NORTH FORK ALSEA & SOUTH FORK ALSEA WATERSHED ANALYSES
RIPARIAN RESERVE TREATMENT RECOMMENDATIONS UPDATE

Marys Peak Resource Area
Salem District, Bureau of Land Management
1717 Fabry Road
Salem, OR 97338
503-375-5646

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Written by: **Amy Haynes, Ecologist ,**

Reviewed by:

Belle Verbics	NEPA Planner
Patrick Hawe	Hydrologist
Tom Tomczyk	Fire/Fuel Specialist
Ron Exeter	Botanist
Scott Hopkins	Wildlife Biologist
Steve Liebhardt	Fisheries Biologist
Diane Morris	Silvicultnrist
Brad Keller	Natural Resources Staff Administrator
Jack Delaini	Writer/Editor

John P. Bacho 05-23-00

John Bacho **Date**
Marys Peak Resource Area Manager

Introduction and Background

The *South Fork Alsea Watershed Analysis* (SFWA; completed November 20, 1995), and the *North Fork Alsea Watershed Analysis* (NFWA; completed July 24, 1996), were “first iteration” watershed analyses, both of which were prepared by the Marys Peak Resource Area. Each was developed to conform to the directions for watershed analysis during initial implementation (fiscal years 1995 and 1996) as specifically stated in the *Salem District Record of Decision and Resource Management Plan*, May 1995 (RMP; p. 71). These watershed analyses were prepared as part of a dynamic process, with the intention to periodically revise and update the analyses as new information becomes available.

Both watershed analyses made general recommendations for management activities in Riparian Reserves. The purpose of this document is to address the criteria for management activities in Riparian Reserves in greater detail and to make recommendations for project designs. No new data were collected, but a more detailed look at seral stages occurring in Riparian Reserves was required.

Riparian Reserves are a basic component of the Aquatic Conservation Strategy (ACS) and are designed to work together with Key Watersheds, Watershed Analysis, and Watershed Restoration to maintain and restore the productivity and resilience of riparian and aquatic ecosystems (FEMAT 1993, p. V-32). Riparian Reserves are the portions of the watershed required for maintaining hydrologic, geomorphic, and ecological processes that directly affect streams, stream processes, and fish habitats. They are also designed to provide travel corridors and resources for both riparian dependant and other riparian and/or late-successional associated plants and animals.

These long-term goals may be achieved within Riparian Reserves by using silvicultural practices designed to provide specific desired vegetation characteristics, provided that watershed analysis has been done and has identified the need (*RMP Standards and Guidelines*, p. C-32).

The original watershed analyses considered the following aspects of Riparian Reserve conditions in some detail:

SFWA:

- Large woody debris (LWD) recruitment potential within 25 meters of streams (p. 63)
- Stream temperature risk due to lack of vegetation within 25 meters of streams (p. 58)

NFWA:

- Riparian shade conditions within 10 meters of streams (pp. 69-70)
- LWD recruitment potential within 30 meters of streams (pp. 70-71)

Concerns related to Riparian Reserves listed in the fisheries and wildlife sections are as follows:

SFWA:

- Lack of LWD recruitment potential for streams (p. 65)
- Removal of old-growth from riparian zones (p. 71)
- Lack of snags, coarse woody debris (CWD), and sub-canopy layers, and lack of species diversity (p. 40)

NFWA:

- Lack of LWD in streams (p. 74)
- Lack of snags, CWD, sub-canopy layers, and lack of species diversity (p. 89)

Current Conditions

Seral Stages

Riparian Reserves constitute approximately 64% of the total BLM land area in the North Fork Alsea watershed and approximately 63% of the total BLM land area in the South Fork Alsea watershed. These figures may be somewhat inflated, because horizontal rather than slope distances were used to calculate acreage in GIS.

Riparian Reserve vegetation in the analysis areas as a whole is characterized by lack of late seral and old-growth habitat (Table 1). Stands older than 80 years account for 29% of the total Riparian Reserve acreage in the South Fork and 25% in the North Fork, far less than is presumed to have occurred prior to European settlement (Ripple 1994). Only 2% of the Riparian Reserves in the South Fork and 6% in the North Fork are composed of stands older than 200 years. The largest seral stage in both watersheds is in conifer stands less than 80 years-old. These stands account for 61% of the Riparian Reserves in the South Fork Alsea and 58 % in the North Fork. Most of them were logged and planted or allowed to seed in, and are generally uniform, even-aged Douglas-fir stands, with a minor component of other conifers and hardwoods in the same canopy layer. Both original watershed analyses noted the lack of sub-canopy layers and species diversity in the watersheds.

