Evidence of disease damage.



Dead or dying trees caused by insect attacks.



A split top.



A fire scar.

If you are fortunate and have three or four tree species on your property, try to maintain a good mixture. This management tool prevents total loss of your forest in case of insect or disease outbreaks which affect only one particular species. If you have only two tree species, select a balanced mixture and consider planting other tree species.



Before: A stand of sickly trees suffering from intense competition and crowded conditions.



After: Using proper thinning techniques, the remaining trees now each have a better chance of health and survival.

Sometimes *all* the trees in an area are of poor quality. Depending on the situation you can: 1) remove all the trees in the area and replant or 2) keep the best of the bad trees and remove the rest. Using either of these methods will depend on your particular needs and intentions for the property.

Occasionally a few trees fall into the poor category but you will want to keep them anyway because of their unique character.

CHARACTER TREES

Character trees:

- 1) are unique in shape or appearance
- 2) provide diversity of species
- 3) are unique or historical points of interest
- 4) perform a particular function
- 5) stand out among the crowd
- 6) hide undesirable views such as roads, buildings, power lines, etc.

Foresters don't condone tree carvings, but this cryptic note from a Basque sheepherder might have changed this ordinary tree into a "point of interest."



This gnarled and knotty old veteran definitely stands out in the crowd.



Generally, character trees do not follow the definition of "good" trees. They may have unusual shapes, grow in funny locations, provide homes for wildlife, be extremely large, etc. While not all properties have character trees, almost every property has a few trees which are prominent or serve a special need. Plan to keep your best character trees. Work around them and highlight them.

A dead top – but in this case it adds character to this scenic view.



Trees which provide homes for wildlife are especially important to save.



Diversity in a stand can be achieved through different tree species (if they exist) or by selecting trees of mixed ages.



Sometimes, character trees are created not from their individual qualities — but because of the function they perform. Notice how these exceptionally large and beautiful ponderosa pines draw the eye's attention away from the power line and fence in the background.

PRIORITY SELECTION SYSTEM

Prioritizing your trees helps determine which ones will be selected for removal. How you prioritize depends on your plans for the property.

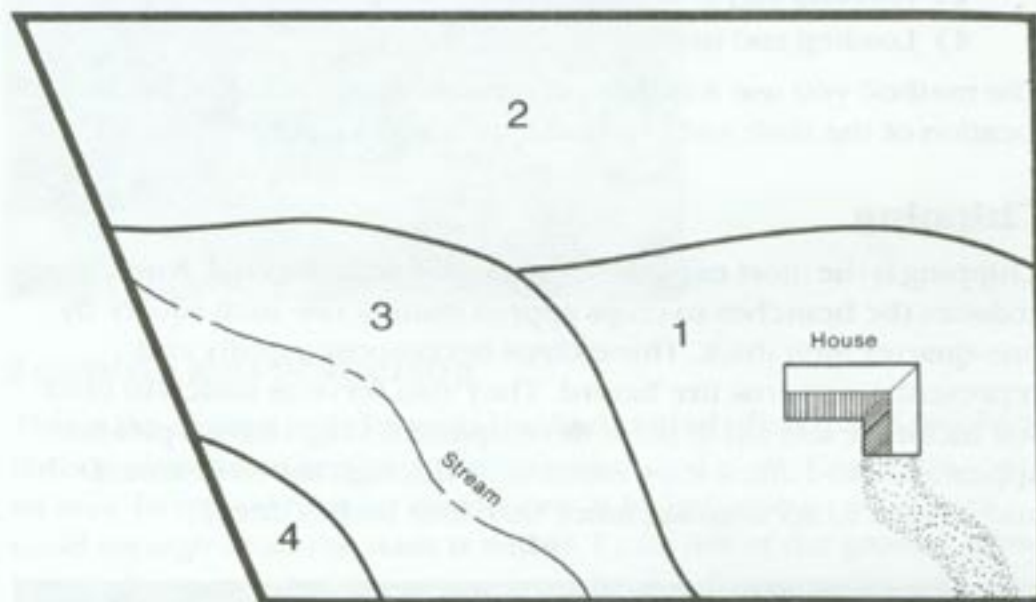
The five general areas to consider in tree selection are:

- 1) **Quality** — Consider the tree's health and vigor and whether it meets the "good tree" definition.
- 2) **Tree Size** — Do you want large trees, small trees or a combination of both? A combination of the two is generally better, but not always possible.
- 3) **Spacing** — Will you create a uniform look by following the spacing guide to the letter? Or, do you want to deviate from the guide to develop areas on your property into openings or thickets?
- 4) **Character Trees** — Do these become "no-cut" trees and thus the number one priority? Are some trees actually hazards which will eventually require removal?
- 5) **Mixed Species** — Are all your trees healthy enough to keep? You may have three tree species but one species is always "bad". Do you want to keep it just be have three species or get rid of the bad ones and replant?



