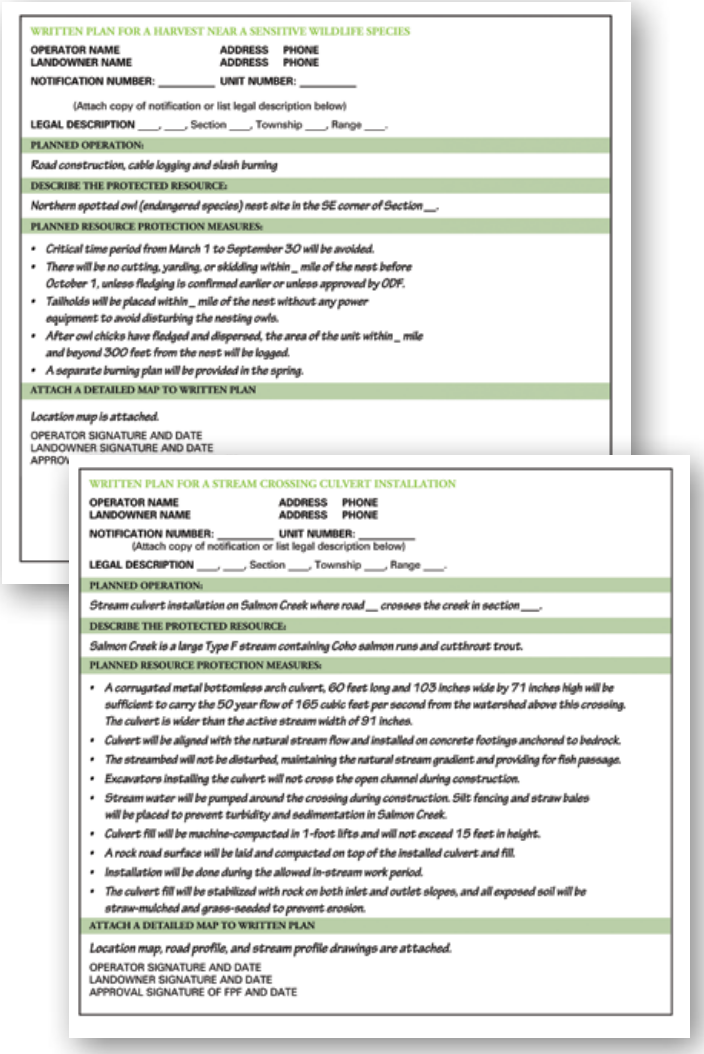
APPENDIX

What you should know about a written plan

It's a document, submitted by a landowner or operator to the Oregon Department of Forestry. It's more than the Notification of Operations – it describes specifically how an operation will meet the requirements of the Oregon Forest Practices Act and Rules. ODF must review it before the operation begins.



WRITTEN PLAN FOR A HARVEST NEAR A SENSITIVE WILDLIFE SPECIES

OPERATOR NAME ADDRESS PHONE
LANDOWNER NAME ADDRESS PHONE

NOTIFICATION NUMBER: _____ UNIT NUMBER: _____

(Attach copy of notification or list legal description below)

LEGAL DESCRIPTION ___, ___, Section ___, Township ___, Range ___.

PLANNED OPERATION:

Road construction, cable logging and slash burning

DESCRIBE THE PROTECTED RESOURCE:

Northern spotted owl (endangered species) nest site in the SE corner of Section __.

PLANNED RESOURCE PROTECTION MEASURES:

- *Critical time period from March 1 to September 30 will be avoided.*
- *There will be no cutting, yarding, or skidding within _ mile of the nest before October 1, unless fledging is confirmed earlier or unless approved by ODF.*
- *Tailholds will be placed within _ mile of the nest without any power equipment to avoid disturbing the nesting owls.*
- *After owl chicks have fledged and dispersed, the area of the unit within _ mile and beyond 300 feet from the nest will be logged.*
- *A separate burning plan will be provided in the spring.*

ATTACH A DETAILED MAP TO WRITTEN PLAN

Location map is attached.

OPERATOR SIGNATURE AND DATE
LANDOWNER SIGNATURE AND DATE
APPRO

WRITTEN PLAN FOR A STREAM CROSSING CULVERT INSTALLATION

OPERATOR NAME ADDRESS PHONE
LANDOWNER NAME ADDRESS PHONE

NOTIFICATION NUMBER: _____ UNIT NUMBER: _____
(Attach copy of notification or list legal description below)

LEGAL DESCRIPTION ___, ___, Section ___, Township ___, Range ___.

PLANNED OPERATION:

Stream culvert installation on Salmon Creek where road __ crosses the creek in section ___.

DESCRIBE THE PROTECTED RESOURCE:

Salmon Creek is a large Type F stream containing Coho salmon runs and cutthroat trout.

PLANNED RESOURCE PROTECTION MEASURES:

- *A corrugated metal bottomless arch culvert, 60 feet long and 103 inches wide by 71 inches high will be sufficient to carry the 50 year flow of 165 cubic feet per second from the watershed above this crossing. The culvert is wider than the active stream width of 91 inches.*
- *Culvert will be aligned with the natural stream flow and installed on concrete footings anchored to bedrock.*
- *The streambed will not be disturbed, maintaining the natural stream gradient and providing for fish passage.*
- *Excavators installing the culvert will not cross the open channel during construction.*
- *Stream water will be pumped around the crossing during construction. Silt fencing and straw bales will be placed to prevent turbidity and sedimentation in Salmon Creek.*
- *Culvert fill will be machine-compacted in 1-foot lifts and will not exceed 15 feet in height.*
- *A rock road surface will be laid and compacted on top of the installed culvert and fill.*
- *Installation will be done during the allowed in-stream work period.*
- *The culvert fill will be stabilized with rock on both inlet and outlet slopes, and all exposed soil will be straw-mulched and grass-seeded to prevent erosion.*

ATTACH A DETAILED MAP TO WRITTEN PLAN

Location map, road profile, and stream profile drawings are attached.

OPERATOR SIGNATURE AND DATE
LANDOWNER SIGNATURE AND DATE
APPROVAL SIGNATURE OF FPF AND DATE

Statutory written plans are always required for operations:

- within 100 feet of a Type F, SSBT or D stream, large lake or significant wetland (not an estuary)
- within 300 feet of a significant wetland (an estuary)
- within 300 feet of a sensitive wildlife site used by threatened or endangered species or other sensitive birds; written plans may be required for these places when the operations are farther away than 300 feet if they could conflict with site protection

Other written plans **may** be needed for other practices that require ODF review and, in some cases, formal approval. Some of these practices include:

- operations on high landslide hazard locations
- road construction with risk of material entering waters of the state
- burning in a riparian management area
- locating a log landing in an RMA
- road construction in an RMA
- stream crossings with 15 feet or higher fills
- temporary stream crossings with 8 feet or higher fills
- placement of wood in Type F, SSBT or N streams
- vegetation retention modification along Type F or SSBT streams
- vegetation modification along Type D and N streams
- locating a yarding corridor in an RMA
- activities that affect sensitive wildlife habitat
- machine activity in stream channels
- alternate practices
- beaver dam removal
- conversion of forestland to a non-forest use

See sample written plans, which include:

- written plan for a sensitive wildlife site
- written plan for a stream crossing
- written plan for a harvest near a Type F or SSBT stream
- written plan for a harvest near a significant wetland

Here's a list of items needed in every written plan:

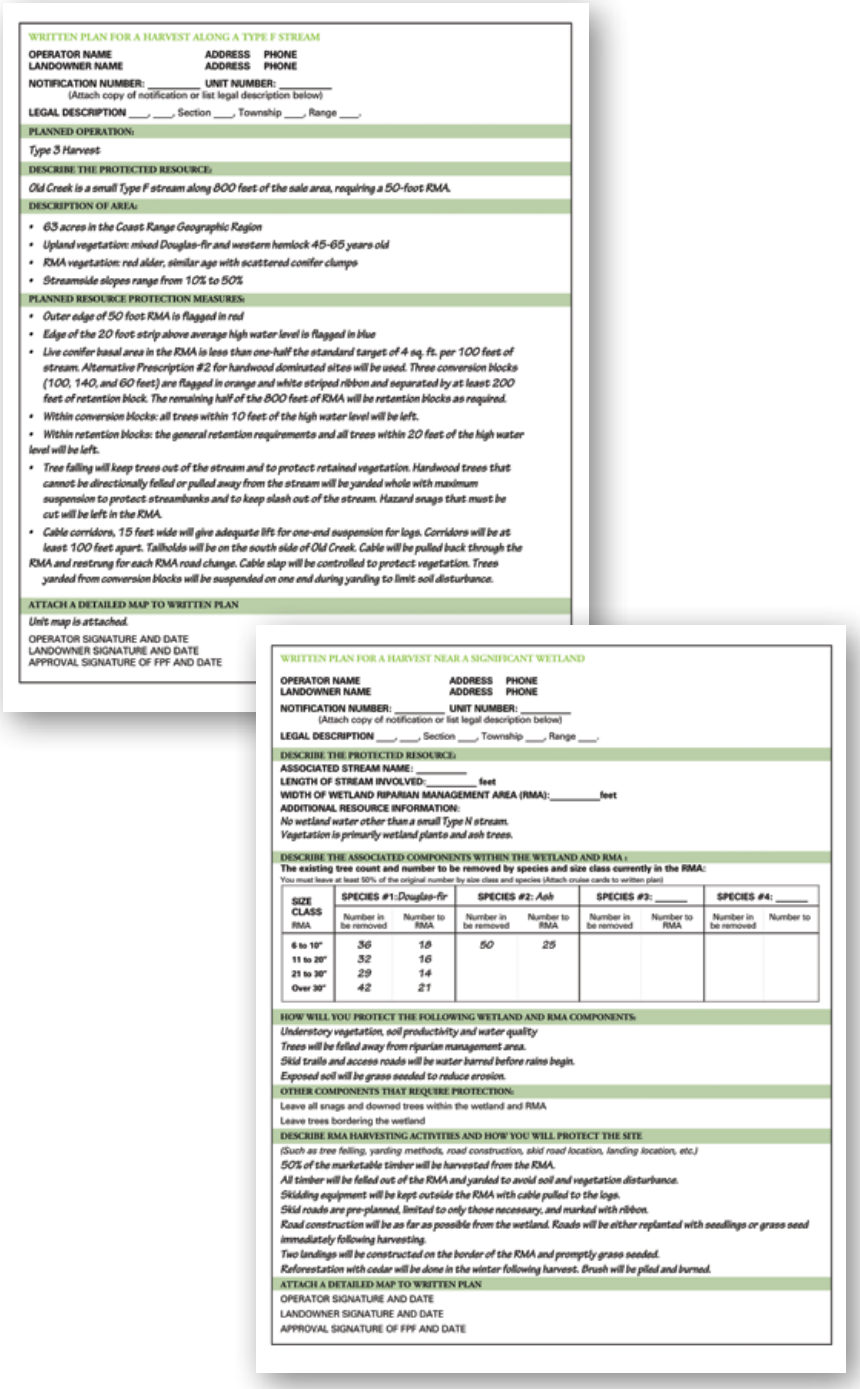
- a legal description or reference to a Notification of Operation and number
- a map showing the operation, the protected resource and section lines, access roads and other important landscape features
- complete description of what's going to be done
- a description of the resource site you are protecting
- a description of how you will do the planned activities to protect the resource site during the operation

Are there fill-in-the-blank forms for written plans?

Yes, they are available from ODF.

When can a written plan be waived?

- A Statutory Written Plan may not be required if the operation activity will not directly affect the physical components of the RMA. For more information check with ODF or see Forest Practices Act Technical Note 10: Statutory Written Plans, at www.oregon.gov/odf



WRITTEN PLAN FOR A HARVEST ALONG A TYPE F STREAM

OPERATOR NAME ADDRESS PHONE
LANDOWNER NAME ADDRESS PHONE

NOTIFICATION NUMBER: _____ UNIT NUMBER: _____
(Attach copy of notification or list legal description below)

LEGAL DESCRIPTION ___, ___, Section ___, Township ___, Range ___.

PLANNED OPERATION:

Type 3 Harvest

DESCRIBE THE PROTECTED RESOURCE:

Old Creek is a small Type F stream along 800 feet of the sale area, requiring a 50-foot RMA.

DESCRIPTION OF AREA:

- *63 acres in the Coast Range Geographic Region*
- *Upland vegetation: mixed Douglas-fir and western hemlock 45-65 years old*
- *RMA vegetation: red alder, similar age with scattered conifer clumps*
- *Streamside slopes range from 10% to 50%*

PLANNED RESOURCE PROTECTION MEASURES:

- *Outer edge of 50 foot RMA is flagged in red*
- *Edge of the 20 foot strip above average high water level is flagged in blue*
- *Live conifer basal area in the RMA is less than one-half the standard target of 4 sq. ft. per 100 feet of stream. Alternative Prescription #2 for hardwood dominated sites will be used. Three conversion blocks (100, 140, and 60 feet) are flagged in orange and white striped ribbon and separated by at least 200 feet of retention block. The remaining half of the 800 feet of RMA will be retention blocks as required.*
- *Within conversion blocks: all trees within 10 feet of the high water level will be left.*
- *Within retention blocks: the general retention requirements and all trees within 20 feet of the high water level will be left.*
- *Tree falling will keep trees out of the stream and to protect retained vegetation. Hardwood trees that cannot be directionally felled or pulled away from the stream will be yarded whole with maximum suspension to protect streambanks and to keep slash out of the stream. Hazard snags that must be cut will be left in the RMA.*
- *Cable corridors, 15 feet wide will give adequate lift for one-end suspension for logs. Corridors will be at least 100 feet apart. Tailholds will be on the south side of Old Creek. Cable will be pulled back through the RMA and restrung for each RMA road change. Cable slap will be controlled to protect vegetation. Trees yarded from conversion blocks will be suspended on one end during yarding to limit soil disturbance.*

ATTACH A DETAILED MAP TO WRITTEN PLAN

Unit map is attached.

OPERATOR SIGNATURE AND DATE
LANDOWNER SIGNATURE AND DATE
APPROVAL SIGNATURE OF FPF AND DATE

WRITTEN PLAN FOR A HARVEST NEAR A SIGNIFICANT WETLAND

OPERATOR NAME ADDRESS PHONE
LANDOWNER NAME ADDRESS PHONE

NOTIFICATION NUMBER: _____ UNIT NUMBER: _____
(Attach copy of notification or list legal description below)

LEGAL DESCRIPTION ___, ___, Section ___, Township ___, Range ___.

DESCRIBE THE PROTECTED RESOURCE:

ASSOCIATED STREAM NAME: _____
LENGTH OF STREAM INVOLVED: _____ feet
WIDTH OF WETLAND RIPARIAN MANAGEMENT AREA (RMA): _____ feet
ADDITIONAL RESOURCE INFORMATION:
No wetland water other than a small Type N stream.
Vegetation is primarily wetland plants and ash trees.

DESCRIBE THE ASSOCIATED COMPONENTS WITHIN THE WETLAND AND RMA :
The existing tree count and number to be removed by species and size class currently in the RMA:
You must leave at least 50% of the original number by size class and species (Attach cruise cards to written plan)

SIZE CLASS RMA	SPECIES #1: *Douglas-fir*		SPECIES #2: *Ash*		SPECIES #3: _____		SPECIES #4: _____	
	Number in be removed	Number to RMA	Number in be removed	Number to RMA	Number in be removed	Number to RMA	Number in be removed	Number to
6 to 10"	36	18	50	25				
11 to 20"	32	16						
21 to 30"	29	14						
Over 30"	42	21						

HOW WILL YOU PROTECT THE FOLLOWING WETLAND AND RMA COMPONENTS:

Understory vegetation, soil productivity and water quality
Trees will be felled away from riparian management area.
Skid trails and access roads will be water barred before rains begin.
Exposed soil will be grass seeded to reduce erosion.

OTHER COMPONENTS THAT REQUIRE PROTECTION:

Leave all snags and downed trees within the wetland and RMA
Leave trees bordering the wetland

DESCRIBE RMA HARVESTING ACTIVITIES AND HOW YOU WILL PROTECT THE SITE

(Such as tree felling, yarding methods, road construction, skid road location, landing location, etc.)
50% of the marketable timber will be harvested from the RMA.
All timber will be felled out of the RMA and yarded to avoid soil and vegetation disturbance.
Skidding equipment will be kept outside the RMA with cable pulled to the logs.
Skid roads are pre-planned, limited to only those necessary, and marked with ribbon.
Road construction will be as far as possible from the wetland. Roads will be either replanted with seedlings or grass seed immediately following harvesting.
Two landings will be constructed on the border of the RMA and promptly grass seeded.
Reforestation with cedar will be done in the winter following harvest. Brush will be piled and burned.

ATTACH A DETAILED MAP TO WRITTEN PLAN

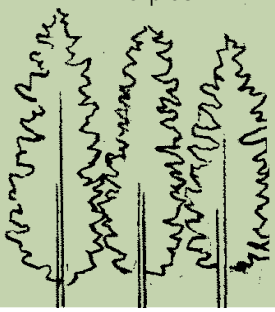
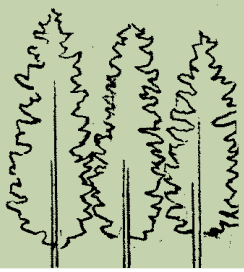
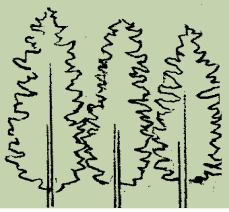
OPERATOR SIGNATURE AND DATE
LANDOWNER SIGNATURE AND DATE
APPROVAL SIGNATURE OF FPF AND DATE

How to determine the site class for your harvest unit

What is site class?