Most remaining BLM Riparian Reserve acres consist of hardwoods and mixed hardwood/ conifer stands. These stands range from narrow bands along streams to wide areas where alder seeded in after logging.

TABLE 1: SERAL STAGES IN BLM RIPARIAN RESERVES

Seral Stage	South Fork Alsea Watershed (acres)	Percentage of Total	North Fork Alsea Watershed (acres)	Percentage of Total
Early Seral (0-30 years)	5,125	40	4,945	34
Mid Seral (40-70 years)	2,644	21	3,478	24
Late Seral (80-199 years)	3,485	27	2,791	19
Old-growth (>200 years)	314	2	913	6
Hardwoods	1,117	9	2,137	16
Non-forest	67	1	91	1
Totals	**12,752**	**100**	**14,355**	**100**

Coarse Woody Debris

Although no formal surveys have been done in the Riparian Reserves of the analysis areas, informal reconnaissance in some stands indicates that logs and snags were left as a result of logging. These logs and snags are now in decay classes three through five. Stands generally lack younger CWD and snags, and thinned stands seem to have much less CWD and snags, probably due to removal during thinning operations. Both watershed analyses noted the lack of both aquatic and terrestrial large down wood.

Trend

With the implementation of the Oregon Forest Practices Act of 1994 (FPA), streamside riparian protection buffers (called riparian management areas) are now required on private and State-owned lands (*Forest Practices Water Protection Rules*, Divisions 24 & 57. 1994). Required protection widths vary depending on stream type and size. The current rules restrict cutting in some riparian areas, requiring that trees growing within 20 feet of streams remain uncut. However, because mandated buffer widths are much narrower than those required on BLM land, wide corridors with older forest characteristics will not likely develop on private lands.

It is probable that the mixed conifer/hardwood stands on BLM lands will develop into older riparian forests. In areas where pure hardwood stands are associated with salmonberry, or where hardwoods overtop most conifers, it is possible that, without management intervention or a largescale disturbance, succession will proceed to brush patches rather than to conifers. (Tappeiner 1991)

Riparian Reserves with older forest characteristics such as large trees, variable spacing, multi-layered canopies, snags, CWD, and species diversity are generally lacking on BLM lands in the analysis areas. About 90% of the Riparian Reserves in the South Fork Alsea and 84% in the North Fork Alsea consist of younger conifer stands which could eventually develop older forest characteristics. Some are already moving in that direction, but without management intervention, others will take a much longer time (see Appendix I).

Stands which were planted densely to produce timber will not produce large individual trees in a short time, nor will those stands with a dense brush understory or a closed canopy produce a second conifer layer. Most of these stands have had CWD and snags removed and will not produce large dead wood for a long time. Federal ownership within the analysis areas consists of approximately half of the total watershed acres (57% of the South Fork and 51% of the North Fork). Therefore, management of Riparian Reserves to produce late-seral/old-growth characteristics could have a positive impact on each watershed as a whole.

Recommendations

The recommendations which follow are in addition to those outlined in the North Fork and South Fork Alsea watershed analyses and do not conflict with recommendations in the LSRA. These additional recommendations cover silvicultural treatments, coarse woody debris, new road building, salvage, and harvest of special forest products.

Silvicultural Treatments

The *NFWA* identified 2,793 acres in Riparian Reserves which could be suitable for density management in the next decade (p. 45); the *SFWA* identified 4,558 acres possibly suitable for density management (p. 8). Management activities in the Riparian Reserves should be used to promote older forest characteristics and attain ACS objectives. Desired riparian characteristics include the following:

- Diverse vegetation appropriate to the water table, geomorphic land type, and stream channel type
- Diverse age classes/multi-layered canopy
- Mature conifers where they have occurred in the past
- Large dead standing/down wood
- Stream connected to its flood plain (flood plain inundated every 1-3 years)
- Stream bank vegetation with adequate root strength to maintain bank stability.