These five considerations are important because different parts of your property may have varying priorities. For example, around your home you may desire character trees first, with a few large trees of mixed species that are attractive and well-spaced. Along the driveway, you may want large, quality, well-spaced trees but you may not care whether they are character trees or of diverse species.

You can modify these guidelines to some extent and still attain a good, healthy stand of trees on your property. You are, in fact, developing small "management prescriptions" for your land just as a professional forester would do. You may wish to map your property into areas and apply a priority to each.



3 Acres (not to scale)

Area 1 = Top priority — reduce wildfire hazards and develop aesthetically pleasing landscape. Keep three large trees around house, save bushy pine near drive entrance, highlight rock outcrop. All other portions within area, use 18' spacing with good mixture of trees species and sizes.

Area 2 = Second priority — use 14' spacing with good mixture of tree species and sizes, save two wildlife trees, cut one small opening 30' in diameter (irregular shape) in NW corner.

Area 3 = Plant 100 trees.

Area 4 = Leave as is.

CLEAN-UP ALTERNATIVES

During thinning operations limbs and branches will accumulate. This debris is called slash. Eliminating slash reduces fire hazards; improves aesthetics; helps develop grass and other vegetation; and improves access for people, livestock and wildlife.

Four common methods of slash disposal are:

- 1) Chipping
- 2) Piling and burning
- 3) Lopping and scattering and
- 4) Loading and hauling

The method you use will depend on cost, the size, amount and location of the slash and the final appearance desired.

Chipping

Chipping is the most expensive method of slash disposal. A machine reduces the branches to chips approximately one inch square by one-quarter inch thick. These chips decompose rapidly and represent a very low fire hazard. They also serve as mulch to hold soil moisture and aid in plant development. Chips have a pleasant appearance and allow easy movement through the slash area. Don't allow chips to accumulate more than four inches deep.



Piling and Burning

Piling and burning is a quick way to eliminate a large amount of slash at moderate cost. Slash is piled in open areas for burning when snow cover is sufficient to prevent fire spread. Piles should be packed tight (twice as high as they are wide) to facilitate burning, but be located far enough from remaining trees to avoid scorching them.

The County Sheriff and local fire departments must be notified before any burning is done; some areas will require burning permits.



Lopping and Scattering

This is the easiest and cheapest method of slash disposal. It involves cutting large branches into smaller pieces and scattering them over an area. In typical forestry operations, it is desirable to cut pieces small enough so all the slash is within 12 inches of the ground. This low slash gives a pleasing appearance, breaks down readily and doesn't inhibit walking.



Loading and Hauling

Loading and hauling is good for small amounts of slash provided you have an adequate vehicle and a place to dump the material. Large amounts of slash make loading and hauling an expensive option for most landowners.

The final clean-up procedure could be a combination of all the slash disposal methods. You may chip some material for mulch around your home, pile and burn areas having excessive slash accumulations, lop and scatter material in low-use areas and haul some slash away.

Be aware of the need for slash disposal and plan how you will accomplish it.



Before — intense competition for sunlight, water, nutrients, and growing room . . .



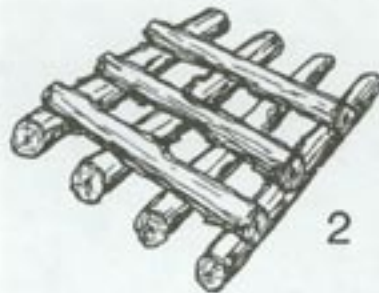
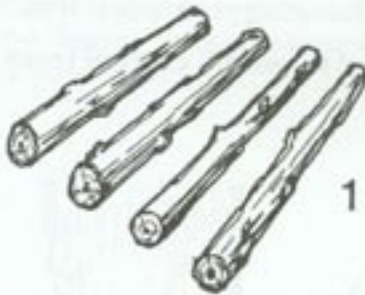
. . . and after thinning — notice that the basic “character” of the stand was preserved, and extra attention has been paid to slash clean-up because of the area’s high scenic value.