Site class is a way to classify forests according to how well trees grow. Trees grow faster in locations with fertile soils and plenty of moisture – these areas have higher site classes. Trees grow more slowly in rocky soils and drier climates where the site class is lower. The Oregon Forest Practices Act and Rules use six forest site classes, ranging from I, the highest site class, down to VI, the lowest. Site classes are measures of how many cubic feet of wood an acre of forest can grow each year until it reaches maturity and starts to slow down. Table A-1 shows how site classes are grouped according to their wood production for the purposes of the requirements.

Table A-1 Site Classes for Oregon Forestlands

	I, II, III (High)	IV and V (Medium)	VI (Low)
Annual forest growth (cubic feet of wood volume per acre per year)	120 plus 	50-119 	20-49 

Why do you need to know the site class?

Site class is the basis for many specific requirements. It helps determine harvest type and reforestation stocking standards, and also the requirements for harvest unit leave trees, down wood and harvest size limitations.

How can you find the site class for your harvest unit or reforestation area?

- Your ODF office can help you determine the site class of your harvest unit or reforestation area.
- You can hire a consulting forester.
- You can determine site class on your own. To do that, first determine "site index," which can be converted to site class. Site index is a measure of the height (in feet) that forest trees will grow to at a specific age, usually 50 or 100 years. A higher site index value means that the forest is more productive and the trees will grow faster. Site index varies for different tree species, because each species has its own characteristic growth rate.

Here are two ways to find the site index for your property.

1. Check the soil survey published by the Natural Resources Conservation Service for most Oregon counties. Locate your harvest unit on the soil survey map, find your soil type and note the site index for the primary tree species that grows in your area

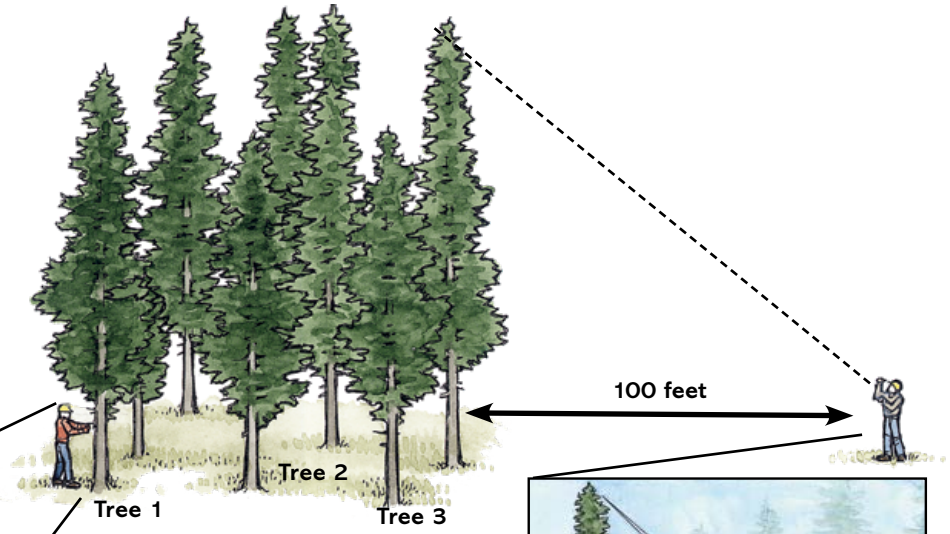
OR

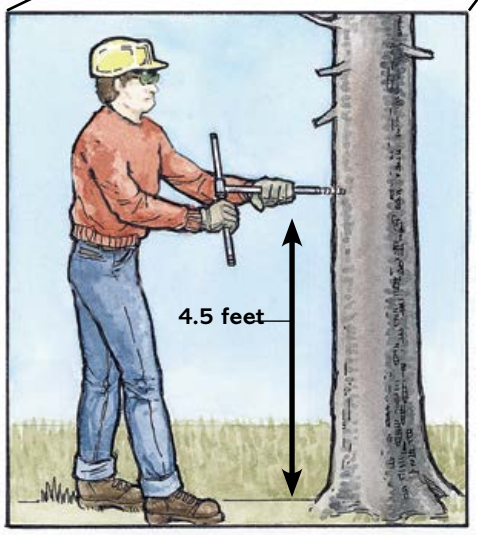
2. Measure site index directly, following this process:

   A. Choose at least three trees, all the same species, that have grown with their crowns in the upper portion of the forest canopy.

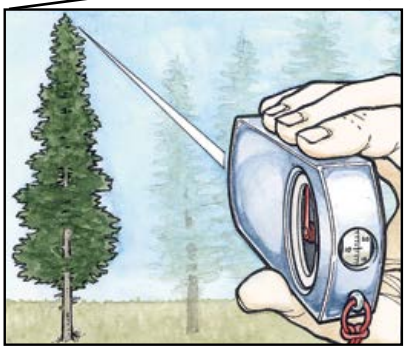
   B. For each tree, measure and record the age and height.

To determine age, use an increment borer to take a core sample from the tree at 4.5 feet above the ground (breast height) and count the growth rings. Add five to 10 years to the ring count to account for the number of years it took the tree to grow to breast height. This is the total age of the tree.





To determine height, use a clinometer or angle-measuring device. Measuring tree height is not difficult, but it takes instruction and practice to be accurate. See "Other information sources below" for a publication on using an increment borer, clinometer and other forest measurement tools.



Clinometer measuring tree height.

C. Use the table for your tree species to figure out the site index for each tree you measure. For example, let's say you measured a Douglas-fir from a forest in western Oregon and found the tree was 70 years old and 110 feet tall. Table A-2 on page 147 shows that the 100-year site index of the tree would be 130. That means that if the tree continues growing to age 100, it is expected to grow to about 130 feet tall. Tables A-2, A-3 and A-4 allow you to find Douglas-fir site indexes (100- or 50-year basis) and ponderosa pine site indexes (100-year basis).

D. The next step is to take the site index figure from Tables A-2, A-3 or A-4 and plug it into Table A-5 (at left) to find out the corresponding site class. For example, the Douglas-fir tree that had a 100-year site index of 130 is in the high category, which includes site classes I, II and III.

For other information sources, see pages 197-198.

Table A-5 Matching Site Index To Site Class

Site Class	I, II, III (High)	IV and V (Medium)	VI (Low)
Douglas-fir site index (100-year basis, westside)	124 or more	80-123	Contact ODF
Douglas-fir site index (50-year basis, westside)	92 or more	70-91	Contact ODF
Ponderosa pine site index (100-year basis)	109 or more	64-108	40-63

Table A-2 Site Index for Douglas-fir, Western Oregon, 100-year Basis														
Total age (years)	Total height (feet)													
20	21	24	26	29	31	34	37	39	42	44	47	49	52	54
30	37	41	46	50	55	60	64	69	74	78	83	88	92	96
40	48	54	60	66	72	78	84	90	96	102	108	114	120	126
50	56	63	70	77	84	91	98	105	112	119	125	132	139	146
60	63	70	78	86	93	101	109	117	124	132	140	148	156	163
70	68	77	85	94	102	110	119	127	135	144	152	161	170	178
80	73	82	91	100	109	118	127	136	145	154	163	172	181	190
90	77	86	96	105	115	125	134	144	153	163	172	182	192	201
100	80	90	100	110	120	130	140	150	160	170	180	190	200	210
Site index	80	90	100	110	120	130	140	150	160	170	180	190	200	210

Table A-3 Site Index for Douglas-fir, Western Oregon, 50-year Basis										
Age (years, at DBH)	Total height (feet)									
10	16	18	20	22	24	27	29	32	34	37
20	30	35	40	44	49	54	59	63	68	73
30	42	49	56	63	70	76	83	90	97	103
40	53	61	69	78	86	95	103	112	120	129
50	60	70	80	90	100	110	120	130	140	150
Site index	60	70	80	90	100	110	120	130	140	150

Note: the first column is based on age at DBH (4.5 feet above ground), not total age of tree as in Tables A-2 and A-4. Do not add any years to the DBH age, unlike total age as noted on page 146.

Table A-4 Site Index for Ponderosa Pine, 100-year Basis													
Total age (years)	Total height (feet)												
20	6	9	12	16	20	25	30	35	40	45	50	55	60
30	11	15	20	26	32	38	44	51	57	64	70	77	84
40	16	22	28	35	42	49	55	63	70	77	85	93	100
50	21	28	35	43	51	58	65	73	80	89	97	105	113
60	26	34	42	50	58	66	73	81	90	99	107	115	124
70	30	39	47	56	64	73	80	89	98	108	116	125	134
80	34	43	52	61	70	79	88	97	106	116	124	133	143
90	37	47	57	66	75	85	94	104	113	123	132	142	152
100	40	50	60	70	80	90	100	110	120	130	140	150	160
Site index	40	50	60	70	80	90	100	110	120	130	140	150	160

Common types of timber harvest systems

Cutting trees, moving logs to a landing and loading logs for transport to a mill are all part of a timber harvest system. It's the way forest owners supply wood products that everyone uses. It also helps them effectively establish new forests. There are different timber harvest systems. Each one has advantages, which are described below. Modifications can make them even more versatile.

What are the harvest systems?

1. conventional chainsaw and tractor/skidder harvest
2. cable logging
3. shovel logging
4. cut-to-length harvesting
5. whole-tree harvesting
6. helicopter logging

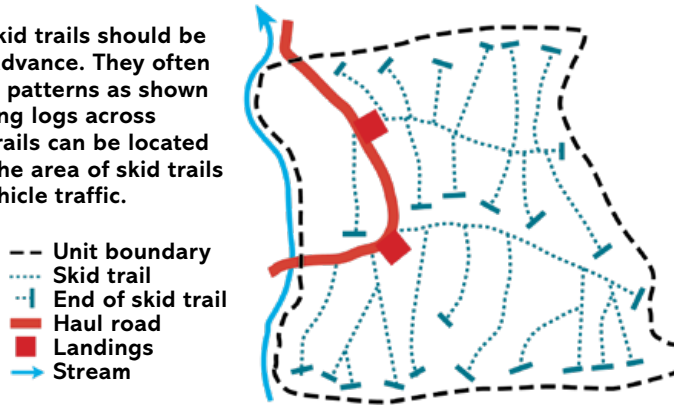
The terrain of your harvest unit will influence your choice of a logging system. On gentle terrain, tree processors and forwarders, excavators, tractors and skidders (explained in the following pages) and even horses can be logical choices. On steep terrain, the choice shifts to cable or helicopter systems.

Conventional chainsaw and tractor/skidder harvest

Hand-operated chainsaws are used to cut, delimb and buck trees into logs at the stumps. Skidders or crawler tractors (dozers) drag the logs to landings, where they are loaded onto trucks.

Tree felling, limbing and bucking are done with chainsaws.

Typical harvest layout. Skid trails should be planned and marked in advance. They often follow parallel branching patterns as shown (see Page 64). By winching logs across greater distances, skid trails can be located farther apart, reducing the area of skid trails and soil impacts from vehicle traffic.



Advantages

- adaptable to smaller harvest locations
- generally less costly equipment

Equipment used

- chainsaw
- log skidder or crawler tractor (dozer)
- log loader or self-loading log truck

Topography considerations

- normally restricted to slopes less than 35 percent
- haul roads usually located at the bottom of the logging unit

Soil considerations

- use of designated skid trails keeps machines on planned routes to help reduce soil disturbance
- on weaker soils, heavy traffic may result in trail ruts that require more water bars after logging
- soil disturbance can be reduced with widely spaced trails and pulling a winch line farther to logs – synthetic lines and other equipment features can make this task easier
- tractors and skidders should lift the front end of logs to reduce soil gouging

Forest stand considerations

- provides much flexibility with a variety of stand management goals

Slash disposal considerations

- lop-and-scatter possible with light accumulations of slash
- pile and burn is an option but requires additional steps and costs
- chipping and biomass energy utilization may be possible

Reforestation considerations

- yarding traffic or post-logging treatment can scarify ground and create areas for natural regeneration or hand-planting
- some advance regeneration may be lost or damaged by vehicle traffic

Economic considerations

- often more labor intensive
- generally, more roads are necessary
- least expensive method if road construction is not needed or is budgeted separately

Left: Skidders or dozers drag logs from the forest to the log landing. To reduce soil disturbance, rubber-tired skidders or crawler tractors are kept on skid trails. Winch line and chokers pull logs to the machine. Right: At the landing, a log loader moves logs onto trucks for delivery to the mill.

Cable logging

On steep terrain, this system uses a steel cable to carry either whole trees or logs to a landing after trees are felled with chainsaws.

Advantages

- allows for harvesting on steep ground and other sensitive terrain
- eliminates the need for skid trails
- can reduce construction and less favorable locations of roads

Equipment used

- chainsaw
- cable yarder
- delimber and log loader

Topography considerations

- well-suited for slopes of 35 percent and greater
- concave slopes allow more cable deflection and greater system efficiency
- intermediate supports allow for log lift in uneven terrain
- haul roads usually located at the top of the logging unit

Soil considerations

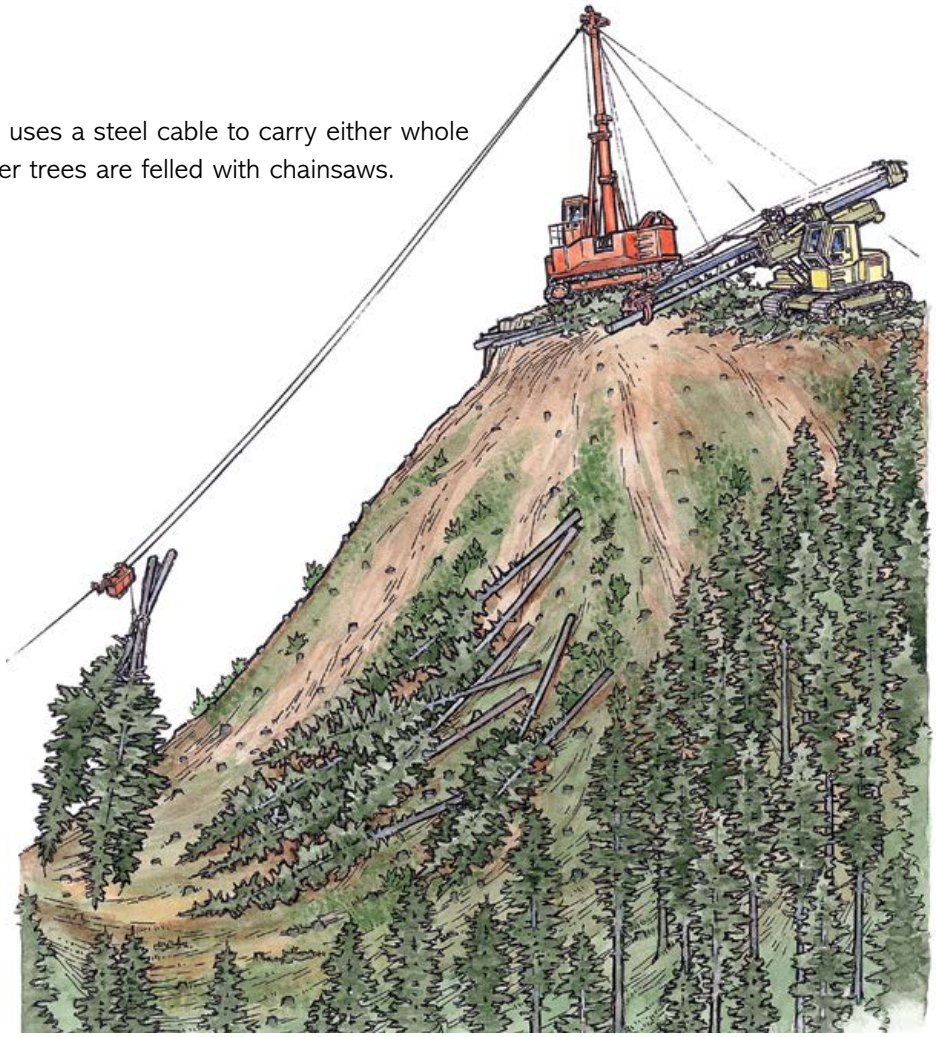
- can significantly reduce soil compaction and disturbance if logs are properly lifted
- heavy equipment is confined to roads and landings

Forest stand considerations

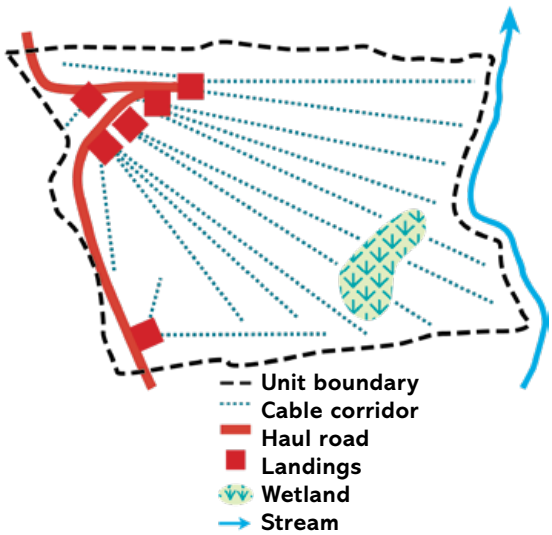
- primarily used with clearcuts and some partial cuts
- a more difficult method for thinning, with potential damage to residual stems

Slash disposal considerations

- if whole trees are brought to the landing, in-unit slash is minimized
- heavy slash piles at the landing must be treated or utilized
- if whole tree yarding is not used, prescribed burning of slash may be needed (see pages 71-74)



Cable yarding systems can reach out 2,500 feet or more, especially with intermediate cable supports. This can help limit road construction needs.



