# Jackson Creek
# Watershed Analysis Iteration 1.1

Prepared by the Umpqua National Forest
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**Approved By:**

/s/ Donna L. Owens **1-25-12**

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**ABSTRACT**

This iteration of the 1995 Jackson Creek Watershed Analysis (WA) expands upon the original WA by considering new information not available 16 years ago. The original WA is not replaced, however specific aspects are deleted, replaced, modified, or clarified. Page numbers are cited for convenience of tracking; updated language is in bold under the italicized original recommendation.

Because some of the WA recommendations were written with past practices in mind, the process of WA iteration allows for new information to be introduced and past recommendations to be updated. The following original recommendations from the 1995 Jackson Creek WA are being iterated and upon signature of this document, will be considered updated for the purposes of project planning.

# Introduction

The Northwest Forest Plan (USDA/USDI 1994) states that Watershed Analysis (WA) is an on-going, iterative process that should expand as appropriate to consider additional available information. The federal guide for watershed analysis describes it as a stage-setting process, where the results of watershed analysis establish the context for subsequent decision making processes (REIC 1995). This iteration of the Jackson Creek WA is based on the need to provide an updated context for the planning of timber sales, focusing on scientific findings that have developed within the last 16 years. An iteration of the Jackson Creek WA is also timely, since the Northwest Forest Plan was amended to clarify the role of the Aquatic Conservation Strategy. This amendment requires project decision makers to consider and use any relevant information from watershed analysis. This is true of WA findings for stand-level management in Riparian Reserves as well as landscape-level management strategies presented in WAs related to disturbance regimes at the watershed scale.

The Jackson Creek watershed encompasses 102,386 acres. Jackson Creek flows directly into the South Umpqua River. The original 1995 Jackson Creek Watershed Analysis (USDA 1995) divided the watershed by Watershed Analysis Areas (WAAs) (Figure 1). Current management direction divides the watershed by subwatersheds (Figure 2). These two hydrologic delineations differ both in boundaries and naming conventions, making the tracking of watershed analysis recommendations difficult. Maps are provided in this document of both the historic and current hydrologic delineations to facilitate accurate cross-tracking.

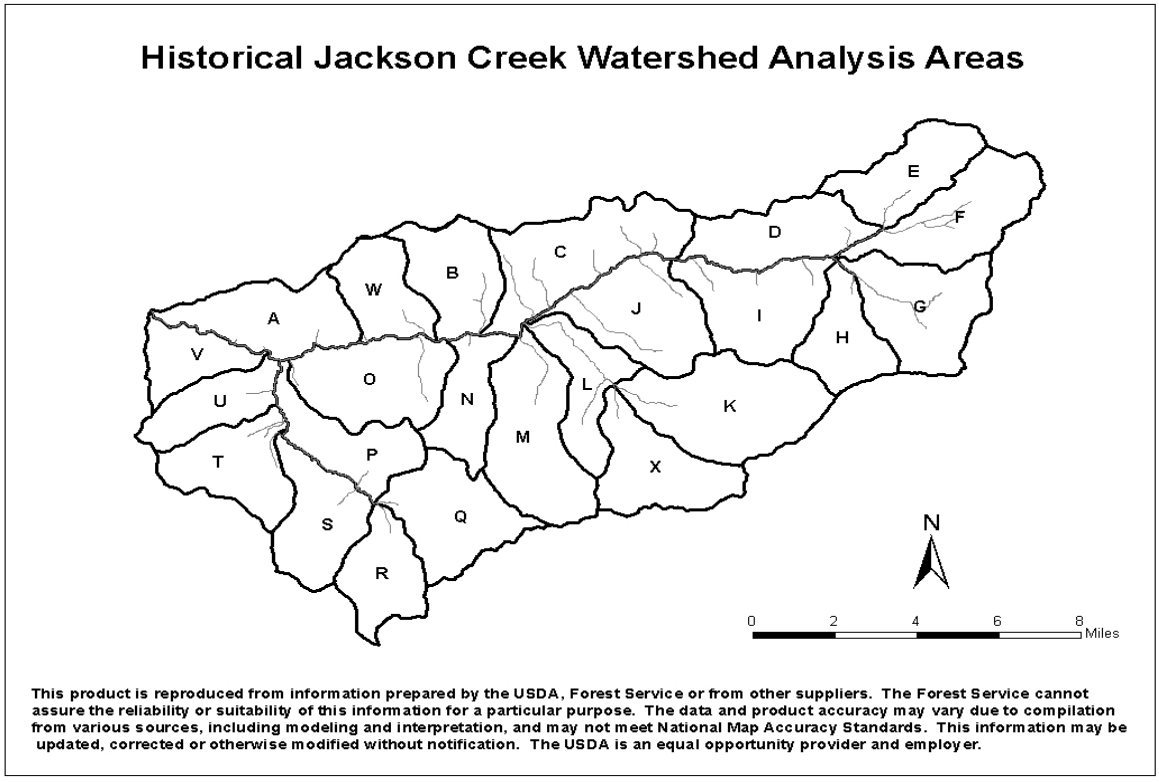
# Riparian Restoration, Maintenance, and Enhancement, and the Role of Disturbance in Riparian Reserves