WILDLIFE PILES

An alternative to slash disposal is the development of wildlife piles. Wildlife use slash piles for 1) homes and shelter; and 2) escape and hiding. The difference depends on the material used and the pile size, and it is important to understand the construction requirements for each.

For Shelter

Using small logs, (four to six inches diameter, and four to eight feet long) develop a "cross-hatch" pile at least two feet high. Complete the pile by placing various lengths of slash over logs and cover thoroughly.



For Hiding and Escape

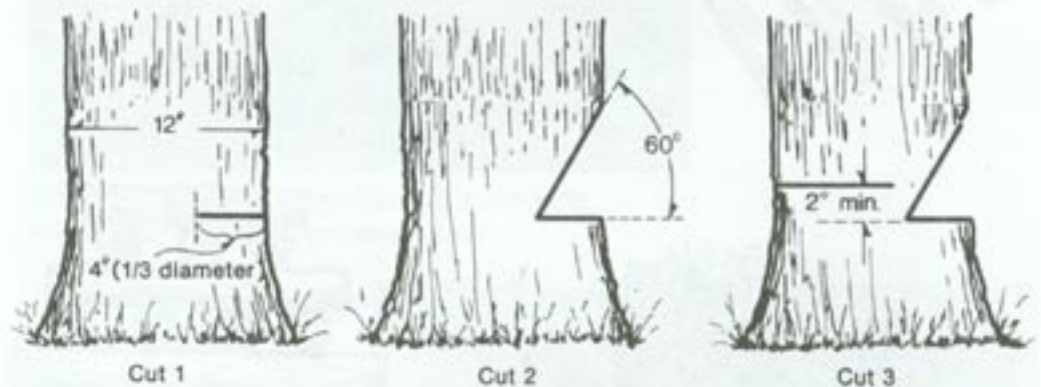
Use four inch and smaller slash to build a pile at least four feet high and six feet square. After a few years the slash may deteriorate and wildlife will no longer hide in it. Then you can burn and remove it.

HOW TO CUT A TREE

Cutting trees is dangerous work. You can reduce the danger greatly by following safety precautions.

Follow these steps for safe tree cutting.

1. **Size-up:** Determine where you want the tree to fall. A leaning tree or a tree with branches only on one side may fall only one way. Is it safe for the tree to fall where it "wants" to go? If so, cut it. Sometimes certain trees require cutting before other ones in order to avoid them getting stuck or "hung-up" together.
2. **Clear-out:** Clear your cutting area. Cut off limbs that are close to the ground so they won't snag your clothes or hinder your cutting. Trim back any brush overhanging your work area.
3. **Three-cuts:** Use a three-cut method for safely cutting trees as shown below.

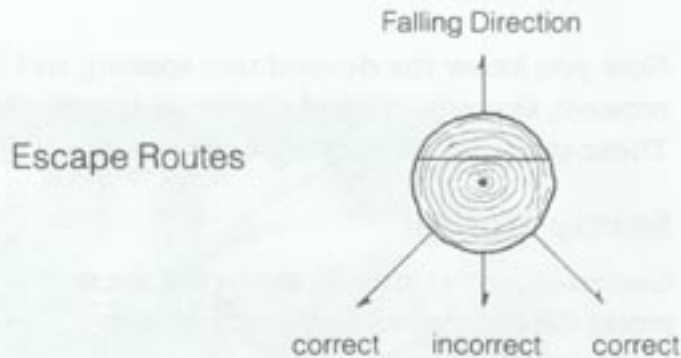


CUT 1: This is a flat cut (do not angle). It should cut at least $1/3$ of the tree stump diameter.

CUT 2: A slanting cut that connects with cut 1. It should be done with a steep angle, approximately 60 degrees. A lesser angle will compress too soon and will not control the tree's falling direction.

CUT 3: This "back cut" should be a minimum of two inches above the first. This is also a flat cut.