Typical cable harvest layout. Generally logs are pulled uphill, but can also be moved downhill. With a strategic layout, logs can be lifted over streams, wetlands and canyons (see page 67).

Reforestation considerations

- may expose fewer spots for easier planting or natural seeding
- brush control needs also may be greater when scarification is reduced

Economic considerations

- can be more costly and specialized than ground-based systems
- small-scale systems can be competitive in some situations

Shovel logging

This ground-based harvest system uses a log loader (also called a shovel) to move logs rather than a skidder, tractor or forwarder. The shovel moves logs across the unit to locations near the road where they can be loaded onto log trucks. Logs are often picked up and moved ("swung") several times before reaching the road.

The shovel starts at the nearest access point and moves logs until they are within reach of the road. From there they can be loaded on trucks.

Advantages

- requires few people and machines
- few or no skid trails needed; existing roads may be adequate
- brush can be piled during harvest operations.

Equipment used

- chainsaw
- tracked excavator equipped with a grapple to grip and move logs

Topography considerations

- limited by slope due to machine instability on steep side hills
- may allow for harvest of some sensitive areas, with less disturbance than other systems

Soil considerations

- less compaction and disturbance if machine passes are limited

Below: Excavators equipped with grapples are common choices for handling logs and doing other useful tasks.

Forest stand considerations

- used primarily in clearcuts or partial cuts
- requires clearing of roadsides for log decks

Slash disposal considerations

- while moving logs, the excavator can pile heavy concentrations of slash for burning, chipping or other utilization

Reforestation considerations

- while or after moving logs or slash, the excavator can prepare the site for planting or seeding

Economic considerations

- small crew size
- one machine for multiple tasks can reduce costs
- efficiency improves with shorter yarding distances

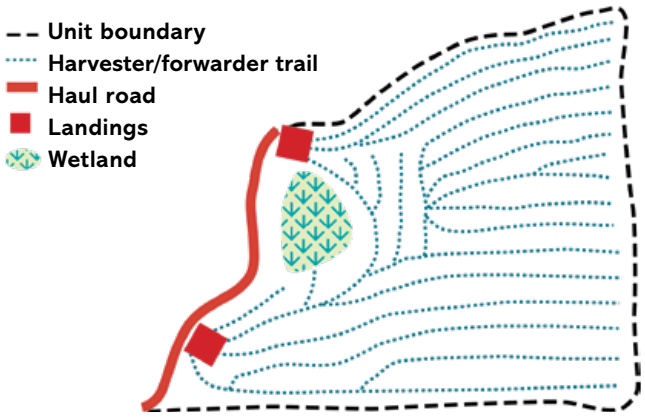
Cut-to-length harvesting

This ground-based system uses a mechanized harvester (tree processor) and a forwarder. The harvester severs, de-limbs and cuts each tree into logs and stacks them in the forest. The forwarder follows, picking up the logs and carrying loads to log trucks. It is also called a harvester-forwarder system.

A single grip processor can reach out 30 feet, cut a tree, strip the limbs, cut the stem into pre-programmed lengths and lay the logs on the ground, all in less than a minute. Ideally, they travel over the tree tops and limbs they leave.

A forwarder follows the harvester, picking up logs and delivering them to log trucks. They can travel long distances, reducing the need for log truck roads.

Logs are offloaded from the forwarder directly to log trucks.



Typical harvest layout. Designated harvester/forwarder trails are about 60 feet apart and often follow parallel patterns across the harvest units.

Advantages

- leaves slash (tree branches and tops) in the forest
- reduces the need for log landings and access roads

Equipment used

- harvester/processor (tracked or wheeled)
- forwarder (often wheeled)

Topography considerations

- normally limited to slopes less than 35 percent

Soil considerations

- can reduce compaction and disturbance, especially if the processor moves over duff and slash and if forwarders stay on slash-covered, designated skid trails
- slash left in the harvest unit will recycle nutrients and organic matter

Forest stand considerations

- an efficient method for commercial thinning
- typically used to move short logs out of the forest rather than long logs
- processor efficiency in dense stands is useful for forest health and fuels treatments

Slash disposal considerations

- by traveling over and compacting the slash, the system can reduce wildfire hazards and may meet slash hazard control requirements with no further treatment
- equipment can be used for slash piling for burning, chipping or other utilization

Reforestation considerations

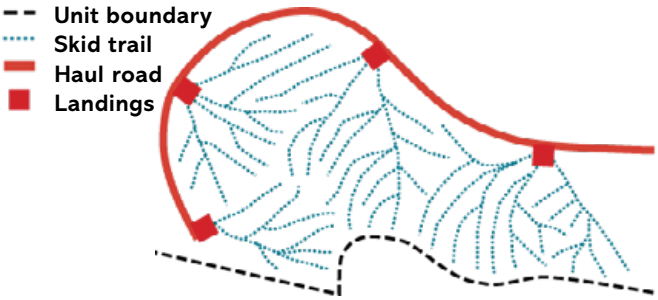
- common for thinnings where residual stocking does not trigger reforestation requirements
- if used for heavier cuts and slash loads, extra steps could create spots for planting or seeding

Economic considerations

- may not require new or improved roads
- relatively expensive and specialized machinery and operators
- may require larger volumes or higher quality timber for efficient use

Whole-tree harvesting

This harvest system brings the entire tree, limbs and tops attached, to the landing or roadside. It can be used for both ground-based and cable applications. When used in ground applications, a feller-buncher often is used to cut and pile bundles of trees in the forest. Then a tractor or skidder drags the tree bundles to the landing or roadside. Finally, a delimber converts the trees to logs.



Typical harvest layout. The feller-buncher and grapple skidder travel over most of the unit. Confining multiple trips to primary skid trails can reduce soil disturbance.

Advantages

- can be relatively efficient, including use of smaller material
- slash is brought to the landing or roadside where it can be burned, chipped or otherwise utilized

Equipment used

- feller-buncher
- crawler tractor or skidder with grapple
- stroke-boom delimber
- log loader

Topography considerations

- normally limited to slopes less than 35 percent
- with ground-based harvest, haul roads are usually at the bottom of the logging area

Soil considerations

- vehicles travel over a larger portion of the area as they cut, stack, gather and drag whole trees
- potential for more soil disturbance and compaction than other ground-based systems
- removal of tops and limbs does not recycle nutrients and organic matter near its source

Forest stand considerations

- efficient harvest and stand conversion when using a clearcut,
- can be used when thinning, but damage to remaining trees can be a problem.

Slash disposal considerations

- slash can be piled and later burned, chipped or otherwise utilized
- slash returned to the harvest area can recycle nutrients and organic matter (see pages 71-73)

Reforestation considerations

- widespread traffic and large tree bundles may damage advance regeneration
- dragging tree bundles can expose areas for planting or seeding

Economic considerations

- costs can increase on steeper ground or with longer skid distances
- bunching trees can help reduce the cost of handling small diameter trees.

A feller-buncher severs trees and lays them in bunches with limbs and tops attached. Bunches are oriented with tree trunks facing downhill.

A crawler tractor or skidder with a grapple picks up bunched trees and drags them to a landing or roadside. Some grapples can swing 180 degrees, making it easier to operate in tight spaces.

The stroke-boom delimber operates at the landing or roadside, removing tree limbs and top, cutting the stem into logs and stacking them.

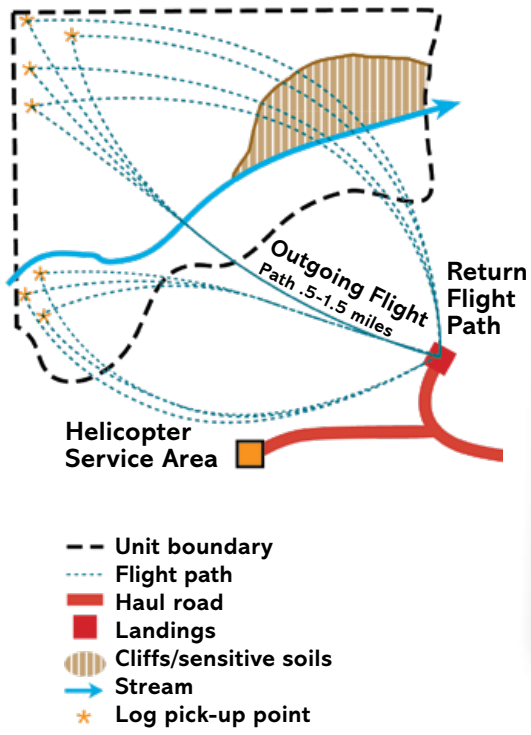
The loader serves two needs: loading trucks and piling tops, branches and log chunks for later burning, chipping or other utilization.

Helicopter logging

This harvest system was once used exclusively for large, high-value timber. Helicopter harvest remains a higher-cost alternative, but it can be used for smaller logs when timber volumes and quality are adequate.

This helicopter has a payload capacity of 6,000 pounds. Flight distances are kept to one-half to 1.5 miles. Longer distances are more costly. Planning to achieve optimum payloads for each trip helps make the operation economic.

Typical harvest layout



Advantages

- can harvest visually sensitive, inaccessible or other areas where other systems are unsuitable
- useful option for locations with high recreational use, special wildlife habitat, riparian/wetlands or geologic hazards
- may reduce or avoid new road construction, including hazardous/sensitive locations

Equipment used

- chainsaw
- logging helicopter
- helicopter maintenance and fueling equipment
- log loader

Topography considerations

- can be used on any type of terrain with suitable landing and helicopter service area locations (i.e., adequate size, safety and efficiency)

Soil considerations

- minimizes in-unit soil disturbance and compaction because logs are fully suspended
- large landings and service areas may require extra drainage or other treatment

Forest stand considerations

- offers efficient, but costly method for commercial thinning
- large landings and service areas can locally impact forest stands.

Slash disposal considerations

- lop-and-scatter methods typically are used to reduce fire hazards
- if further treatment is needed, it can be costly where road access is limited

Reforestation considerations

- slash left on-site and limited yarding disturbance result in fewer exposed spots for easy planting or natural seeding

Economic considerations

- typically the most expensive logging system
- equipment and crew needs can result in costs three to four times those of ground-based systems
- reduced road construction needs may help offset high costs
- without adequate volume of higher value logs, harvest costs may exceed timber revenues

Cultural resources

What are cultural resources?

Cultural resources are archaeological sites or objects that are found on public or private lands.

What do they look like?

Typical indications of archeological sites include stone tools, fire-cracked rock, shells, bone fragments and things like house pit depressions, hearths, fire rings, cairns (heaps of stones that signify memorials or landmarks) and similar items. Glassy rock fragments, along with tools and debris from the manufacturing process -- in an area where they are not normally found -- are a good indicator of archaeological sites.

Stewardship forests inform landowners when an operation may impact a cultural resources site and provide them with the ODF Fact Sheet "Protecting Cultural and Historical Sites."

Why are they important?

The number of archaeological sites is limited. They are irreplaceable and nonrenewable. They are also an inherent part of the cultural heritage of the people of Oregon.

How old is old?

Cultural resources include more than prehistoric or Native American artifacts. Even old logging remains, stumps with springboard notches, camp dumps, railroad grades, homestead cabins, historic irrigation ditches, scribed trees and trails are included in the definition of cultural resources. In addition to artifacts, traditional hunting and gathering sites and "religious" sites may also be historical cultural records.

What are the legal protections?

Archaeological-object and -site laws protect these sites.

Counties may also have regulations related to these sites, and landowners who find cultural artifacts should contact the county planning department.

The State Historic Preservation Office maintains a comprehensive, statewide inventory of sites, structures and objects that are potentially significant in Oregon history, prehistory, architecture, archaeology and culture. This office is part of the Oregon Parks and Recreation Department. Game enforcement officers of the Oregon State Police serve as partners in initial investigation and protection of cultural sites, and thus may provide timely help when needed.

For other information sources, see pages 197-198

Steam Donkey. Photo by Tom Adams, http://www.quercusphotographic.com

How to know the basal area of your harvest, reforestation or riparian management area

What is basal area?

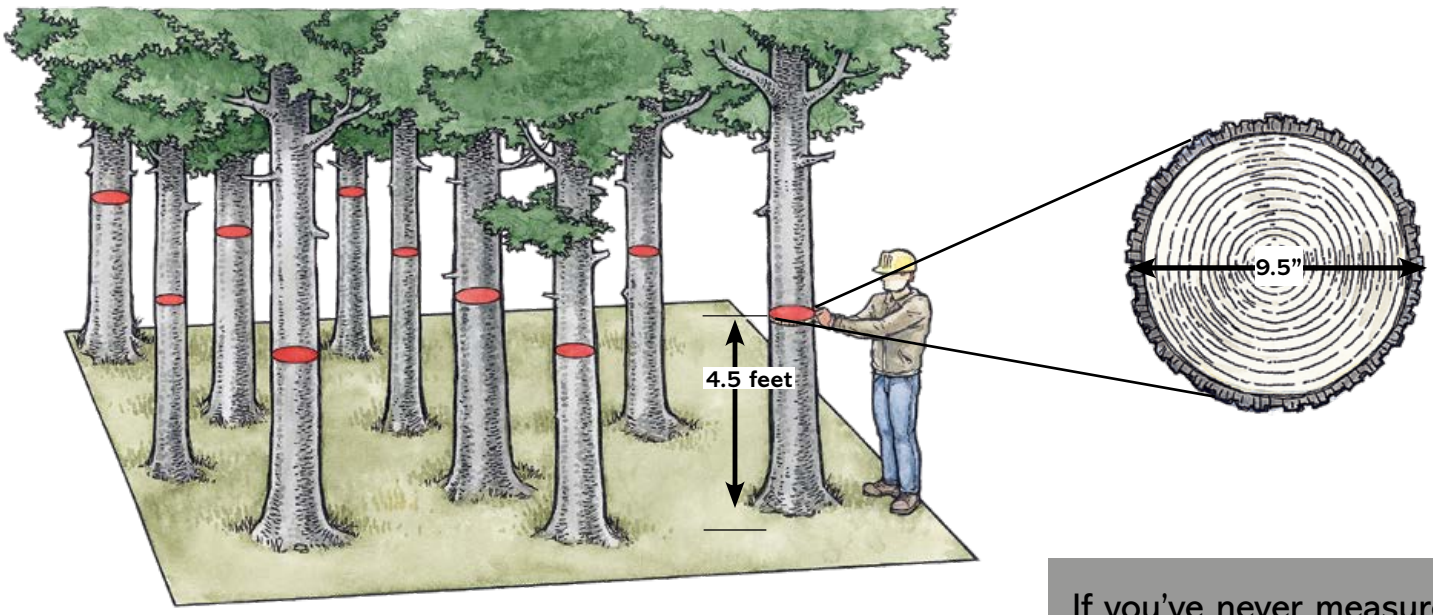
Basal area is the cross-sectional area of a tree stem at 4.5 feet above the ground. The basal area of a tree is calculated by measuring its diameter (see diagram). Tree diameter is measured at 4.5 feet above the ground on the uphill size and is referred to as the DBH (diameter at breast height). Why 4.5 feet? It provides a convenient and consistent point for measuring tree diameter.

To calculate basal area:

Basal area = tree diameter^2 X .005454.

If you know the diameter of a tree, you can calculate its basal area. It's the same formula used to calculate the area of a circle. This tree is 9.5 inches at DBH. Its basal area is 0.5 square feet. Therefore, in our example:

BA = 9.5" x 9.5" x .005454 = 0.5 ft^2



Imagine this to be one acre. The cross-section, at DBH, of each tree is indicated.

Why do you need to know about basal area?

Basal area is an important measurement. When combined with the average diameter of the trees, basal area gives people involved with a harvest a mental picture of the forest. If you know basal area you can calculate the number of trees per acre, another part of the picture.

If you're planning to harvest, reforest, leave wildlife trees or evaluate options for an RMA, you'll need to know basal area. The requirements for each of these activities depend on knowing the basal area measurement.

Basal area is usually calculated on a per-acre basis. That's because we're interested in knowing how much surface area (square feet) the tree stems are occupying on each acre. Add the individual basal area of every tree on an acre and you have the basal area per acre.

Basal area is expressed in square feet per acre. Here's a simple example: 250 trees on an acre, all with diameters of 9.5 inches DBH -- 0.5 square feet each -- would total 125 square feet of basal area. (0.5 x 250 = 125).

If you've never measured a tree's diameter, here's how:

Obtain a diameter tape or a normal household tape to measure the DBH.

- A diameter tape is convenient because it measures the tree's circumference but its scale directly converts this amount and shows the diameter in inches.
- A normal tape can be used to measure circumference of a tree. The circumference is converted to diameter by the formula:

$$DBH = \frac{\text{circumference (inches)}}{3.14}$$

More about basal area

Two separate acres can have the same basal area but a different number of trees. Tree diameters are an important influence on basal area.

For example, these two acres have the same basal area but different numbers of trees. Here's the interesting part. If you know the basal area per acre of a stand of trees, and the average diameter of the trees, you can figure out the number of trees per acre.

If Acre 1 has 24-inch trees and 78.5 square feet of BA, you would need 25 trees to equal 78.5 square feet per acre.