Both the decision to treat and the treatment prescription should be determined on a site-specific basis. General criteria for management activities in the Riparian Reserves are found in Table 2, and factors to consider when designing a Riparian Reserve project are found in Appendix II. In addition, there are guidelines set out in the *Late-Successional Reserve Assessment, Oregon Coast Province- Southern Portion* (June 1997) for management activities in Late Successional Reserves (Appendix III of this document and LSRA, pp. 39-47).

Management priorities should include the following:

- Areas designated as high priority for restoration by wildlife and/or fisheries biologists.
- Areas designated as high priority by the LSRA (see Appendix III)
- Areas of connectivity to adjacent watersheds.
- Riparian areas where in-channel improvement is planned or has been completed.

TABLE 2: CRITERIA FOR MANAGEMENT ACTIVITIES IN THE RIPARIAN RESERVES

CURRENT CONDITION	MANAGEMENT ACTIVITIES
Mixed hardwood/conifer stands or pure hardwood stands	
• No conifer stumps present/no evidence that conifer is suited to the site or historically present	• No Treatment
• Conifer stumps present/conifers overtopped by dense hardwood canopy	• Release and/or underplant conifers. Decision to treat and the treatment prescription would be determined on a site specific basis. Treatment would be appropriate to the geomorphic context of the site and objectives would be based on the site's physical and biological potential.
Conifer stands less than 20 years old	
• Dense uniform stands	• Control stocking to maintain growth of dominant trees and maintain health of stand. Prescription would be determined on a site-specific basis, and may include a range of spacing densities for each site. Maintain diversity of species. Some conifers may be released to an open- grown condition to promote wolfy limbs.
• Stands with a large component of hardwoods	• Release conifers to maintain a conifer component in the Riparian Reserves.

CURRENT CONDITION	MANAGEMENT ACTIVITIES
Stands 20-80 years	
• Previously thinned stands, or stands with natural openings where a conifer understory is initiating, and overstory canopy is closing.	• Manage density to encourage understory growth. Prescription would be determined on a site-specific basis and may include uneven spacings, a range of densities, small patch cuts, small unthinned patches, and opening up specific trees to encourage wolfy limbs. Where appropriate, trees may be cut and left in adjacent streams to provide structure, cover, and support a diverse aquatic habitat. Maintain minor species and trees with desirable wildlife characteristics, including hard-woods. Leave enough green trees to ensure snag and CWD recruitment. Remove merchantable material in excess of snag and CWD requirements (as determined by the ID team) where it poses a forest health hazard (excess fuel loading, Douglas-fir bark beetle or black stain infestation). Prescriptions (where possible) should include all subsequent treatments to maintain understory growth, achieve snag/CWD goals, achieve older forest characteristics, or any other identified goals.
• Fast growing stands with relative densities over 0.35[1]	• Thin to maintain fast growth of dominant trees. Prescriptions would be determined on a site-specific basis and may include any of the above treatments, as well as underplanting and subsequent density management to maintain understory growth.

CURRENT CONDITION	MANAGEMENT ACTIVITIES
Stands over 80 Years, Matrix (GFMA) land	
• Overstocked, even-aged stands with more than 150 trees per acre and/or relative densities greater than 0.35[1]	• Manage density to maintain fast growth of dominant trees. Prescription to be determined on a site-specific basis and may include any of the treatments recommended for younger stands, including underplanting.
• Previously treated stands with stagnating understory conifers	• Manage density to encourage understory growth Prescription to be determined on a site-specific basis and may include any of the treatments recommended for younger stands

1 RD (relative density) is a ratio: trees per acre in a stand, adjusted to a 10" DBH, divided by the trees per acre of a fully stocked stand, 10" DBH (595 trees for Douglas-fir). 0.35 is the point where growth slows from competition. 0.6 is the point where competition begins to cause mortality.

New Road Construction

In general, to meet Aquatic Conservation Strategy objectives, new road construction in Riparian Reserves should be avoided. The current planning process for new road construction requires the involvement of specialists on the affected resources, including the hydrologist, soils scientist, botanist, wildlife biologist, fisheries biologist, and road engineer. At the present time, best management practices are being used to help determine the road location, general road design features, design of cross drains and stream crossings, as well as the actual road construction.

- Continue this interdisciplinary process of evaluating each new road proposal, and when needed, utilize specialists from outside the agency to verify findings.

- When interdisciplinary teams are considering proposals for constructing road crossings on stream channels (as defined in the RMP), the methodology recommended in the *Benton Foothills Watershed Analysis* (p. 140) should be used.