4. **Escape Route:** *Always* have an escape route that you can take when the tree begins to fall. It should be well away from the tree's falling direction and back to one side. Some trees have been known to "kick back" from the falling direction.



This logger has chosen a safe escape route as the tree falls, but apparently forgot to look for other hazards. Note the "leaner" snag nearby to the far left of the photo.



5. **Hang-ups:** Occasionally, trees get stuck on other trees as they are falling. These "leaners" require **SPECIAL PRECAUTION** because they can fall anytime! Sometimes rolling the tree will prompt it to fall. A safe way to handle this situation is to winch or pull the tree with a chain and vehicle until it comes free and falls.

6. **Jack-straw:** When trees are cut without regard to where they will fall, they often become tangled, making limbs and clean-up very difficult. To avoid jack-strawing, cut and fell your trees in the same direction. You will find it is worth the extra effort when it comes time to consolidate the wood products and clean up the slash.

SUGGESTED CUTTING REQUIREMENTS

Now you know the desired tree spacing and have selected trees to remove, keeping in mind character trees and clean-up alternatives. These other pointers may be of help.

Stump Height

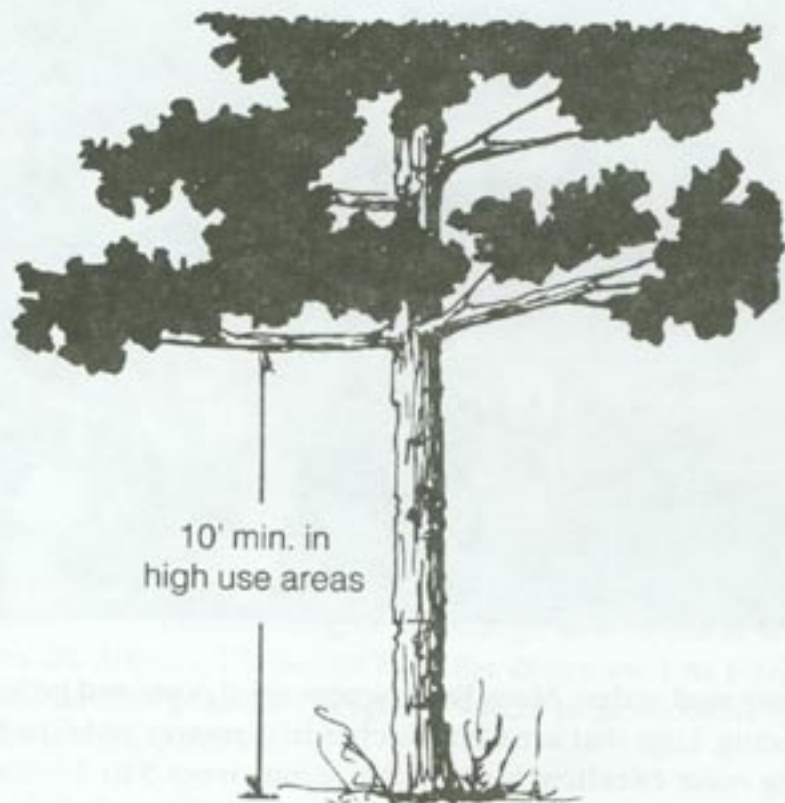
Generally, lower stumps are better for safe walking and eventual wood disintegration. Four inches or less is a reasonable goal. Occasionally you may wish to have a high stump of about four feet. These stumps are good for bird feeders and birdbaths, or even for hanging a hammock!



Stumps should be cut as low as possible.

Limbing

In high use areas limbing trees up to ten feet is a good safety practice. Around homesites, limbing trees up to ten feet reduces the fire hazard. Cut limbs flush to the main stem or trunk. Limbing all trees up to approximately six feet is beneficial for growth but not necessary.



Power Lines, Improvements

Note where improvements and utilities are located before cutting so the tree will fall safely. Power lines, fences and tables always seem to suddenly "materialize" just as the tree begins to fall. Flagging these areas beforehand saves embarrassment and added costs of repair.

Follow-up

Because forests are not static, continued work in the future will always be necessary to keep up with the changes that will take place. Once you get your trees responding well, they will grow, get broken limbs, blow over, or get sick and eventually begin competing once again with one another. After three to five years, you may even need to thin them again. Take time to follow-up and examine your property each year.