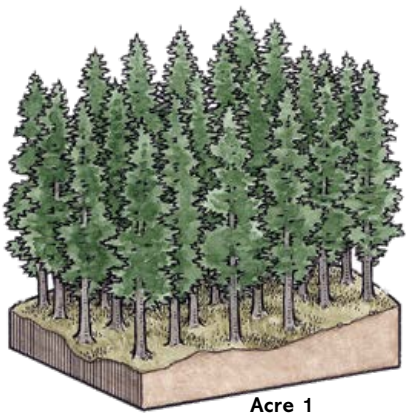
BA = 24" x 24" x .005454 = 3.1

78.5 ft^2 per acre ÷ 3.1= 25 trees per acre (41-foot spacing)

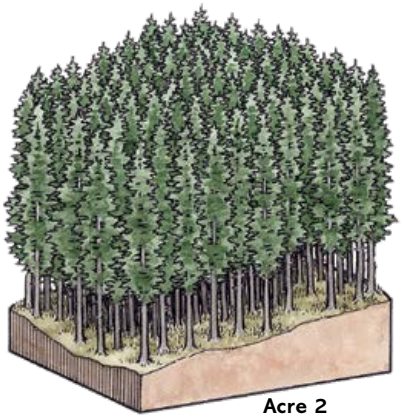
If Acre 2 has 6-inch trees and a basal area of 78.5, you would need 392 trees to equal 78.5 square feet per acre.

BA = 6" x 6" x .005454 = .2

78.5 ft^2 per acre ÷ .2 = 392 trees per acre (10.5-foot spacing)



This acre has a BA of 78.5.



This acre has a BA of 78.5.

How do you measure the basal area of your harvest unit?

The simplest way to determine the basal area of your harvest unit is to sample the stand with plots. Space plots evenly across the unit along compass lines. On each plot, measure the diameter and calculate the basal area of each tree. Circular, one-fifth-acre plots are commonly used.

To calculate the basal area of each tree on the plot, it's easiest to use Table A-6 at right. Or you may find it to your advantage to use Table A-7, which has the basal areas for tree diameters listed in 2-inch increments. A third option is to calculate the basal area for 1-inch intervals using the basal area formula on the previous page. These added options provide greater accuracy in determining basal area. However, in meeting legal requirements you must be consistent – you can't switch back and forth between the tables and the formula.

As an example, the illustration below shows a 20-acre site with 12 one- fifth-acre plots. First record the basal area of each plot. Then calculate the total basal area for all plots and determine the average basal area per plot by dividing the total basal area by 12. Then expand the average basal area per plot to an entire acre by multiplying by 5. Now you know the average basal area per acre for the 20-acre harvest unit.

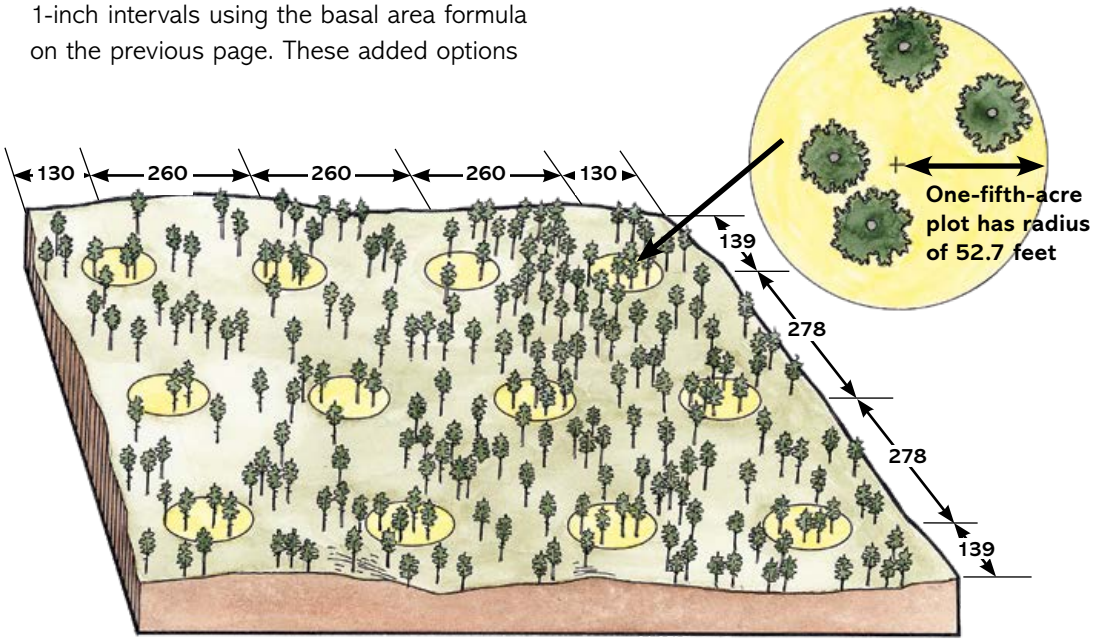
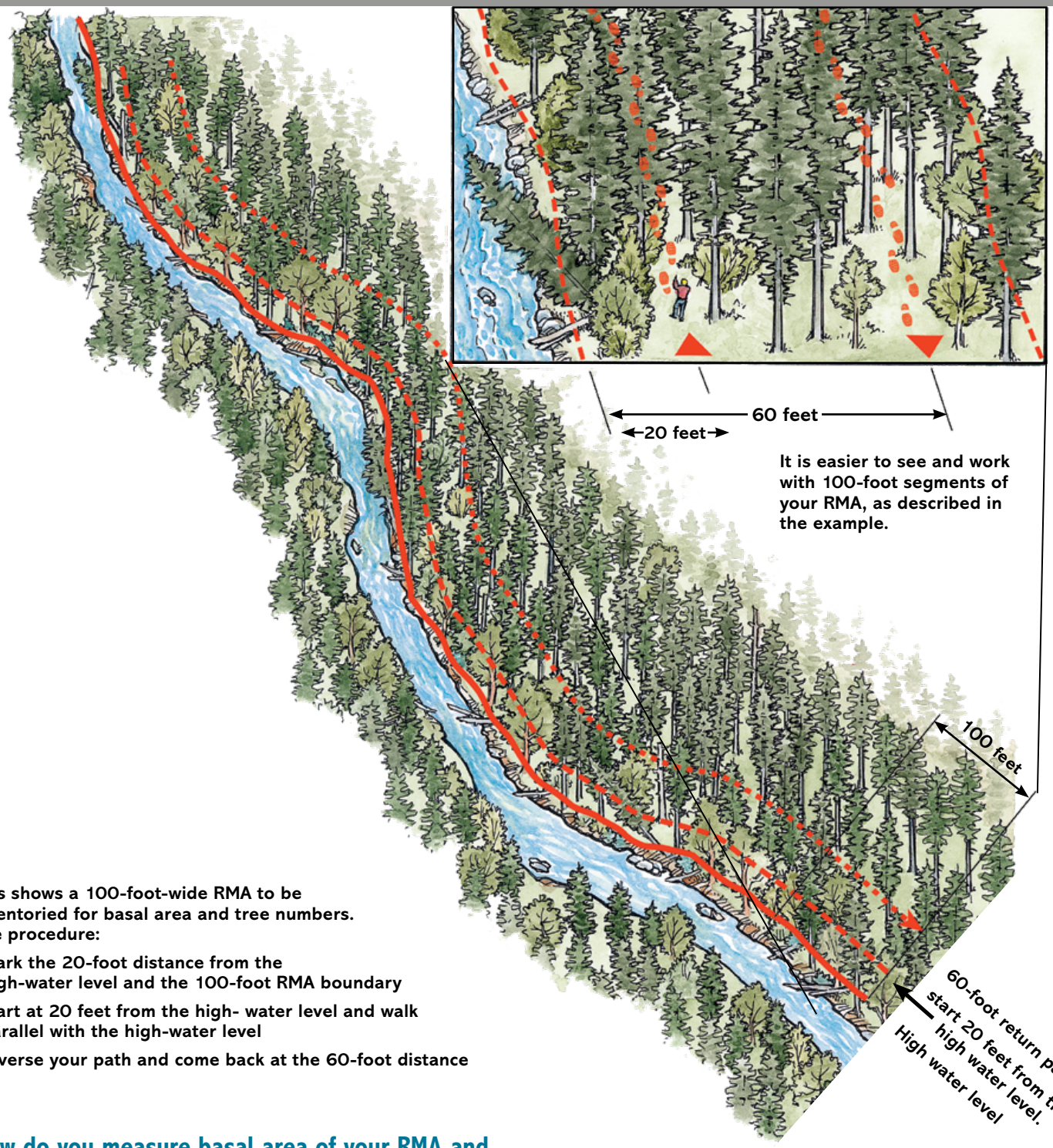


Table A-6	
DBH (inches)	Basal area (square feet)
6 to 10	0.3
11 to 15	0.9
16 to 20	1.8
21 to 25	2.9
26 to 30	4.3
31 to 35	5.9
36 to 40	7.9

Table A-7	
DBH (inches)	Basal area (square feet)
6	0.2
8	0.35
10	0.55
12	0.79
14	1.07
16	1.4
18	1.77
20	2.2
22	2.6
24	3.14
26	3.69
28	4.28
30	4.9
32	5.58
34	6.3
36	7.07



This shows a 100-foot-wide RMA to be inventoried for basal area and tree numbers. The procedure:

- **mark the 20-foot distance from the high-water level and the 100-foot RMA boundary**
- **start at 20 feet from the high- water level and walk parallel with the high-water level**
- **reverse your path and come back at the 60-foot distance**

How do you measure basal area of your RMA and identify which trees to leave?

1. Determine the necessary width of your RMA (Table 2-3). Then walk through a representative part of the RMA to see the size and density of conifers. Remember, conifers -- rather than hardwood trees -- are favored because, in general, they live longer, grow larger and last longer as snags and down logs.
2. Figure out how many trees must be left per 1,000 feet to meet the basal area target for the stream type (see, "You want to harvest along a stream – what do you need to know?" Page 19).
3. Use Table A-6, A-7 or the formula on page 156 to estimate average basal area per tree based on your estimate of the average diameter.

   For example, if the average diameter of conifers in the RMA is about 24 inches then the average basal area per tree is about 3 square feet. If the target for the stream is 170 square feet per 1,000 feet (17 per 100 feet) then you know that you will need to leave about five to six 24-inch conifers per 100 feet of RMA.

   17 ÷ 3 = 5.7

4. Determine the RMA length within the harvest unit by measuring in the field (pacing or using a tape) or scaling off an accurate aerial photo or map. Multiply the basal area target by this length.

   For example, if the RMA length is 1,500 feet and the basal area target is 170 square feet per 1,000 feet, the total for the 1,500 feet in the unit is 255 square feet.

   170 x 1,500 ÷ 1,000 = 255

5. Use a tally sheet like the example on page 160 (RMA tree tabulation form) to keep track of acceptable leave trees. Keep in mind you may be asked to submit copies of such field notes to ODF.

   Walk along the stream and select acceptable leave trees, starting with those that must be left: trees within 20 feet of the high-water level and trees that lean over the stream. Mark a number on each tree with tree-marking paint and record its diameter, whether conifer or hardwood, and its distance from the stream. Wait to fill in the basal area column until you've walked all of the 20-foot "no touch" portion of the RMA. Reverse direction and come back, marking and recording additional conifers in the outer RMA, as needed, to get close to the basal area target (recall your estimate of how many trees needed per 100 feet – 5.7, as calculated in the above example).

6. Calculate values for the basal area column (use Table A-6, A-7 or the basal area formula) and sum up the tree numbers and basal area values. Separate snags and large hardwoods from the live conifers.

   Compare the total conifer basal area with the standard target for the georegion and stream type and size (remember, there is usually both a basal area and tree count requirement). If you are above the standard target, you can go through the RMA again and consider harvesting some of the trees found beyond the 20-foot zone. If you are below the target, you'll need to measure and identify enough acceptable leave trees in the outer RMA to reach the target.

Table A-9 RMA Tree Tabulation Form (example)

Tree #	Conifer or hardwood	DBH	Basal area	Distance from stream
1	C	12	.9	<20
2	C	18	1.8	30
3	C	16	1.8	30
4	C	15	.9	40
5	C	14	.9	40
6	C	11	.9	40
7	C	11	.9	<20
8	C	11	.9	<20
9	C	19	1.8	<20
10	C	13	.9	30
11	H	28	4.3	30
12	C	12	.9	30
13	C	18	1.8	30
14	C	16	1.8	<20
15	C	35	5.9	<20
16	C	18	1.8	<20
17	C	21	2.9	30
18	C	14	.9	40
19	C	11	.9	40
20	C	36	7.9	30
Sum conifer	19 trees, 7 <20 ft.		36.5	14 sq. ft. <20 ft.
Sum hardwood	1 tree		4.3	

General prescription requirements for stream RMAs

This section includes the general prescription protection requirements for RMAs for various regions and stream and harvest types. Use these summaries when the live conifer basal area in the RMA is more than the standard target. For a detailed description of stream RMA protection see pages 19-33.

To use the summaries, you need to know the following:

1. the geographic region of your harvest (see page 10)
2. the type and size of the stream in the harvest unit (see page 8)
3. the type of harvest (1, 2, 3 or Unclassified) you will be doing (see page 17)

Check the list below for the page number of the summary that fits your situation. For example, if you are planning an operation in the Siskiyou geographic region, with a Type 3 harvest along a Large, Type F stream, use the summary on page 162.

Use for

large Type F streams, Type 2 or 3 harvests and west-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

Table A-10 – Large Type F Basal Area Targets		
Geographic region	Square feet of basal area per 1,000 feet of stream	
	Standard target	Active management target
Coast Range & South Coast	230	170
Interior & Western Cascades	270	200
Siskiyou	220	170

RMA width – 100 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- no fewer than 40 live conifers, at least 11 inches DBH, per 1,000 feet within the RMA
- enough conifer basal area within the RMA to meet the standard target

[OR]

Leave less conifer basal area, but no less than the active management target, in exchange for stream improvement work. This includes:

- placing logs or trees in stream channels to create pools or hiding cover for fish
- installing fencing or off-channel watering sites to keep livestock away from streams
- constructing small side channels to provide refuge for fish during high flows, and/or
- other enhancement work

Check with ODF if you plan to exchange basal area for stream improvement work.

Can some hardwoods and snags help meet the target?

Yes. All cottonwood and Oregon ash trees (at least 6 inches DBH) left in the RMA but growing more than 20 feet from the high-water level may count toward the basal area target.

A combination of the following can make up to 10 percent of the basal area target:

- the basal area of hardwoods (other than alder) left in the RMA that are at least 24 inches DBH but growing more than 20 feet from the high-water level
- the basal area of sound snags, at least 6 inches DBH and at least 30 feet high, that are anywhere within the RMA

Can trees left in RMAs help meet other leave tree requirements?

Yes. Conifers left in the RMA in excess of the active management target and hardwoods left beyond 20 feet from the channel may be counted toward requirements for leave trees within Type 2 or 3 harvests, as long as they meet the other requirements for leave trees.

Use for

medium Type F streams, Type 2 or 3 harvests and west-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

Table A-11 Medium Type F Basal Area Targets		
Geographic region	Square feet of basal area per 1,000 feet of stream	
	Standard target	Active management target
Coast Range & South Coast	120	90
Interior & Western Cascades	140	110
Siskiyou	110	90

RMA width – 70 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- no fewer than 30 live conifers, at least 8 inches DBH, per 1,000 feet within the RMA
- enough conifer basal area within the RMA to meet the standard target

[OR]

Leave less conifer basal area, but no less than the active management target, in exchange for stream improvement work. This includes:

- placing logs or trees in stream channels to create pools or hiding cover for fish
- installing fencing or off-channel watering sites to keep livestock away from streams
- constructing small side channels to provide refuge for fish during high flows
- other enhancement work

Check with ODF if you plan to exchange basal area for stream improvement work.

Can some hardwoods and snags help meet the target?

Yes. A combination of the following can make up to 10 percent of the basal area target:

- the basal area of hardwoods (other than alder) left in the RMA that are greater than 24 inches DBH but growing more than 20 feet from the high-water level
- the basal area of sound snags, at least 6 inches DBH and at least 30 feet high, that are anywhere within the RMA

Can trees left in RMAs help meet other leave tree requirements?

Yes. Conifers left in the RMA in excess of the active management target and hardwoods left beyond 20 feet of the channel may be counted toward requirements for leave trees within Type 2 or 3 harvests, as long as they meet the other requirements for leave trees.

Use for

small Type F streams, Type 2 or 3 harvest and west-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

Table A-12 Small Type F Basal Area Targets		
Geographic region	Square feet of basal area per 1,000 feet of stream	
	Standard target	Active management target
Coast Range & South Coast	40	20
Interior & Western Cascades	40	20
Siskiyou	40	20

RMA width – 50 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- enough conifer basal area within the RMA to meet the standard target

[OR]

Leave less conifer basal area, but no less than the active management target, in exchange for stream improvement work. This includes:

- placing logs or trees in stream channels to create pools or hiding cover for fish
- installing fencing or off-channel watering sites to keep livestock away from streams
- constructing small side channels to provide refuge for fish during high flows
- other enhancement work

Check with ODF if you plan to exchange basal area for stream improvement work.

Can some hardwoods and snags help meet the target?

Yes. A combination of the following can make up to 10 percent of the basal area target:

- the basal area of hardwoods (other than alder) left in the RMA that are at least 24 inches DBH but growing more than 20 feet from the high-water level
- the basal area of sound snags, at least 6 inches DBH and at least 30 feet high, that are anywhere within the RMA

Can trees left in RMAs help meet other leave tree requirements?

Yes. All conifers and hardwoods left in the RMA may be counted toward requirements for leave trees within Type 2 or 3 harvests, as long as they meet the other requirements for leave trees.

Use for

large Type F streams, Type 1 or unclassified harvest and west-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

Table A-13 Large Type F Basal Area Targets		
Geographic region	Square feet of basal area per 1,000 feet of stream	
	Standard target	Active management target
Coast Range & South Coast	300	270
Interior & Western Cascades	350	310
Siskiyou	290	260

RMA width – 100 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- no fewer than 40 live conifers, at least 11 inches DBH, per 1,000 feet within the RMA
- enough conifer basal area within the RMA to meet the standard target

[OR]

Leave less conifer basal area, but no less than the active management target, in exchange for stream improvement work. This includes:

- placing logs or trees in stream channels to create pools or hiding cover for fish
- installing fencing or off-channel watering sites to keep livestock away from streams
- constructing small side channels to provide refuge for fish during high flows
- other enhancement work

Check with ODF if you plan to exchange basal area for stream improvement work.