Coarse Woody Debris

Coarse woody debris, or down wood and snags, is an important component of the Riparian Reserves. Informal reconnaissance in the analysis area indicates that there is generally a sufficient amount of CWD in decay classes three through five, but formal data exist only for those stands that have had stand exams. Accurate methods for assessing CWD in stand exams are still evolving.

Management goals for the Riparian Reserves are aimed at developing older forest characteristics, much like the goals for Late Successional Reserves. It is appropriate, therefore, to use the guidelines found in the LSRA as well as recommendations of Resource Area biologists to design management activities in Riparian Reserves which provide for down wood and snags in all decay classes over the life of the stand.

It is likely that many stands will come close to the LSRA minimums with the CWD already there in decay classes three through five. The primary concern will be leaving sufficient wood in decay classes one and two. In smaller diameter stands, it will likely be necessary to leave most of the future hard snags and down wood as green trees in order to provide for large hard CWD over the life of the stand. Treatment prescriptions should therefore include long-term treatment and monitoring plans to cover all activities over time to achieve CWD goals for the stand.

There is a concern that felling and leaving large numbers of green trees will in some cases increase populations of Douglas-fir bark beetles (*Dendroctonus pseudotsugae*) to levels that will cause damage to living trees and adversely affect the achievement of management objectives in the Riparian Reserves (see Appendix I). It will be necessary, therefore, to take into consideration guidelines for minimizing this threat. Hostetler (1996) is the most current source for such guidelines, although there likely will be others published in the future.

Salvage

- Salvage should be logged from existing roads
- Guidelines in the RMP and LSRA, where appropriate, should be followed, and logs should only be salvaged when ACS objectives can be met by the operation.
- Adequate CWD should be left on the site to meet ACS objectives.
- A site-specific analysis should be done using the ID team process.

Fire

Prescribed fire may be used at any age to achieve management objectives, within the guidelines of the District RMP and LSRA, where appropriate. Most likely fire would be used in mid- and later seral stands to conduct understory burns to stimulate or reduce growth of specific understory vegetation. Prescribed fire may also be used to reduce the fuel loading and risk of high intensity, stand replacing fires in selected areas.

Special Forest Products

The guidelines set out in the District CX should be followed in the Riparian Reserves.

Appendix I: Thinning Young Stands to Improve Structure and Maintain Health

Stand Structure

Without management, stands will get older but they may not develop the structure we deem desirable, and not at the rate we desire. We should not assume young stands will naturally develop into the same type of old-growth stands we see today (Spies, 1991). It is possible that young stands regenerating presently from logging are developing at much higher densities than those of old-growth stands. A recent study found that current old-growth stands may have developed from very open stands in which the trees never really competed with each other for light (Tappeiner 1997). In addition, some intensively managed stands have been simplified (Berg 1996), tending to have fewer species, more uniform tree sizes and spacing, and no large remnant overstory trees (Spies 1991).

We know that as stands age there are processes which contribute to structural changes. One such process is a decline in stand density and consequent increase in individual tree size (Spies 1991), due to a well-documented negative relationship between tree size and stand density (Tappeiner 1997). Death over time of individual suppressed trees also leads to understory development as light increases on the forest floor.

These processes happen naturally over time, but thinning can speed some processes as we substitute management for time. A recent study by Bailey and Tappeiner (1998) compared young thinned and unthinned stands to old-growth stands. They found that thinned stands and old-growth stands shared more characteristics than did unthinned and old-growth stands. Overstory tree size, live crown ratio, and density in thinned stands were more similar to old-growth, as were seedling density and frequency, and tall shrub density.

The rate that thinning increases tree size and shortens the stem exclusion stage depends on initial stand density, intensity of thinning, site productivity, and natural disturbance (Bailey, 1998). Stands located in the North Fork Alsea watershed were recently modeled in Organon (*Running Bear Density Management Project Silvicultural Prescription*, Marys Peak Resource Area, 1999). This simulation shows that stands thinned between ages 34 and 54 decreased the time to reach an average stand diameter of 20 inches by a range of 20 to 60 years. (see Table II-1) The rate that thinning increases desirable stand structure, such as initiation of an understory, was not modeled, but based on experience with past thinnings, it is assumed that the additional light reaching the forest floor would speed the process.