Wood Utilization

After thinning operations, you may wonder what to do with all the wood. Here are some suggestions.

Firewood: You can burn it. Others might want to sell it. Costs of thinning sometimes can be recovered by selling firewood.



Posts and poles: Many landowners need posts and poles for fencing. Logs that are 6 to 8 inches in diameter and 6 to 8 feet long make excellent posts. Long, skinny trees 3 to 4 inches in diameter and 12, 14 and 16 feet long become good fence rails.

Big logs: Trees over ten inches in diameter and longer than eight feet are large enough to make lumber. Your local sawmill would buy your big material and may pick it up.

Cones and foliage: Craftspeople create many things from cones and foliage. Depending on your materials you may be able to sell these tree parts for decorations.

Consider your wood material for different types of wood products. Investigate the different markets and derive some income from wood use.

Now you know the basic principles for thinning trees. As you work on your thinning project, feel free to contact your nearest CSFS district office with questions that might arise.

Good Luck!

GUIDE TO NATIVE COLORADO CONIFERS

This guide will help you identify native conifers. To use this simple "key", closely examine your trees and follow these steps:

- 1) Count how many needles in a "bundle" (growing from the same location on the twig)
- 2) Measure length of needles
- 3) Measure length of cone
- 4) Note unique characteristics such as:
 - needles — blunt or scale-like
 - needles — flat, square, round or twisted
 - cones — upright or hanging
 - cones — prickly or smooth
 - berries — one- or two-seeded
 - tree shape from a distance

As an example, if the tree you are trying to identify has two or three needles in a bundle, go to Roman Numeral II of the Guide. If these needles are 2-1/2 inches long or shorter, go to B under II. If the needles are 3/4 to 1-1/2 inches long, the cones are 1 to 1-1/2 inches long and have large seeds (or spaces where large seeds have been), the tree is b, Pinyon Pine.

I. Needles, 5 in a bundle

A. Needles 1 to 1-1/2 inches long with tiny white specks of pitch; cones approximately 3 inches, each scale tipped with long, curved, sharp bristle.



actual size

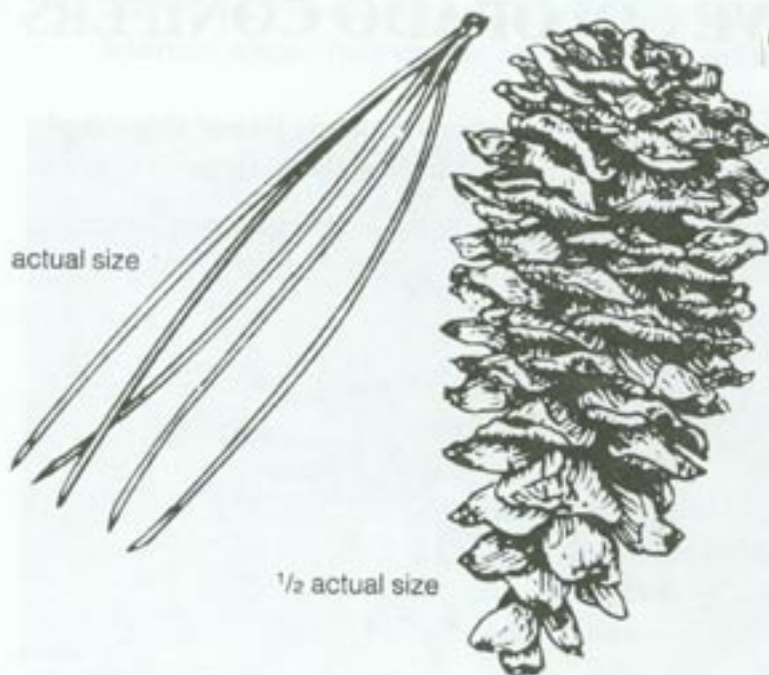


Bristlecone Pine
(*Pinus aristata*)

1/2 actual size

B. Needles 1-1/2 to 3 inches long, flexible and almost silky; branches bend readily without breaking; cones vary 3 to 10 inches long with *no* prickles.