Can some hardwoods and snags help meet the target?

Yes. All cottonwood and Oregon ash trees at least 6 inches DBH left in the RMA but growing more than 20 feet from the high water level may count toward the basal area target. This allowance applies only to large Type F streams.

A combination of the following can make up to 10 percent of the basal area target:

- the basal area of hardwoods (other than alder) left in the RMA that are at least 24 inches DBH but growing more than 20 feet from the high-water level
- the basal area of sound snags, at least 6 inches DBH and at least 30 feet high, that are anywhere within the RMA

Use for

medium Type F streams, Type 1 or unclassified harvest and west-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

Table A-14 Medium Type F Basal Area Targets		
Geographic region	Square feet of basal area per 1,000 feet of stream	
	Standard target	Active management target
Coast Range & South Coast	160	140
Interior & Western Cascades	180	160
Siskiyou	140	120

RMA width – 70 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- no fewer than 30 live conifers, at least 8 inches DBH, per 1,000 feet within the RMA
- enough conifer basal area within the RMA to meet the standard target

[OR]

Leave less conifer basal area, but no less than the active management target, in exchange for stream improvement work. This includes:

- placing logs or trees in stream channels to create pools or hiding cover for fish
- installing fencing or off-channel watering sites to keep livestock away from streams
- constructing small side channels to provide refuge for fish during high flows
- other enhancement work

Check with ODF if you plan to exchange basal area for stream improvement work.

Can some hardwoods and snags help meet the target?

Yes. A combination of the following can make up to 10 percent of the basal area target:

- the basal area of hardwoods (other than alder) left in the RMA that are at least 24 inches DBH but growing more than 20 feet from the high-water level
- the basal area of sound snags, at least 6 inches DBH and at least 30 feet high, that are anywhere within the RMA

Use for

small Type F streams, Type 1 or unclassified harvest and west-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

Table A-15 Small Type F Basal Area Targets		
Geographic region	Square feet of basal area per 1,000 feet of stream	
	Standard target	Active management target
Coast Range & South Coast	50	30
Interior & Western Cascades	50	30
Siskiyou	50	30

RMA width – 50 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- enough conifer basal area within the RMA to meet the standard target

[OR]

Leave less conifer basal area, but no less than the active management target, in exchange for stream improvement work. This includes:

- placing logs or trees in stream channels to create pools or hiding cover for fish
- installing fencing or off-channel watering sites to keep livestock away from streams
- constructing small side channels to provide refuge for fish during high flows
- other enhancement work

Check with ODF if you plan to exchange basal area for stream improvement work.

Can some hardwoods and snags help meet the target?

Yes. A combination of the following can make up to 10 percent of the basal area target:

- the basal area of hardwoods (other than alder) left in the RMA that are at least 24 inches DBH but growing more than 20 feet from the high-water level
- the basal area of sound snags, at least 6 inches or greater DBH and at least 30 feet high, that are anywhere within the RMA

Use for

large Type F streams, Type 2 or 3 harvest and east-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

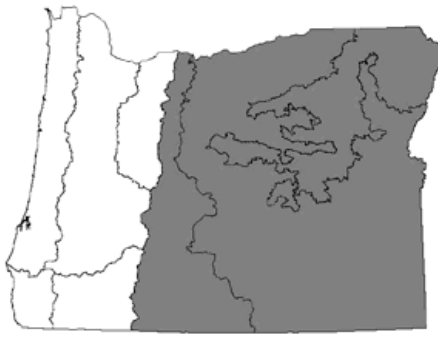


Table A-16 Large Type F Basal Area Targets		
Geographic region	Square feet of basal area per 1,000 feet of stream	
	Standard target	Active management target
Eastern Cascades	170	130
Blue Mountains	170	130

RMA width – 100 feet

Leave the following on each side of stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- no fewer than 40 live conifers, at least 11 inches DBH, per 1,000 feet within the RMA
- enough conifer basal area within the RMA to meet the standard target

[OR]

Leave less conifer basal area, but no less than the active management target, in exchange for stream improvement work. This includes:

- placing logs or trees in stream channels to create pools or hiding cover for fish
- installing fencing or off-channel watering sites to keep livestock away from streams
- constructing small side channels to provide refuge for fish during high flows
- other enhancement work

Check with ODF if you plan to exchange basal area for stream improvement work.

Can some hardwoods and snags help meet the target?

Yes. All hardwoods at least 6 inches DBH left in the RMA may count toward the basal area target.

Sound conifer snags, at least 6 inches DBH and at least 30 feet high, left in the RMA may count toward as much as 10 percent of the basal area target.

Can trees left in RMAs help meet other leave tree requirements?

Yes. Conifers left in the RMA in excess of the active management target and hardwoods left beyond 20 feet of the channel may be counted toward requirements for leave trees within Type 2 or 3 harvests, as long as they meet the other requirements for leave trees.

Use for

medium Type F streams, Type 2 or 3 harvest and east-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

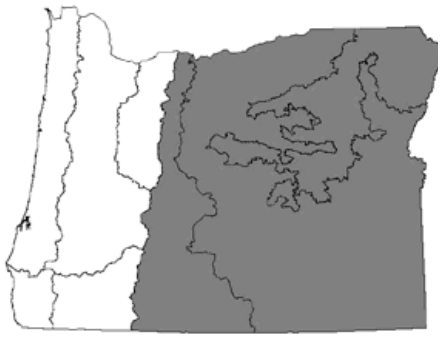


Table A-17 Medium Type F Basal Area Targets		
Geographic region	Square feet of basal area per 1,000 feet of stream	
	Standard target	Active management target
Eastern Cascades	90	70
Blue Mountains	90	70

RMA width – 70 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- no fewer than 30 live conifers, at least 8 inches DBH, per 1,000 feet within the RMA
- enough conifer basal area within the RMA to meet the standard target

[OR]

Leave less conifer basal area, but no less than the active management target, in exchange for stream improvement work. This includes:

- placing logs or trees in stream channels to create pools or hiding cover for fish
- installing fencing or off-channel watering sites to keep livestock away from streams
- constructing small side channels to provide refuge for fish during high flows
- other enhancement work

Check with ODF if you plan to exchange basal area for stream improvement work

Can some hardwoods and snags help meet the target?

Yes. All hardwoods (6 inches or greater DBH) left in the RMA may count toward the basal area target.

Sound conifer snags (6 inches or greater DBH and at least 30 feet high) left in the RMA may count toward as much as 10 percent of the basal area target.

Can trees left in RMAs help meet other leave tree requirements?

Yes. Conifers left in the RMA in excess of the active management target and hardwoods left beyond 20 feet of the channel may be counted toward requirements for leave trees within Type 2 or 3 harvests, as long as they meet the other requirements for leave trees.

Use for

small Type F streams, Type 2 or 3 harvest and east-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

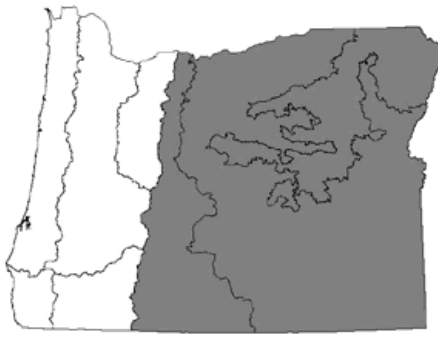


Table A-18 Small Type F Basal Area Targets		
Geographic region	Square feet of basal area per 1,000 feet of stream	
	Standard target	Active management target
Eastern Cascades	50 (40 of live conifer)	50 (30 of live conifer)
Blue Mountains	50 (40 of live conifer)	50 (30 of live conifer)

RMA width – 50 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- enough conifer basal area within the RMA to meet the standard target

[OR]

Leave less conifer basal area, but no less than the active management target, in exchange for stream improvement work. This includes:

- placing logs or trees in stream channels to create pools or hiding cover for fish
- installing fencing or off-channel watering sites to keep livestock away from streams
- constructing small side channels to provide refuge for fish during high flows
- other enhancement work

Check with ODF if you plan to exchange basal area for stream improvement work.

Can some hardwoods and snags help meet the target?

Yes. No more than 40 square feet per 1,000 feet of the standard target or 30 square feet per 1,000 feet of active management target is required to be live conifer. The remainder of the target is to be met by the basal area of retained snags, dead or dying trees, or hardwoods if they are available.

All hardwoods at least 6 inches DBH left in the RMA may count toward the basal area target.

Sound conifer snags, at least 6 inches DBH and at least 30 feet high, left in the RMA may count toward as much as 10 percent of the basal area target.

Can trees left in RMAs help meet other leave tree requirements?

Yes. All conifers and hardwoods left in the RMA may be counted toward requirements for leave trees within Type 2 or 3 harvests, as long as they meet the other requirements for leave trees.

Use for

large Type F streams, Type 1 or unclassified harvest and east-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

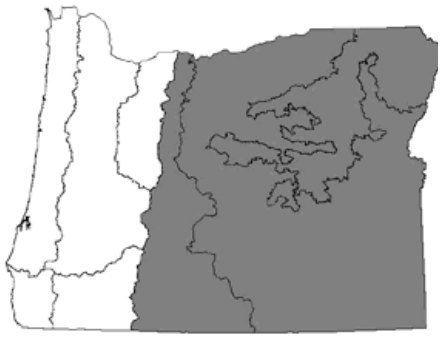


Table A-19 Large Type F Basal Area Targets		
Geographic region	Square feet of basal area per 1,000 feet of stream	
	Standard target	Active management target
Eastern Cascades	220	200
Blue Mountains	220	200

RMA width – 100 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- no fewer than 40 live conifers, at least 11 inches DBH, per 1,000 feet within the RMA
- enough conifer basal area within the RMA to meet the standard target

[OR]

Leave less conifer basal area, but no less than the active management target, in exchange for stream improvement work. This includes:

- placing logs or trees in stream channels to create pools or hiding cover for fish
- installing fencing or off-channel watering sites to keep livestock away from streams
- constructing small side channels to provide refuge for fish during high flows
- other enhancement work

Check with ODF if you plan to exchange basal area for stream improvement work.

Can some hardwoods and snags help meet the target?

Yes. All hardwoods at least 6 inches DBH left in the RMA may count toward the basal area target.

Sound conifer snags, at least 6 inches DBH and at least 30 feet high, left in the RMA may count toward as much as 10 percent of the basal area target.

Use for

medium Type F streams, Type 1 or unclassified harvest and east-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

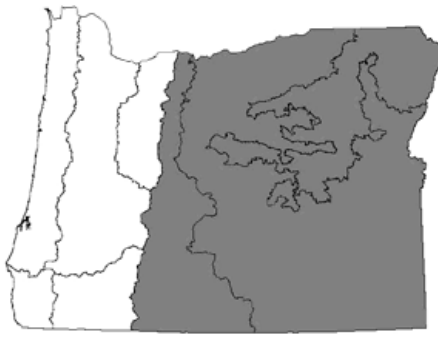


Table A-20 Medium Type F Basal Area Targets		
Geographic region	Square feet of basal area per 1,000 feet of stream	
	Standard target	Active management target
Eastern Cascades	120	100
Blue Mountains	120	100

RMA width – 70 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- no fewer than 30 live conifers, at least 8 inches DBH, per 1,000 feet within the RMA
- enough conifer basal area within the RMA to meet the standard target

[OR]

Leave less conifer basal area, but no less than the active management target, in exchange for stream improvement work. This includes:

- placing logs or trees in stream channels to create pools or hiding cover for fish
- installing fencing or off-channel watering sites to keep livestock away from streams
- constructing small side channels to provide refuge for fish during high flows
- other enhancement work

Check with ODF if you plan to exchange basal area for stream improvement work.

Can some hardwoods and snags help meet the target?

Yes. All hardwoods at least 6 inches DBH left in the RMA may count toward the basal area target.

Sound conifer snags, at least 6 inches DBH and at least 30 feet high, left in the RMA may count toward as much as 10 percent of the basal area target.

Use for

small Type F streams, Type 1 or unclassified harvest and east-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

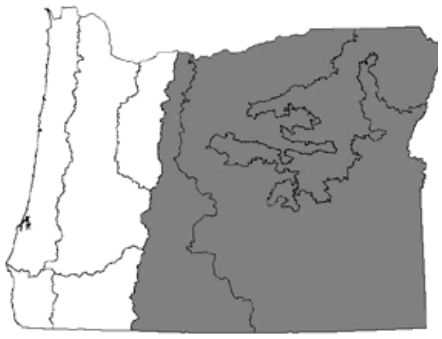


Table A-21 Small Type F Basal Area Targets		
Geographic region	Square feet of basal area per 1,000 feet of stream	
	Standard target	Active management target
Eastern Cascades	50 (40 of live conifer)	50 (30 of live conifer)
Blue Mountains	50 (40 of live conifer)	50 (30 of live conifer)

RMA width – 50 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- enough conifer basal area within the RMA to meet the standard target

[OR]

Leave less conifer basal area, but no less than the active management target, in exchange for stream improvement work. This includes:

- placing logs or trees in stream channels to create pools or hiding cover for fish
- installing fencing or off-channel watering sites to keep livestock away from streams
- constructing small side channels to provide refuge for fish during high flows
- other enhancement work

Check with ODF if you plan to exchange basal area for stream improvement work.

Can some hardwoods and snags help meet the target?

Yes. No more than 40 square feet per 1,000 feet of the standard target or 30 square feet per 1,000 feet of the active management target is required to be live conifer. The remainder of the target is to be met by the basal area of retained snags, dead or dying trees, or hardwoods if they are available.

All hardwoods at 6 inches DBH left in the RMA may count toward the basal area target.

Sound conifer snags at least 6 inches DBH left in the RMA may count toward as much as 10 percent of the basal area target.

Use for

Medium Type SSBT, Prescription 1 – No Harvest RMA, Type 2 or 3 harvests and Coast Range, South Coast, Interior and Western Cascades geographic regions, including the "main stem" of any Type F stream upstream of the Type SSBT of a harvest Type 2 or Type 3 units.

Use when

no harvest will take place within the RMA of a Type SSBT stream.

Table A-22 Medium Type SSBT Prescription 1 – No Harvest RMA: Streamside Tree Retention for Harvest Type 2 or Type 3 Units (OAR 629-642-0105)
Wildlife Leave Trees: Up to 50% of the trees retained to meet the total basal area target and any wildlife leave trees in excess of the total basal area target: Square feet of basal area per each 500-foot stream segment, each side of the stream (any combination of conifers and hardwoods 6 inches or greater DBH)
RMA Total basal area (20 to 80 feet) = 69 sq. ft.
Notes for Table A-22 1. Distances are measured from the high water level of the Type SSBT stream. 2. Up to 10% of the basal area requirement may be comprised of sound conifer snags 6 inches or greater DBH and at least 30 feet tall.

RMA width – 80 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees within the RMA that lean over the stream channel
- all snags and downed wood in the stream channel and RMA

Can trees left in RMAs help meet the wildlife leave tree requirements?

Yes. Operators may count as wildlife trees all conifers and hardwoods that meet wildlife leave tree requirements as follows:

- all trees within 20 feet of the high-water level channel
- in the remainder of the RMA, up to 50% of the trees retained to meet the total basal area target in Table A-22, and
- any trees in excess of the total basal area target in Table A-22

Use for

medium Type SSBT, Prescription 2 – Partial Harvest RMA, Type 2 or 3 harvests and Coast Range, South Coast, Interior and Western Cascades geographic regions, including the "main stem" of any Type F stream upstream of the Type SSBT of a harvest Type 2 or Type 3 units.

Use when

the live conifer basal area in the RMA located more than 20 feet from the high water level of the Type SSBT stream is more than the RMA total basal area in Table A-23.

Table A-23 Medium Type SSBT Prescription 2 - Partial Harvest RMA:
Streamside Tree Retention for Harvest Type 2 or Type 3 Units (OAR 629-642-0105)

Basal area target: Square feet of basal area per each 500-foot stream segment, each side of the stream (any combination of conifers and hardwoods 6 inches or greater DBH)	Live conifer trees (8 inches or greater DBH) per each 500-foot stream segment, each side of the stream
No Harvest Zone: 0 to 20 feet = Retain all trees. Trees in this area do not count toward meeting the basal area or live conifer tree requirements in this table.	
Inner Zone: 20 to 50 feet, minimum 18 sq. ft.	Inner Zone: 20 to 50 feet, minimum 7 trees
Outer Zone: 50 to 80 feet, minimum 18 sq. ft.	Outer Zone: 50 to 80 feet, minimum 7 trees
RMA Total (20 to 80 feet) = 69 sq. ft.	RMA Total (20 to 80 feet) = 15 trees

Notes for Table A-23
1. Distances are measured from the high water level of the Type SSBT stream.
2. Up to 10% of the basal area requirement may be comprised of sound conifer snags 6 inches or greater DBH and at least 30 feet tall.
3. Must meet requirements of each zone and RMA total.

RMA width – 80 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees within the RMA that lean over the stream channel
- all snags and downed wood in the stream channel and RMA
- minimum live conifer trees, at least 8 inches DBH, per 500 feet within the RMA for the Inner Zone, Outer Zones and the RMA total in Table A-23
- minimum conifer and hardwood basal area targets within the RMA for the Inner Zone, Outer Zones and the RMA total in Table A-23

Can some hardwoods and snags help meet the basal area targets?