TABLE II-1. THINNING VS. NO THINNING, RUNNING BEAR DENSITY MANAGEMENT[1]

Sale Unit		Age	QMD[2] (in inches)	Trees/Acre	Mean Crown Ratio (%)	Age QMD > 20.0"
1,2,3,4	**Original Stand**	42	12.7	274	49	
	Unthinned	87	18.8	188	29	97
	Thinned	87	24.0	81	33	62
5	**Original Stand**	42	16.3	148	44	
	Unthinned	87	22.0	128	25	72
	Thinned	87	28.6	49	33	47
6	**Original Stand**	34	12.2	171	50	
	Unthinned	79	19.8	132	25	84
	Thinned	79	26.4	52	36	49
7	**Original Stand**	39	11.9	260	46	
	Unthinned	83	18.6	176	25	99
	Thinned	83	23.3	91	28	62
8	**Original Stand**	36	9.6	466	39	
	Unthinned	81	16.5	217	26	111
	Thinned	81	26.6	56	38	51
9	**Original Stand**	37	9.2	474	30	
	Unthinned	82	15.5	246	23	>117
	Thinned	82	21.4	98	31	81
10	**Original Stand**	48	14.8	171	42	
	Unthinned	93	20.7	144	23	88
	Thinned	93	25.2	73	28	63
11	**Original Stand**	42	10.8	281	35	
	Unthinned	87	15.7	219	23	>132
	Thinned	87	23.8	93	44	72

Sale Unit		Age	QMD[2] (in inches)	Trees/Acre	Mean Crown Ratio (%)	Age QMD > 20.0"
12	**Original Stand**	54	16.0	170	34	
	Unthinned	99	25.1	110	21	74
	Thinned	99	34.5	40	31	54
13	**Original Stand**	37	11.5	265	32	
	Unthinned	82	19.4	180	21	87
	Thinned	82	25.7	72	27	52

1. The stands were modeled using ORGANON version 6.0, SMC version 1.0, a growth-and-yield model developed by OSU. Numbers generated by growth-and-yield models can be used as a relative comparison of treatments in a given stand. They are not necessarily accurate predictions of future growth, however, since future stand measurements are dependent upon disturbance patterns and other stochastic events which can never be accurately predicted.

2. QMD = quadratic mean diameter, the DBH of the tree of mean basal area.

Forest Health

Thinning young stands increases wind firmness by strengthening root systems, increasing diameter to height ratios, and increasing live crown ratios, which lowers the tree's center of crown mass. In addition to wind firmness, reducing competition within a stand increases the vigor of individual trees left. Vigorous trees are better able to resist a moderate bark beetle attack (Curtis 1998). In addition, thinning is a traditional management technique for controlling root diseases such as *Phellinus weirri* which are spread by contact with other roots and are therefore exacerbated by dense stocking.

Thinning accelerates diameter growth of conifers, thereby increasing the size of future standing and down dead wood. The trade-off is that when thinned material is removed from the stand, a considerable amount of smaller-size CWD is removed. The reason for removal is forest health: large amounts of dead wood put a stand at risk for catastrophic fire and Douglas-fir bark beetle attack.

Retention of large amounts of dead wood on the ground immediately increases the risk of fire as well as the rate of spread and resistance to control. The risk of a fire and the rate of its spread are highest during the first 1-2 years following cutting when there is a large amount of fine fuel in a surface and aerial arrangement, and then they drop significantly and return to pre-treatment risk levels over the next 10-40 years. The resistance to control, determined by the amount and size of fuels, remains significantly higher than normal for 15 to 25 years. On average, after about 20 years, thinning-size material begins to break down rapidly to duffy material which still poses a slightly higher than normal risk of a fire start, as well as resistance to control. A high loading of surface fuels increases the likelihood of fire spreading upward into the canopy and up into snags, further increasing the difficulty of controlling a wildfire. Consequently, desired structural characteristics, such as the snags and multi-layered canopies which we are attempting to create, are at a greater risk of loss.

Douglas-fir bark beetles are attracted to freshly killed Douglas-fir trees over approximately 8 to12 inches in diameter. It has been observed that disturbances which produce large numbers of dead trees can cause a population build-up in bark beetles and result in infestation of adjacent healthy trees. For three to four years after a large disturbance, the number of standing green trees infested and killed approaches 60% of those killed by the original event (Hostetler 1996). As an example, a stand thinned from 190 trees to 100 trees per acre, with all cut trees remaining at the site, would have approximately 46 standing green trees per acre at the end of four years, assuming all cut trees were over 12" DBH. Therefore, guidelines suggest leaving the minimum number of dead trees possible to achieve CWD objectives after a thinning, and if creation of additional down wood and snags is appropriate, to do it in pulses every three to four years (Hostetler 1996).