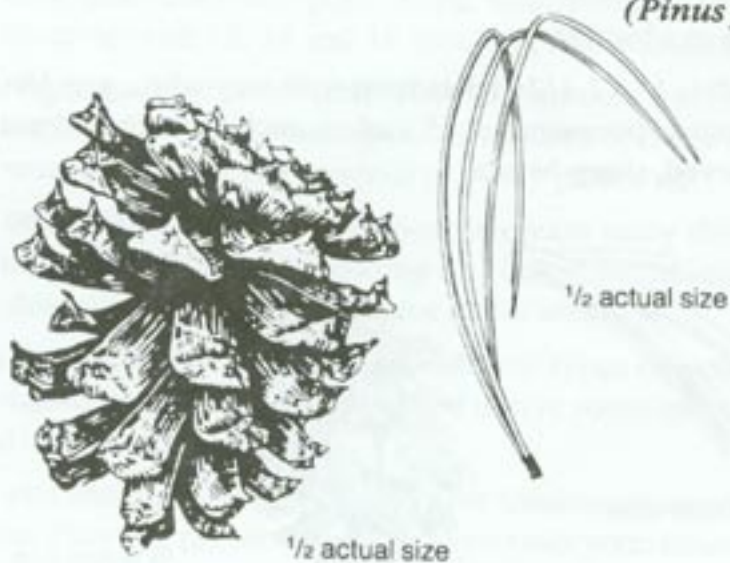
Limber Pine
(*Pinus flexilis*)



II. Needles, 2 or 3 in a bundle

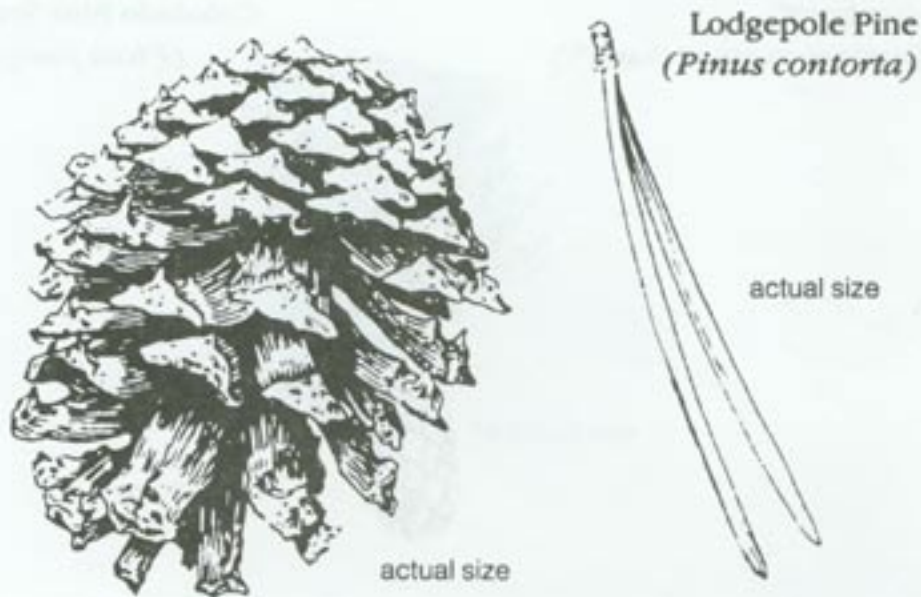
A. Needles 3 to 7 inches long; cones 3 to 5 inches long, scales armed with spines.

Ponderosa Pine
(*Pinus ponderosa*)