Yes. A combination of the following can be included in the basal area target:

- the basal area of hardwoods left in the RMA that are greater than 6 inches DBH but growing more than 20 feet from the high-water level
- the basal area of sound snags, at least 6 inches DBH and at least 30 feet high, that are growing more than 20 feet from the high-water level can account for up to 10% of the basal area requirement

Can trees left in RMAs help meet the wildlife leave tree requirements?

Yes. Operators may count as wildlife trees all conifers and hardwoods that meet wildlife leave tree requirements as follows:

- all trees within 20 feet of the high-water level channel
- in the remainder of the RMA, up to 50% of the trees retained to meet the total basal area target in Table A-23, and
- any trees in excess of the total basal area target in Table A-23

Use for

medium Type SSBT, Prescription 3 – North-sided Buffer, Type 2 or 3 harvests and Coast Range, South Coast, Interior and Western Cascades geographic regions, including the "main stem" of any Type F stream upstream of the Type SSBT of a harvest Type 2 or Type 3 units.

Use when

the north side of a Type SSBT stream has a stream segment at least 200 feet length and meets the standards in the Type SSBT Prescription 3.

Table A-24. Medium Type SSBT Prescription 3 – North-sided Buffer: Streamside Tree Retention for Harvest Type 2 or Type 3 Units (OAR 629-642-0105)
Geographic Region: Coast Range, South Coast, Interior, Western Cascades
Wildlife Leave Trees: All conifers and hardwoods trees that meet wildlife leave tree requirements within 40 feet of the stream high water level.
Notes for Table A-24. 1. Distances are measured from the high water level of the Type SSBT stream.

RMA width – 40 feet

Leave the following on the north side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees within the RMA that lean over the stream channel
- all snags and downed wood in the stream channel and RMA

Type SSBT Prescription 3 standards:

- north side of a Type SSBT stream has a stream segment at least 200 feet in length, and
- Type SSBT stream has a stream valley direction that runs in a general east to west direction, stream valley direction is between 60 and 120 degrees east and 240 and 300 degrees west on a compass bearing of 0 and 360 degrees as north

Operators shall:

- retain all trees within 40 feet of the high water level on the north side of a Type SSBT stream where the stream valley direction criteria are met
- apply either Type SSBT Prescription 1 – No Harvest RMA or Type SSBT Prescription 2 – Partial Harvest RMA, where the Type SSBT Prescription 3 – North-sided Buffer is not applied
- describe in a written plan and map where Prescription 3 is intended to be implemented

Can trees left in RMAs help meet the wildlife leave tree requirements?

Yes. Operators may count as wildlife trees all conifers and hardwoods that meet wildlife leave tree requirements within 40 feet of the stream high water level.

Use for

medium Type SSBT, relief Prescription 1 – No Harvest RMA, Type 2 or 3 harvests and Coast Range, South Coast, Interior and Western Cascades geographic regions, including the "main stem" of any Type F stream upstream of the Type SSBT of a harvest Type 2 or Type 3 units.

Use when

no harvest will take place within the Type SSBT RMA and the parcel meets the standards of relief Prescription 1 – No Harvest RMA

Table A-25 Medium Type SSBT Relief Prescription 1 – No Harvest RMA: Streamside Tree Retention for Harvest Type 2 or Type 3 Units (OAR 629-642-0110)
Wildlife Leave Trees: Up to 50% of the trees retained to meet the total basal area target and any wildlife leave trees in excess of the total basal area target. Square feet of basal area per each 500-foot stream segment, each side of the stream (any combination of conifers and hardwoods 6 inches or greater DBH)
RMA Total basal area (20 to 70 feet) = 58 sq. ft.
Notes for Table A-25 1. Distances are measured from the high water level of the Type SSBT stream. 2. Up to 10% of the basal area requirement may be comprised of sound conifer snags 6 inches or greater DBH and at least 30 feet tall.

RMA width – 70 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees within the RMA that lean over the stream channel
- all snags and downed wood in the stream channel and RMA

Can trees left in RMAs help meet the wildlife leave tree requirements?

Yes. Operators may count as wildlife trees all conifers and hardwoods that meet wildlife leave tree requirements as follows:

- the basal area of hardwoods left in the RMA that are greater than 6 inches DBH but growing more than 20 feet from the high-water level
- the basal area of sound snags, at least 6 inches DBH and at least 30 feet high, that are growing more than 20 feet from the high-water level can account for up to 10% of the basal area requirement

Can trees left in RMAs help meet the wildlife leave tree requirements?

Yes. Operators may count as wildlife trees all conifers and hardwoods that meet wildlife leave tree requirements as follows:

- all trees within 20 feet of the high-water level channel
- in the remainder of the RMA, up to 50% of the trees retained to meet the total basal area target in Table A-25, and
- any trees in excess of the total basal area target in Table A-25

Use for

medium Type SSBT, relief Prescription 2 - Partial Harvest RMA, Type 2 or 3 harvests and Coast Range, South Coast, Interior and Western Cascades geographic regions, including the "main stem" of any Type F stream upstream of the Type SSBT of a harvest Type 2 or Type 3 units.

Use when

the live conifer basal area in the RMA located more than 20 feet from the high-water level of the Type SSBT stream is more than the RMA total basal area in Table A-24 and the parcel meets the standards in relief Prescription 2 – Partial Harvest RMA.

Table A-26 Medium Type SSBT Relief Prescription 2 - Partial Harvest RMA: Streamside Tree Retention for Harvest Type 2 or Type 3 Units (OAR 629-642-0110)

Basal area target: Square feet of basal area per each 500-foot stream segment, each side of the stream (any combination of conifers and hardwoods 6 inches or greater DBH)	Live conifer trees (8 inches or greater DBH) per each 500-foot stream segment, each side of the stream
No Harvest Zone: 0 to 20 feet = Retain all trees. Trees in this area do not count toward meeting the basal area or live conifer tree requirements in this table.	
Inner Zone: 20 to 45 feet, minimum 15 sq. ft.	Inner Zone: 20 to 45 feet, minimum 6 trees
Outer Zone: 45 to 70 feet, minimum 15 sq. ft.	Outer Zone: 45 to 70 feet, minimum 6 trees
RMA Total (20 to 70 feet) = 58 sq. ft.	RMA Total (20 to 70 feet) = 13 trees
Notes for Table A-26 1. Distances are measured from the high water level of the Type SSBT stream. 2. Up to 10% of the basal area requirement may be comprised of sound conifer snags 6 inches or greater DBH and at least 30 feet tall. 3. Must meet requirements of each zone and RMA total.	

RMA width – 70 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees within the RMA that lean over the stream channel
- all snags and downed wood in the stream channel and RMA
- minimum live conifers, at least 8 inches DBH, per 500 feet within the RMA for the Inner Zone, Outer Zone and the RMA total in Table A-26
- minimum conifer and hardwood basal area targets within the RMA for the Inner Zone, Outer Zone and the RMA total in Table A-26

Can some hardwoods and snags help meet the basal area targets?

Yes. A combination of the following can be included in the basal area target:

- the basal area of hardwoods left in the RMA that are greater than 6 inches DBH but growing more than 20 feet from the high-water level
- the basal area of sound snags, at least 6 inches DBH and at least 30 feet high, that are growing more than 20 feet from the high-water level can account for up to 10% of the basal area requirement

Can trees left in RMAs help meet the wildlife leave tree requirements?

Yes. Operators may count as wildlife trees all conifers and hardwoods that meet leave tree requirements as follows:

- all trees within 20 feet of the high-water level channel
- in the remainder of the RMA, up to 50% of the trees retained that meet the basal area target in Table A-26, and
- any trees in excess of the total basal area target in Table A-26

Use for

small Type SSBT, Prescription 1 – No Harvest RMA, Type 2 or 3 harvests and Coast Range, South Coast, Interior and Western Cascades geographic regions, including the "main stem" of any Type F stream upstream of the Type SSBT of a harvest Type 2 or Type 3 units.

Use when

no harvest will take place within the RMA of a Type SSBT stream.

Table A-27 Small Type SSBT Prescription 1 – No Harvest RMA: Streamside Tree Retention for Harvest Type 2 or Type 3 Units (OAR 629-642-0105)
Wildlife Leave Trees: Up to 50% of the trees retained to meet the total basal area target and any wildlife leave trees in excess of the total basal area target. Square feet of basal area per each 500-foot stream segment, each side of the stream (any combination of conifers and hardwoods 6 inches or greater DBH)
RMA Total basal area (20 to 60 feet) = 37 sq. ft.
Notes for Table A-27 1. Distances are measured from the high water level of the Type SSBT stream. 2. Up to 10% of the basal area requirement may be comprised of sound conifer snags 6 inches or greater DBH and at least 30 feet tall..

RMA width – 80 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees within the RMA that lean over the stream channel
- all snags and downed wood in the stream channel and RMA

Can trees left in RMAs help meet the wildlife leave tree requirements?

Yes. Operators may count as wildlife trees all conifers and hardwoods that meet wildlife leave tree requirements as follows:

- all trees within 20 feet of the high-water level channel
- in the remainder of the RMA, up to 50% of the trees retained to meet the total basal area target in Table A-27, and
- any trees in excess of the total basal area target in Table A-27

Use for

small Type SSBT, Prescription 2 – Partial Harvest RMA, Type 2 or 3 harvests and Coast Range, South Coast, Interior and Western Cascades geographic regions, including the "main stem" of any Type F stream upstream of the Type SSBT of a harvest Type 2 or Type 3 units.

Use when

the live conifer basal area in the RMA located more than 20 feet from the high-water level of the Type SSBT stream is more than the RMA total Basal Area in Table A-28.

Table A-28 Small Type SSBT Prescription 2 - Partial Harvest RMA:
Streamside Tree Retention for Harvest Type 2 or Type 3 Units (OAR 629-642-0105)

Basal area target: Square feet of basal area per each 500-foot stream segment, each side of the stream (any combination of conifers and hardwoods 6 inches or greater DBH)	Live conifer trees (8 inches or greater DBH) per each 500-foot stream segment, each side of the stream
No Harvest Zone: 0 to 20 feet = Retain all trees. Trees in this area do not count toward meeting the basal area or live conifer tree requirements in this table.	
Inner Zone: 20 to 40 feet, minimum 10 sq. ft.	Inner Zone: 20 to 40 feet, minimum 4 trees
Outer Zone: 40 to 60 feet, minimum 10 sq. ft.	Outer Zone: 40 to 60 feet, minimum 4 trees
RMA Total (20 to 60 feet) = 37 sq. ft.	RMA Total (20 to 60 feet) = 8 trees

Notes for Table A-28
1. Distances are measured from the high water level of the Type SSBT stream.
2. Up to 10% of the basal area requirement may be comprised of sound conifer snags 6 inches or greater DBH and at least 30 feet tall.
3. Must meet requirements of each zone and RMA total.

RMA width – 60 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees within the RMA that lean over the stream channel
- all snags and downed wood in the stream channel and RMA
- minimum live conifers, at least 8 inches DBH, per 500 feet within the RMA for the Inner Zone, Outer Zone and the RMA total in Table A-28
- minimum conifer and hardwood basal area targets within the RMA for the Inner Zone, Outer Zone and the RMA total in Table A-28

Can some hardwoods and snags help meet the basal area targets?

Yes. A combination of the following can be included in the basal area target:

- the basal area of hardwoods left in the RMA that are greater than 6 inches DBH but growing more than 20 feet from the high-water level
- the basal area of sound snags, at least 6 inches DBH and at least 30 feet high, that are growing more than 20 feet from the high-water level can account for up to 10% of the basal area requirement

Can trees left in RMAs help meet the wildlife leave tree requirements?

Yes. Operators may count as wildlife trees all conifers and hardwoods that meet leave tree requirements as follows:

- all trees within 20 feet of the high-water level channel
- in the remainder of the RMA, up to 50% of the trees retained to meet the total basal area target in Table A-28, and
- any trees in excess of the total basal area target in Table A-28

Use for

small Type SSBT, Prescription 3 – North-sided Buffer, Type 2 or 3 harvests and Coast Range, South Coast, Interior and Western Cascades geographic regions, including the "main stem" of any Type F stream upstream of the Type SSBT of a harvest Type 2 or Type 3 units.

Use when

the north side of a Type SSBT stream has a stream segment at least 200 feet length and meets the standards in the Type SSBT Prescription 3.

Table A-29. Small Type SSBT Prescription 3 – North-sided Buffer: Streamside Tree Retention for Harvest Type 2 or Type 3 Units (OAR 629-642-0105)
Geographic Region: Coast Range, South Coast, Interior, Western Cascades
Wildlife Leave Trees: All conifers and hardwoods trees that meet wildlife leave tree requirements within 40 feet of the stream high water level.
Notes for Table A-29 1. Distances are measured from the high water level of the Type SSBT stream.

RMA width – 40 feet

Leave the following on the north side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees within the RMA that lean over the stream channel
- all snags and downed wood in the stream channel and RMA

Type SSBT Prescription 3 – North-sided Buffer Standards:

- north side of a Type SSBT stream has a stream segment at least 200 feet in length
- Type SSBT stream has a stream valley direction that runs in a general east to west direction
- stream valley direction is between 60 and 120 degrees east and 240 and 300 degrees west on a compass bearing of 0 and 360 degrees as north

Operators shall:

- retain all trees within 40 feet of the high water level on the north side of a Type SSBT stream where the stream valley direction criteria are met
- apply either Type SSBT Prescription 1 – No Harvest RMA or Type SSBT Prescription 2 – Partial Harvest RMA, where the Type SSBT Prescription 3 – North-sided Buffer is not applied
- describe in a written plan and map where Prescription 3 is intended to be implemented.

Can trees left in RMAs help meet the wildlife leave tree requirements?

Yes. Operators may count as wildlife trees all conifers and hardwoods that meet wildlife leave tree requirements within 40 feet of the stream high water level.

Use for

small Type SSBT, relief Prescription 1 – No Harvest RMA, Type 2 or 3 harvests and Coast Range, South Coast, Interior and Western Cascades geographic regions, including the "main stem" of any Type F stream upstream of the Type SSBT of a harvest Type 2 or Type 3 units.

Use when

no harvest will take place within the RMA of a Type SSBT stream.

Table A-30 Small Type SSBT Relief Prescription 1 – No Harvest RMA: Streamside Tree Retention for Harvest Type 2 or Type 3 Units (OAR 629-642-0110)
Wildlife Leave Trees: Up to 50% of the trees retained to meet the total basal area target and any wildlife leave trees in excess of the total basal area target. Square feet of basal area per each 500-foot stream segment, each side of the stream (any combination of conifers and hardwoods 6 inches or greater DBH)
RMA Total basal area (20 to 50 feet) = 28 sq. ft.
Notes for Table A-30 1. Distances are measured from the high water level of the Type SSBT stream. 2. Up to 10% of the basal area requirement may be comprised of sound conifer snags 6 inches or greater DBH and at least 30 feet tall.

RMA width – 50 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees within the RMA that lean over the stream channel
- all snags and downed wood in the stream channel and RMA

Can trees left in RMAs help meet the wildlife leave tree requirements?

- all trees within 20 feet of the high-water level channel
- in the remainder of the RMA, up to 50% of the trees retained to meet the total basal area target in Table A-30, and
- any trees in excess of the total basal area target in Table A-30

Use for

small Type SSBT, relief Prescription 2 – Partial Harvest RMA, Type 2 or 3 harvests and Coast Range, South Coast, Interior and Western Cascades geographic regions, including the "main stem" of any Type F stream upstream of the Type SSBT of a harvest Type 2 or Type 3 units.

Use when

the live conifer basal area in the RMA located more than 20 feet from the high-water level of the Type SSBT stream is more than the RMA total in Table A-31 and the parcel meets the standards of relief Prescription 2 – Partial Harvest RMA.

Table A-31 Small Type SSBT Relief Prescription 2 - Partial Harvest RMA: Streamside Tree Retention for Harvest Type 2 or Type 3 Units (OAR 629-642-0110)

Basal area target: Square feet of basal area per each 500-foot stream segment, each side of the stream (any combination of conifers and hardwoods 6 inches or greater DBH)	Live conifer trees (8 inches or greater DBH) per each 500-foot stream segment, each side of the stream
No Harvest Zone: 0 to 20 feet = Retain all trees. Trees in this area do not count toward meeting the basal area or live conifer tree requirements in this table.	
Inner Zone: 20 to 35 feet, minimum 7 sq. ft	Inner Zone: 20 to 35 feet, minimum 3 trees
Outer Zone: 35 to 50 feet, minimum 7 sq. ft.	Outer Zone: 35 to 50 feet, minimum 3 trees
RMA Total (20 to 50 feet) = 28 sq. ft.	RMA Total (20 to 50 feet) = 6 trees

Notes for Table A-31
1. Distances are measured from the high water level of the Type SSBT stream.
2. Up to 10% of the basal area requirement may be comprised of sound conifer snags 6 inches or greater DBH and at least 30 feet tall.
3. Must meet requirements of each zone and RMA total.

RMA width – 50 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees within the RMA that lean over the stream channel
- all snags and downed wood in the stream channel and RMA
- minimum live conifers, at least 8 inches DBH, per 500 feet within the RMA for the Inner Zone, Outer Zone and the RMA total in Table A-31
- minimum conifer and hardwood basal area targets within the RMA for the Inner Zone, Outer Zone and the RMA total in Table A-31

Can some hardwoods and snags help meet the basal area targets?

Yes. A combination of the following can be included in the basal area target:

- the basal area of hardwoods left in the RMA that are greater than 6 inches DBH but growing more than 20 feet from the high-water level
- the basal area of sound snags, at least 6 inches DBH and at least 30 feet high, that are growing more than 20 feet from the high-water level can account for up to 10% of the basal area requirement

Can trees left in RMAs help meet the wildlife leave tree requirements?