Appendix II: Riparian Reserve Project Design--Factors to Consider

Management objectives for a site should be based on its physical and biological potential, and its geomorphic context. The geomorphic context should be field investigated, and an explanation of its significance to the site's physical and biological processes should be addressed in the project EA. This description should include an estimate of the extent of true riparian zone (i.e., the stream adjacent zone that influences conditions *directly* in the aquatic environment) as distinguished from the uplands that lie within the Riparian Reserve area.

Factors to consider when distinguishing the uplands from the true riparian zone include the following:

- Vegetation — wetland plant and bryophyte indicator species verses upland species.

- Slope breaks — those points on the slope where erosional processes have produced an oversteepened and actively eroding surface that contributes sediment directly to the channel and/or flood plain.

- Geomorphic type — flood plains, terraces, alluvial-colluvial fans, debris torrents, in-channel landslide deposits, stream banks and vertical canyon walls ("gorges") are all considered to be influencing aquatic conditions actively and directly, and are therefore part of an ecological riparian zone. In contrast, stable colluvial hillslopes, benches and ridge lines are considered upland.

- Water table — as evidenced by plant communities and physical conditions at the site.

- Stream channel type — steep, intermittent "source" stream vs. low gradient depositional reach.

Upland sites within the Riparian Reserve allocations are transitional, and their direct influence on aquatic conditions quickly approaches a limit where management activities carry small potential risk for the aquatic system. How quickly this limit is approached varies by issue (e.g., stream temperature vs. sediment supply) as well as spatially and temporally. This should be recognized in project planning by addressing these specific effects at the project level.

Since standards and guidelines for a properly functioning riparian zone have not been well quantified, we need to develop our own on a site-specific basis. For the true riparian zone, we should identify reference sites that can serve as models for how we think the site in question should or could function. This would help define the "range of natural variability" for the site. Where no adequate reference site can be identified, we must rely on "professional judgement," backed up by whatever research and reference work we can locate, combined with evidence from the site in question.

Treatment prescriptions should include all subsequent treatments necessary to achieve older forest characteristics, ACS objectives, and coarse woody debris (CWD) goals for the stand. Monitoring needs to be identified specifically to insure that it is completed and that the results are carried on into future planning.

APPENDIX III: Link to *Late-Successional Reserve Assessment, Oregon Coast Province- Southern Portion*, June 1997 (LSRA)

The LSRA proposes to treat land within Late-Successional Reserves (LSR) both inside and outside Riparian Reserves generally with the same treatment prescriptions since many of the objectives for LSRs are similar to the objectives for Riparian Reserves, and thus similar treatments are appropriate (LSRA p. 40).

The LSRA defines LSR Zones and Landscape Cells, and identifies treatment priorities for each (LSRA pp. 29-33 and Map 12).

LSR lands within the North Fork Alsea watershed are designated as Core LSR Zone, according to the LSRA. The Core LSR Zone is designed to provide the genetic source for populations of late-successional species. Within the Core Zone, the North Fork Alsea has LSR lands in three Landscape Cells (see Table 2).

LSR lands within the South Fork Alsea watershed are designated as Corridor and Buffer Zones. The Corridor Zone serves as a refuge for late-successional forest species which are dispersing from stable populations in the Core Zone. The Buffer Zone serves to provide connectivity and dispersal between other portions of the landscape. LSR lands in the South Fork Alsea are divided into four Landscape Cells (Table 2).

Cells 1, 2, and 4 have the highest treatment priorities within the LSR, according to the LSRA.

TABLE III-1: PERCENTAGE OF LAND AREA IN LSR LANDSCAPE CELLS[1]

Landscape Cell	North Fork Alsea: % LSR land area	South Fork Alsea: % LSR land area
1 (Contiguous Mature)	**20**	**47**
2 (Mixed Seral)	0	0
3 (Early Seral)	0	**12**
4 (Early Seral Link to Mature)	**70**	**2**
5 (Early Seral Connectivity)	**10**	0
6 (Early Seral)	0	**39**

1. Includes land both inside and outside Riparian Reserves

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