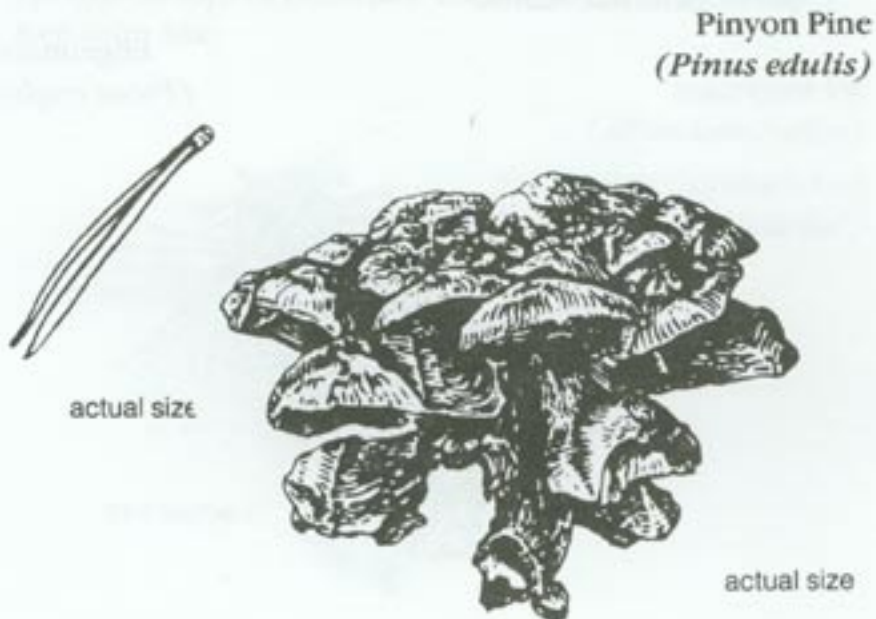


B. Needles, (usually 2), seldom over 2-1/2 inches long.

a. Needles 1-1/4 to 2-1/2 inches long, yellow-green, and usually twisted, 2 needles per bundle; cones 1-1/2 to 2 inches long, cling to tree unopened for many years, small seeds when opened.



b. Needles 3/4 to 1-1/2 inches long; cones 1 to 1-1/2 inches long, open readily in fall, large seeds.



III. Needles, single (not bundled with others)

A. Needles very stiff and sharp pointed, four-sided, leave grate-like stubs on twig when missing; twig surface of current year's growth smooth and free of fine hairs; cones hang down and are usually over 3 inches with parchment-like scales.

Colorado Blue Spruce
(*Picea pungens*)



$\frac{1}{2}$ actual size

B. Needles are four-sided, leave grate-like stubs on twig when missing, not as stiff as blue spruce, disagreeable odor when crushed; twig surface of current year's growth has fine hairs; cones hang down and are less than 2 inches long with parchment-like scales.

Engelmann Spruce
(*Picea engelmannii*)



$\frac{1}{2}$ actual size

C. Needles flat, flexible

- a. Needles 1 inch long, slightly twisted at base, leave small raised scars on twigs when missing; cones hang down and are 2 to 2-1/2 inches long with three-pronged tongues between cone scales.

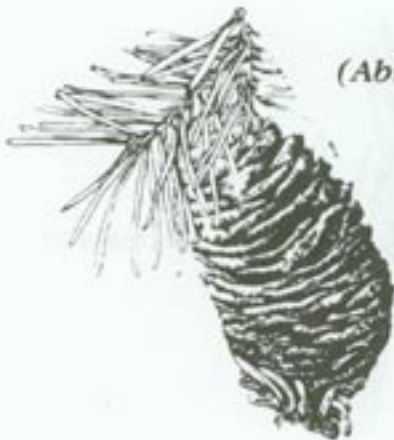
Douglas-fir
(*Pseudotsuga menziesii*)



1/2 actual size

- b. Needles 1 to 1-3/4 inches long; leave flat round scars on twigs when missing, and tend to turn upward from bottom of branch giving appearance of needles growing from only one side of branch; cones 2 to 4 inches long, purple and upright on tops of branches; disintegrate upon maturity; tree spire-like.

Subalpine Fir
(*Abies lasiocarpa*)
(or variety Corkbark Fir)
(*Abies lasiocarpa* "lasiocarpa")



1/2 actual size

c. Needles 1-3/4 to 3 inches long, leave flat round scars on twig when missing, tend to turn upward from bottom of branch giving appearance of needles growing from only one side of branch; cones 3 to 5 inches long, yellow to greenish-purple, upright on tops of branches, disintergrate upon maturity; tree not spire-like.

White Fir
(*Abies concolor*)



1/2 actual size

IV. Needles, single (not bundled with other), scale-like

A. Needles about 1/16 inch long, reduced to small green scales which make the twigs prickly; cones are small bluish berries; bushy shape; often found with pinyon pine.

Rocky Mountain Juniper
2 seeds per berry
(2 years to mature)
(*Juniperus scopulorum*)



actual size



actual size

or Utah Juniper
1 seed per berry
(2 years to mature)
(Juniperus utabensis)

(hard to tell apart)

or One-Seed Juniper
1 seed per berry
(1 year to mature)
(Juniperus monosperma)