Yes. Operators may count as wildlife trees all conifers and hardwoods that meet wildlife leave tree requirements as follows:

- all trees within 20 feet of the high-water level channel
- in the remainder of the RMA, up to 50% of the trees retained that meet the basal area target in Table A-31, and
- any trees in excess of the total basal area target in Table A-31

Use for

large Type D or N streams, Type 2 or 3 harvest and west-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

Table A-32 Large Type D or N Basal Area Targets	
Geographic region	Standard target, square feet of basal area per 1,000 feet of stream
Coast Range & South Coast	90
Interior & Western Cascades	110
Siskiyou	90

RMA width – 70 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- no fewer than 30 live conifers, at least 11 inches DBH, per 1,000 feet within the RMA
- enough conifer basal area within the RMA to meet the standard target

Can some hardwoods and snags help meet the target?

Yes. All cottonwood and Oregon ash trees, at least 6 inches DBH, left in the RMA but growing more than 20 feet from the high-water level may count toward the basal area target.

A combination of the following can make up to 10 percent of the basal area target:

- the basal area of hardwoods (other than alder) left in the RMA that are greater than 24 inches DBH but growing more than 20 feet from the high-water level
- the basal area of sound snags, at least 6 inches DBH and at least 30 feet high, that are anywhere within the RMA

Can trees left in RMAs help meet other leave tree requirements?

Yes. All conifers and hardwoods left in the RMA may be counted toward requirements for leave trees within Type 2 or Type 3 harvests, as long as they meet the other requirements for leave trees.

Use for

medium Type D or N streams, Type 2 or 3 harvest and west-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

Table A-33 Medium Type D or N Basal Area Targets	
Geographic region	Standard target, square feet of basal area per 1,000 feet of stream
Coast Range & South Coast	50 (30 may be from hardwoods)
Interior & Western Cascades	50 (30 may be from hardwoods)
Siskiyou	50 (30 may be from hardwoods)

RMA width – 50 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- no fewer than 10 live conifers, at least 8 inches DBH, per 1,000 feet within the RMA
- enough conifer basal area within the RMA to meet the standard target.

Can some hardwoods and snags help meet the target?

Yes. Hardwood trees left in the RMA can contribute up to a maximum of 30 square feet of basal area per 1,000 feet toward meeting the basal area target.

Sound conifer snags, at least 6 inches DBH and at least 30 feet high, can make up as much as 5 percent of the basal area target.

Use for

large Type D or N streams, Type 1 or unclassified harvest and west-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

Table A-34 Large Type D or N Basal Area Targets	
Geographic region	Standard target, square feet of basal area per 1,000 feet of stream
Coast Range & South Coast	140
Interior & Western Cascades	160
Siskiyou	120

RMA width – 70 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RM,
- no fewer than 30 live conifers, at least 11 inches DBH, per 1,000 feet within the RMA
- enough conifer basal area within the RMA to meet the standard target.

Can some hardwoods and snags help meet the target?

Yes. All cottonwood and Oregon ash trees, at least 6 inches DBH, left in the RMA but growing more than 20 feet from the high-water level may count toward the basal area target.

A combination of the following can make up to 10 percent of the basal area target:

- the basal area of hardwoods (other than alder) left in the RMA that are greater than 24 inches DBH but growing more than 20 feet from the high-water level
- the basal area of sound snags, at least 6 inches DBH and at least 30 feet high, that are anywhere within the RMA

Use for

medium Type D or N streams, Type 1 or unclassified harvest and west-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

Table A-35 Medium Type D or N Basal Area Targets	
Geographic region	Standard target, square feet of basal area per 1,000 feet of stream
Coast Range & South Coast	60 (30 may be from hardwoods)
Interior & Western Cascades	60 (30 may be from Hardwoods)
Siskiyou	60 (30 may be from hardwoods)

RMA width – 50 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- no fewer than 10 live conifers, at least 8 inches DBH, per 1,000 feet within the RMA
- enough conifer basal area within the RMA to meet the standard target

Can some hardwoods and snags help meet the target?

Yes. Hardwood trees left in the RMA can contribute up to a maximum of 30 square feet of basal area per 1,000 feet toward meeting the basal area target.

Sound conifer snags, at least 6 inches DBH and at least 30 feet high, can make up as much as 5 percent of the basal area target.

Use for

large Type D or N streams, Type 2 or 3 harvest and east-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

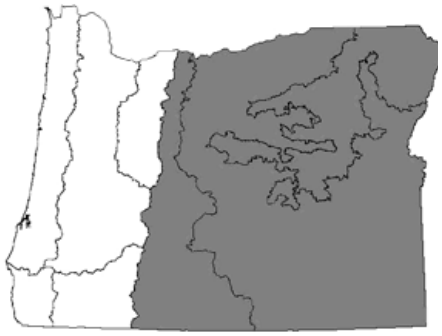


Table A-36 Large Type D or N Basal Area Targets	
Geographic region	Standard target, square feet of basal area per 1,000 feet of stream
Eastern Cascades	70
Blue Mountains	70

RMA width – 70 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- no fewer than 30 live conifers, at least 11 inches DBH, per 1,000 feet within the RMA
- enough conifer basal area within the RMA to meet the standard target.

Can some hardwoods and snags help meet the target?

Yes. All hardwoods left in the RMA may count toward the basal area target.

Sound conifer snags, at least 6 inches DBH and at least 30 feet high, left in the RMA may count toward as much as 10 percent of the basal area target.

Can trees left in RMAs help meet other leave tree requirements?

Yes. All conifers and hardwoods left in the RMA may be counted toward requirements for leave trees with Type 2 or 3 harvests, as long as they meet the other requirements for leave trees.

Use for

medium Type D or N streams, Type 2 or 3 harvest and east-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

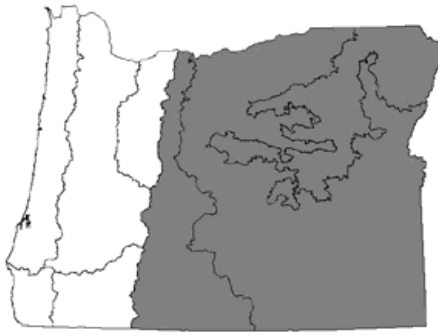


Table A-37 Medium Type D or N Basal Area Targets	
Geographic region	Standard target, square feet of basal area per 1,000 feet of stream
Eastern Cascades	50
Blue Mountains	50

RMA width – 50 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- no fewer than 10 live conifers, at least 8 inches DBH, per 1,000 feet within the RMA
- enough conifer basal area within the RMA to meet the standard target

Can some hardwoods and snags help meet the target?

Yes. All hardwoods left in the RMA may count toward the basal area target.

Sound conifer snags, at least 6 inches DBH and at least 30 feet high, can make up as much as 5 percent of the basal area target.

Can trees left in RMAs help meet other leave tree requirements?

Yes. All conifers and hardwoods left in the RMA may be counted toward requirements for leave trees with Type 2 or 3 harvests, as long as they meet the other requirements for leave trees.

Use for

large Type D or N streams, Type 1 or unclassified harvest and east-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

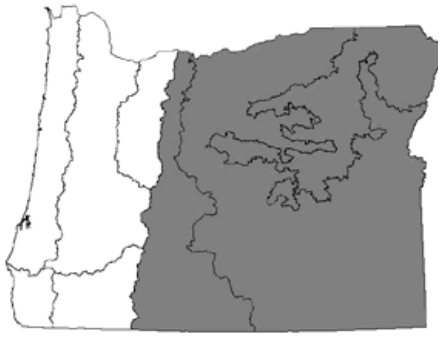


Table A-38 Large Type D or N Basal Area Targets	
Geographic region	Standard target, square feet of basal area per 1,000 feet of stream
Eastern Cascades	100
Blue Mountains	100

RMA width – 70 feet

Leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and downed wood in the channel and RMA
- no fewer than 30 live conifers, at least 11 inches DBH, per 1,000 feet within the RMA
- enough conifer basal area within the RMA to meet the standard target

Can some hardwoods and snags help meet the target?

Yes. All hardwoods left in the RMA may count toward the basal area target.

Sound conifer snags, at least 6 inches DBH and at least 30 feet high, left in the RMA may count toward as much as 10 percent of the basal area target.

Use for

medium Type D or N streams, Type 1 or unclassified harvest and east-side geographic regions.

Use when

the live conifer basal area in the RMA is more than the standard target.

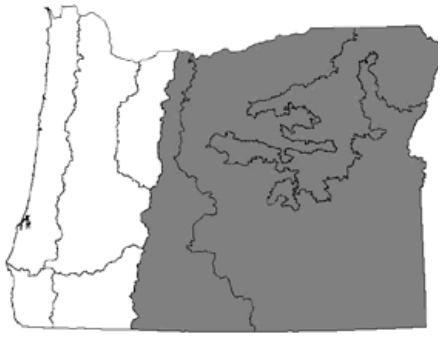


Table A-39 Medium Type D or N Basal Area Targets	
Geographic region	Standard target, square feet of basal area per 1,000 feet of stream
Eastern Cascades	60
Blue Mountains	60

RMA width – 50 feet

Leave the following on each side of the stream:

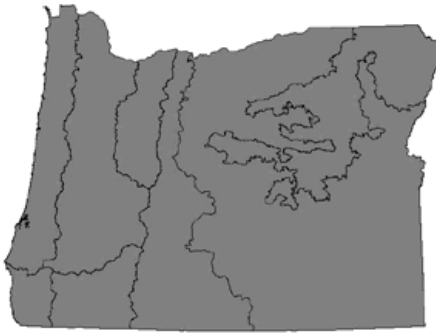
- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA
- no fewer than 10 live conifers, at least 8 inches DBH, per 1,000 feet within the RMA
- enough conifer basal area within the RMA to meet the standard target

Can some hardwoods and snags help meet the target?

Yes. All hardwoods left in the RMA may count toward the basal area target.

Sound conifer snags, at least 6 inches DBH and at least 30 feet high, can make up as much as 5 percent of the basal area target.

Use for
small Type D streams, all types of harvest and all geographic regions.



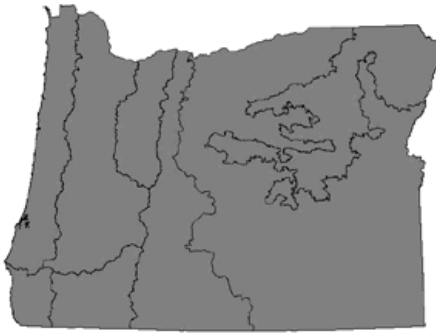
RMA width – 20 feet

There are no basal area targets for these streams.

However, leave the following on each side of the stream:

- all understory vegetation within 10 feet of the high-water level
- all trees within 20 feet of the high-water level
- all trees that lean over the channel and grow in the RMA
- all snags and down wood in the channel and RMA

Use for
small Type N streams, all types of harvest and all geographic regions.



No RMA width designated

There are no basal area targets for these streams.

However, leave the following on each side of the stream:

- understory vegetation and unmerchantable conifers (those less than 6 inches DBH) for 10 feet on each side of the high-water level for the perennial channels indicated below

Table A-40 Small Type N Vegetation Retention

Geographic region	Where required
Coast Range	None required
South Coast	Perennial channels where the upstream drainage area is greater than 160 acres
Interior	Perennial channels where the upstream drainage area is greater than 330 acres
Western Cascades	None required
Siskiyou	Perennial channels where the upstream drainage area is greater than 580 acres
Eastern Cascades	All perennial channels
Blue Mountains	All perennial channels

A stream is considered to be perennial if it usually has summer surface flow after July 15, as determined by ODF.

To minimize stream warming, operators are encouraged to leave understory vegetation and non-merchantable trees (those less than 6 inches DBH) along all perennial streams in operation areas.

How to plan for and calculate peak flows for stream crossings

If you're planning to install or replace a stream crossing, there's a key question to answer: Are there fish in the stream?

If yes, it's best to get help from a professional, because designing and installing the stream crossing can get complicated. Stream crossings must allow for fish passage, and this involves more things to consider. For example, the slope of the stream may require a different crossing design that makes the installation more costly. It's wise to check with experienced people.

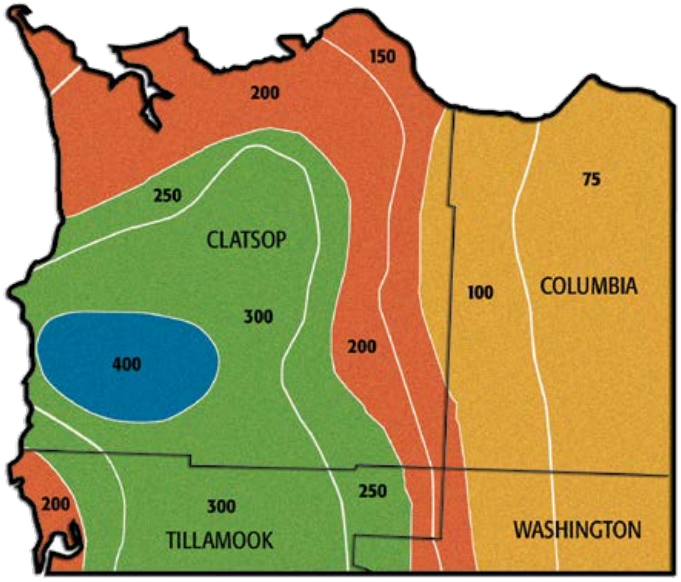
If no, your stream crossing is probably more straightforward.

Follow these steps to calculate the size of the culvert needed if the crossing is not on a fish-bearing stream. In some situations the same size culvert also may be adequate for a stream that has fish, but this should be verified before construction.

Remember that if the fill depth for your planned stream crossing is more than 15 feet (see page 129), it requires a written plan.

What flow level must the crossing be able to handle?

Forest practices rules require that a culvert or bridge crossing be sized to handle at least a 50-year peak flow (sometimes referred to as the 50-year storm).



This is the ODF's "Peak Flow for Forest Streams" map for the northwest corner of Oregon. Lines on the map indicate the 50-year peak flow in cubic feet per second per square mile of drainage area. For this area of Oregon, 50-year peak flows vary from 75 cfs per square mile on east side of the map to 400 cfs on the (wet) west side.

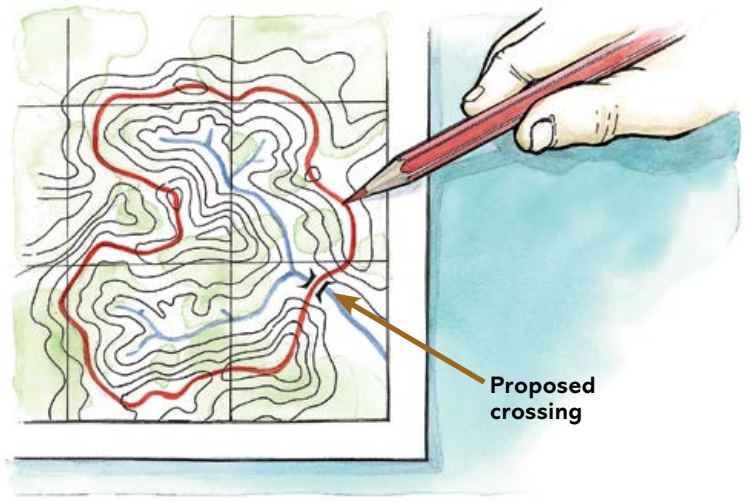
What this means

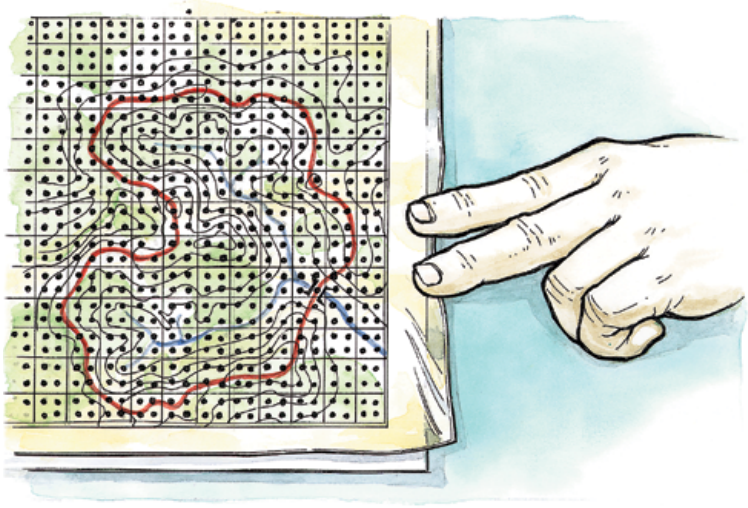
You need to be sure the structure you're installing can handle a very large storm and the runoff it produces. If not, the resulting damage or washout can require a costly replacement, along with stream and fish habitat damage below the failure and the inconvenience of a closed road.

The "50-year peak flow" actually refers to the local storm flow that has a 2 percent chance of occurring in any given year. When averaged across many years, a flow of this size occurs only about twice a century, but it's important to understand that the occurrence of such a storm flow does not affect the likelihood of the next big event – there's still a one in 50 chance (2 percent) a similar flow will occur in any following year.

How do you determine the peak flow?

Without a long-term gauging station on your stream, you can't know for sure what the 50-year peak flow is for a particular stream crossing location, but it can be estimated from an ODF map that's based on other local records and information. Here's how to do it.





STEP 1

Use a "Peak Flows for Forest Streams" map available at your local ODF office. The northwest corner of this map is illustrated on page 192.

Find the location of your planned stream crossing on the map. What is the value of the closest line? If your crossing is between two lines, figure out the average value of the two closest lines.

Example: Let's say you're planning to install a culvert in a location where the map indicates the 50-year peak flow to be 100 cfs per square mile of drainage. The next thing you have to figure out is the size of the drainage above your planned crossing.

STEP 2

Determine the size of the drainage upstream of your crossing.

- Use a 7.5-minute topographic map or software. Outline the drainage boundary (highest terrain above the stream crossing) with a pencil or electronic drawing tool (see illustration above).
- Use a 1:24000 dot grid to determine the size of the drainage. Dot grids are printed on clear plastic so you can lay them on top of topographic maps and see drainage boundaries (see illustration above). If you have map software, it may have a tool that can determine areas within such boundaries.
- Count the number of grid intersections that fall within the drainage boundary.
- Multiply the number of grid intersections by .036. This is the drainage area in square miles.

Example: If the number of squares counted within the drainage boundary is 23, the drainage is .83 square miles.

Here's the calculation: 23 x .036 = .83

STEP 3

Calculate peak flow for the size of your drainage.

From Step 1 we know the peak flow: 100 cfs.

From Step 2 we know the size of the drainage: .83 square miles.

How many cubic feet per second must the culvert handle?

The culvert must be sized to handle a flow of at least 83 cfs.

Here's the calculation: 100 x .83 = 83

STEP 4

Determine what size culvert is needed.

From Step 3 we know the peak flow in cfs.

Go to Table A-40. It lists the flow capacities for common sizes of round culverts.

The table shows that a 54-inch circular culvert has a capacity up to 87 cfs. With good conditions it would likely handle a flow of 83 cfs, but a larger pipe would provide an extra margin of safety.

Table A-40
Flow Capacity For Circular Culverts

Diameter (inches)	Capacity (cfs)
18	Less than 5
24	5-11
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For other information sources, see pages 197-198.

Glossary

Although some important terms are included here, many are specifically defined in sections of the Oregon Forest Practices Act (ORS 527.620) and Rules (OAR 629-600-0100). Always verify these definitions to help ensure compliance with the act and rules.

Acre
a land area of 43,560 square feet, in any shape. If square, it would measure approximately 209 feet per side

Active management target
the minimum basal area required to protect the RMA when a landowner agrees to do stream improvement work on a Type F stream

Active Road
a road currently being used or maintained for removing commercial forest products.

Afforestation
planting a forest in an area where the previous vegetation or land use was not forest

Aggregate
mechanically crushed, angular rock used for forest road surfacing

Alternatives to burning
methods to reduce or avoid the need for slash burning (e.g., lop and scatter, chipping and biomass utilization)

Anadromous fish
fish that are born and reared in fresh water, move to the ocean to grow and mature, and return to fresh water to reproduce (e.g., salmon, steelhead, shad)

Aquatic life
organisms (e.g., plants, insects, animals) that spend all or a portion of their life in water

Aspect
the direction toward which a slope faces

Basal area
the cross-sectional area of the trunk of a tree, 4.5 feet above the ground, often calculated from the diameter at that height: basal area = tree diameter squared, times .005454

Biomass
the wood product obtained by chipping or grinding all or some portion of trees (e.g., tops, limbs, unmerchantable stems and other residues) usually for renewable energy production

Blowdown
trees felled by high winds

Bog
a hydrologically closed (no significant water flow) wetland, characterized by saturated peat soils and specialized plant communities

Bull trout
Fish species *Salvelinus confluentus*

Cable yarding
moving logs from the stump to the landing using an overhead system of winch-driven cables to which logs are attached with chokers

Clearcut
a logging and reforestation method for shade-intolerant tree species, in which the entire timber stand, except required leave trees, is harvested

Cobble
the name for a specific size class of rock: 3 to 12 inches in diameter

Conifer
a tree with cones, often called "evergreen" because it keeps its foliage year-round (e.g., pine, spruce, fir and larch trees) and also known as "softwood" from its wood characteristics

Culvert
pipe that channels water under a road

Cutslope
the slope above a road, created by a cut into the face of a hill slope during road construction

D stream – see "Type D stream"

DBH
(diameter at breast height) the diameter of a tree outside of the bark at breast height (i.e., 4.5 feet above the ground, measured on the uphill side of the tree)

Default standard
the minimum basal area required to protect the RMA when the existing basal area is less than half of the standard target and Alternative Prescriptions #1 and #2 are not applicable

Deforestation
clearing a forest and putting the land into a nonforest use

Domestic water use
the use of water for human consumption and other household human use

Down log
a green tree or an existing log intentionally left on the ground after a harvest for wildlife habitat and other benefits

Downspout
an attachment (e.g., a half-round culvert section) to a culvert outlet that carries water beyond the fill slope to control erosion

Drain dip
a shallow depression in the road surface to provide for surface drainage without interrupting vehicle traffic

End haul
moving excavated roadway material by dump truck to another location, in contrast to sidecasting the material next to the road

Estuary
a body of water semi-enclosed by land and connected with the open ocean where saltwater and freshwater mix (e.g., all estuary waters, tidelands, tidal marshes and submerged lands extending upstream to the head of tidewater)

Every reasonable effort
actions required by the landowner or operator if a fire starts in an active operation, which maintain limited liability exposure; can vary based on amount and type of available resources

F stream – see "Type F stream"

Fledgling
a young bird learning to fly

Flush
any activity that causes a sensitive wildlife species to leave its nest, roost or perching tree

Free-to-grow
the point when a tree or stand has a high probability of remaining or becoming dominant over competing vegetation; reforestation rules require this be achieved within six years

Geotextile
synthetic fibers formed into woven or non-woven fabric used to separate, filter or reinforce; used in road surfaces to reduce rutting, stabilize the ground and increase the load-carrying capacity

Gradient
the slope of a road surface in the direction of travel, usually expressed in percent; e.g., a 10 percent grade equals a change along the road of 10 feet vertical in 100 horizontal feet

Granite soils (decomposed granites; granitics)
light-colored soils with a coarse texture due to particle sizes ranging from sand to small gravel; loose and highly erodible due to low clay content that does not hold particles together

Ground-based yarding
moving logs from the stump to the landing using a dozer or rubber-tired skidder; attached logs are pulled behind the machine with chokers or one end of the logs lifted and dragged with a grapple

Hardwood
a broadleaf, usually deciduous, tree (e.g., oak, maple, cottonwood, ash, madrone)

Headwall
the steep, often bowl-shaped, upper reaches of a drainage

High-water level
the water level reached during the average annual high flow; often corresponds with the edge of streamside terraces, a change in vegetation or a change in soil or litter characteristics

Hog fuel
logging debris (e.g., defective logs, chunks, branches) that is ground up at a log landing and sold to and/or used by a mill to create electricity

Inactive Road
a road used for forest management exclusive of removing commercial forest products.

Juvenile fish
immature fish or fingerlings; stream crossings must not impede their movement up and downstream

Landowner
any individual, combination of individuals, partnership, corporation or association of whatever nature that holds an ownership interest in forestland, including the state and any political subdivision of the state

Limited liability (fire suppression)
a landowner or operator is responsible for fire suppression costs of no more than $300,000, given "every reasonable effort" and no willful, malicious or negligent actions found to cause the fire

Log landing
the area where logs may be collected, delimbed and loaded onto trucks.

Main stem
the portion of a Type F stream that is directly upstream of a Type SSBT stream

Marsh
a wetland formed in a shallow pond, depression, river margin or tidal area; characteristic plants include grasses, sedges, cattails and bulrushes

N stream – see "Type N stream"

Notification of Operation
a document required to be filed with the ODF 15 days prior to starting a forest operation

Operation
any commercial activity relating to the establishment, management or harvesting of forest tree species

Operator
any person, including a landowner or timber owner, who conducts an operation

Peak flow
the highest stream flow from a large storm or snowmelt event; a 50-year return interval flow for stream crossing design

Perennial stream
a stream that has running water after July 15 under normal climatic conditions

Plantation
a reforested area composed primarily of trees established by planting or seeding practices

Pole
a young tree between 1 and 10 inches DBH (see DBH)

Prescribed burn
the deliberate burning of wildland fuels for the purpose of fire hazard reduction, with consideration of local weather, soil moisture, populated areas and time of day

Prior approval
formal permission from ODF for certain forest practices before the activities begin

Ravel (dry ravel)
the particle-by-particle erosion of loose rock or dry soil fragments from steep slopes, driven by gravity and not water; common on road cutslopes and on steep slopes after wildfire

Reforestation
the re-establishment of forest cover either naturally or by planting or seeding

Resource site
unique area used by sensitive, threatened or endangered species where protection measures are required; includes nesting, roosting, watering and foraging locations

RMA (riparian management area)
an area along each side of specified waters of the state with special vegetation retention and management requirements for the protection of water quality, fish and wildlife habitat

Road prism
the cross-section of a road between the points of excavation and fill

Rule of thumb
a simple guideline or procedure based on general concepts or experience, which provides roughly correct but not strictly accurate or reliable results

Salmon
any of the five salmon species that exist in Oregon. These species are:

(a) Chinook salmon *(Oncorhynchus tshawwytscha)*;

(b) Coho salmon *(Oncorhynchus kisutch)*;

(c) Chum salmon (*Oncorhynchus keta)*;

(d) Sockeye salmon *(Oncorhynchus nerka)*; and

(e) Pink salmon *(Oncorhynchus gorbuscha)*

SSBT
a stream with salmon, steelhead or bull trout present or otherwise used by salmon, steelhead, or bull trout at any time of the year as determined by the State Forester

Scarify
mechanically remove competing vegetation or interfering debris, and/or disturbing the soil surface, to improve reforestation success

Scenic highway
designated highways with special requirements for forest operations within specified distances

Seedling
a young tree less than 1 inch DBH (see DBH)

Seep
water emerging from the ground along an extensive line or surface; in contrast to a spring where the water emerges from a localized spot

Shelterwood
A harvest and reforestation method in which most trees are removed but some are retained to shade seedlings that otherwise would be susceptible to heat and drought

Shovel
an excavator equipped with a grapple, used instead of a skidder or dozer to move logs

Side channel
a channel other than a main channel of a stream that only has flowing water when high-water levels occur

Significant wetland
those wetland types that require site-specific protection

Site class
a grouping of site indexes that indicates relative productivity

Site index
a measure of forest site quality based on the height of the dominant trees in a stand at a specified age, usually 50 or 100 years

Site preparation
any treatment that enhances site conditions for plantation establishment or natural regeneration

Skidding
in ground-based logging, the process of dragging logs from the woods to a landing; called "yarding" in cable or helicopter logging

Slash
tree tops, branches, bark and other natural debris, left after a forest operation

Slope (degrees or percent)
an incline measured as the change in surface level within a given horizontal distance, expressed in degrees or as a percentage (e.g., a rise of 2 feet that spans 100 feet is a 2 percent slope or an angle of 1.15 degrees)

Snag
a dead standing tree or section of the stem at least 30 feet tall and at least 11 inches DBH (see DBH)

Sound snag
a dead tree with some intact bark or limb stubs; conifers can have merchantable wood

Squash pipe
a type of culvert used to cross streams in areas with low road clearances or wide channels; also can provide better conditions for fish passage

Standard target
the minimum basal area of specified tree types and sizes that must be retained in the RMA when harvesting near a Type F or D stream

Steelhead
the anadromous life history variant of *Oncorhynchus mykiss*

Stocking
the number of trees on a given area, as in the case of trees per acre required to be planted after a harvest

Stream
a channel with a distinct bed or banks scoured by water which serves to confine water and that contains flowing surface water during some portion of the year.

Stream-associated wetland
a wetland that is not classified as significant and that is next to a stream

Stream improvement
actions to improve aquatic habitat, including placing logs, trees or boulders in streams, fencing out livestock, constructing side channels and afforestation

Subgrade
the layer of a roadbed on which the base or surface course is placed; on an unsurfaced road, this is the wearing surface (top layer upon which vehicles travel)

Talus
slope formed by an accumulation of rock debris, sometimes from a cliff or road cut above

Temporary crossing
a stream crossing installed and used during a harvest and promptly removed when the operation is completed or prior to seasonal runoff, whichever comes first

Temporary fill
material (e.g., soil and rock) used to construct a temporary crossing that must be removed from below the high water level of the stream at the completion of the operation

Threatened or endangered species
any species of plant or animal listed as in danger of becoming rare or extinct throughout all or a significant portion of its range, as defined by the Endangered Species Act of 1976

Topography
the surface forms, elevations and contours of an area of land

Turbidity
the cloudy appearance of a water body, caused by suspended or dissolved solids, algae, etc.; can indicate natural or accelerated erosion

Type 1 harvest
a harvest operation that requires reforestation because the number of seedlings, saplings or poles left does not meet the local stocking standards; however, wildlife leave trees are not required

Type 2 harvest
a harvest operation that requires wildlife leave trees but not reforestation because an adequate number of seedlings, saplings or poles are left; sometimes called a "green clearcut"

Type 3 harvest
a harvest operation that requires reforestation and, if larger than 25 acres, wildlife leave trees and down logs; limited to 120 acres and typically a clearcut

Type D stream
a stream that has domestic water use, but no fish use

Type F stream
a stream with fish use, or both fish use and domestic water use

Type N stream
a stream with neither fish nor domestic water use

Unclassified harvest
a harvest operation that meets the standards for both reforestation stocking and wildlife trees; typically a commercial thinning

Understory vegetation
those plants growing below the canopy formed by other, taller plants in a forest

Waste disposal area
a location for excess soil, rock and other debris from road construction that is stable and from where the material will not enter waters of the state

Water bar
a diversion ditch and/or hump constructed diagonally across a road or skid trail to control runoff and prevent erosion of road and trail surfaces

Waters of the State
include canals, creeks, estuaries, ponds, reservoirs, springs, streams, wells and wetlands

Wetland
an area sufficiently inundated or saturated by surface or ground water that local plants are typically those adapted to wet soil conditions; includes marshes, swamps, bogs and similar areas

Wildlife tree
a green tree at least 30 feet tall and at least 11 inches DBH (see DBH), planned for and left after a harvest to supply habitat for birds and other wildlife

Written plan
a document prepared by an operator or landowner that describes how an operation will be conducted and will protect resources; required by the ODF for several types of operations and/or activity locations

Other information sources

OAR = Oregon Administrative Rules

ORS = Oregon Revised Statutes

Copies of these and other publications and technical information available from ODF at www.oregon.gov/odf or from OFRI at KnowYourForest.org

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1. OAR Chapter 629-Division 605, Planning Forest Operations
2. A Guide to Legal Requirements for Preventing and Controlling Fires in Operations on and near Forestland in Oregon – ODF
3. OAR Chapter 629-Division 600, Definitions

FROM PAGE 12 – SECTION: HOW WATERS OF THE STATE ARE CLASSIFIED AND PROTECTED

1. OAR Chapter 629-Division 635, Water Protection Rules: Purpose, Goals, Classification and Riparian Management Areas
2. OAR Chapter 629-Division 642, Water Protection Rules: Vegetation Retention Along Streams
3. OAR Chapter 629-Division 645, Water Protection Rules: Riparian Management Areas and Protection Measures for Significant Wetlands
4. OAR Chapter 629-Division 650, Water Protection Rules: Riparian Management Areas and Protection Measures for Lakes
5. OAR Chapter 629-Division 655, Water Protection Rules: Riparian Management Areas and Protection Measures for "Other Wetlands," Seeps and Springs
6. Forest Practices Technical Note 1 Water Classification

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1. OAR Chapter 629-Division 630, Harvesting Rules
2. ORS 527.620, Definitions
3. ORS 527.676, Leaving snags and downed logs in harvest type 2 or type 3 units; green trees to be left near certain streams

FROM PAGE 33 – SECTION: YOU WANT TO HARVEST TIMBER ALONG A STREAM. WHAT DO YOU NEED TO KNOW?

1. OAR Chapter 629-Division 635, Water Protection Rules: Purpose, Goals, Classification and Riparian Management Areas
2. OAR Chapter 629-Division 642, Water Protection Rules: Vegetation Retention Along Streams

FROM PAGE 35 – SECTION: YOU WANT TO HARVEST TIMBER AROUND A LAKE. HOW DO YOU MEET THE REQUIREMENTS?

OAR Chapter 629-Division 650, Water Protection Rules: Riparian Management Areas and Protection Measures for Lakes

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OAR Chapter 629-Division 645, Water Protection Rules: Riparian Management Areas and Protection Measures for Significant Wetlands

FROM PAGE 40 – SECTION: WHAT ARE THE REQUIREMENTS FOR LEAVING WILDLIFE TREES, SNAGS AND DOWN LOGS?

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FROM PAGE 47 – SECTION: HOW DO YOU PROTECT SENSITIVE WILDLIFE SITES WHEN YOU HARVEST?

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FROM PAGE 50 – SECTION: WHAT ARE THE REQUIREMENTS WHERE RAPIDLY MOVING LANDSLIDES MAY OCCUR?

1. Storm Impacts and Landslides of 1966. ODF Technical Report #4
2. Landslides and Public Safety Issues. ODF

FROM PAGE 53 – SECTION: WHAT ARE THE REQUIREMENTS FOR HARVESTING NEAR SCENIC HIGHWAYS?

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FROM PAGE 71 – SECTION: WHAT SHOULD YOU KNOW ABOUT SLASH TREATMENT AND SITE PREPARATION?

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FROM PAGE 83 – SECTION: YOU'RE PLANNING A HARVEST; DO YOU NEED TO REFOREST?

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Estimating Site Productivity on Your Woodland. Oregon State University Extension Circular 1128

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ODF Fact Sheet Protecting Cultural and Historic Sites

FROM PAGE 193 – SECTION: HOW TO PLAN FOR AND CALCULATE PEAK FLOWS FOR STREAM CROSSINGS

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