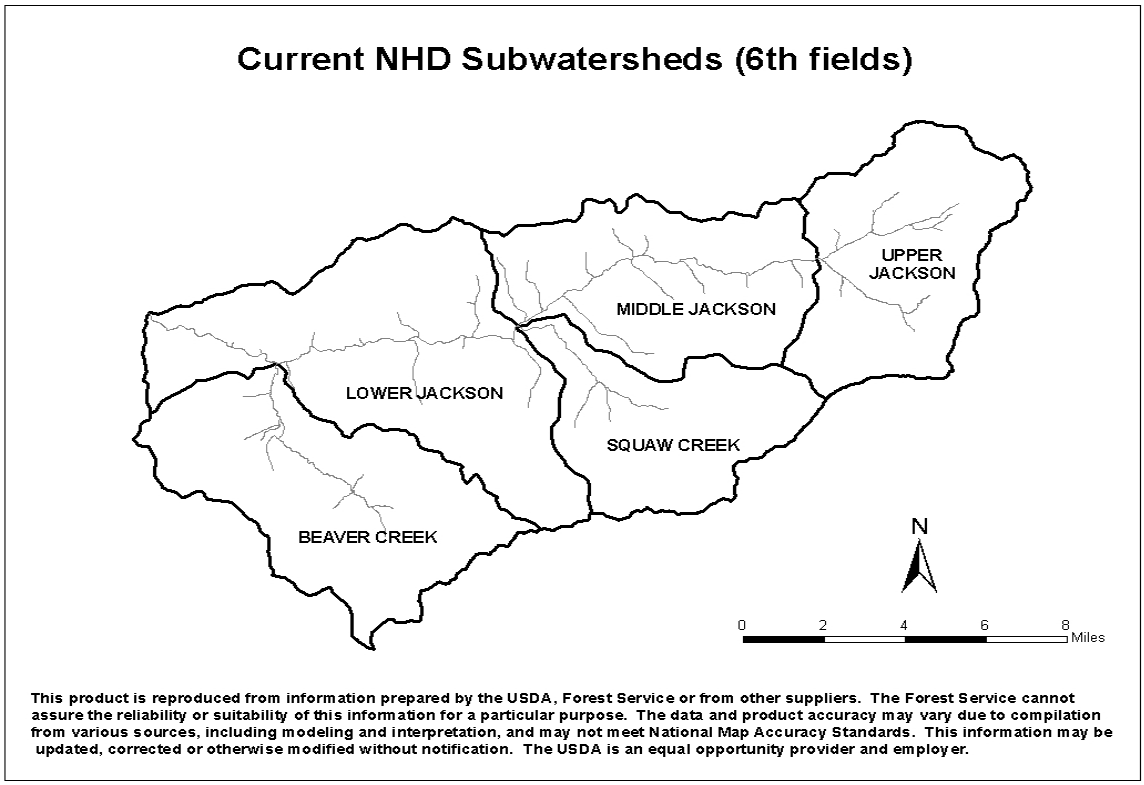
Under the Aquatic Conservation Strategy (ACS), Riparian Reserves (RR) are used to maintain and restore riparian structures and functions of streams, confer benefits to riparian-dependent and associated species, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of the watershed. The Riparian Reserves also serve as connectivity corridors among the Late-Successional Reserves.

The ACS must strive to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources, and restore currently degraded habitats. This approach seeks to prevent further degradation and restore habitat over broad landscapes as opposed to individual projects or small watersheds (USDA/USDI 1994, USDA/USDI 2004).

The Jackson Creek WA reported that due to fire exclusion and past timber management practices, dense, homogeneous stem exclusion stands are over-represented on the landscape compared to pre-European settlement times. In 1995 it was estimated that 57% of riparian areas in the Beaver Creek area were in stem exclusion stage; historically this stage would have covered 29% of riparian areas. The late seral stage historically covered 42% of riparian areas while in 1995, they covered 27%. Recent research has shown that dense forest canopies with homogenous and continuous stand structures have an increased potential for crown fires. These types of homogenous forest structures have dramatically altered how wildfires burn in these forests from how they burned historically (Powell et al. 2001, Peterson et al. 2005).

A 2000 fire history study that compared riparian and upslope areas in the Steamboat Creek watershed on the Umpqua National Forest, showed no significant difference between fire return intervals in riparian compared to upland sites (Olson and Agee 2005). Another study found that fire exclusion has altered riparian forest structure, composition and successional trajectory in




**Figures 1 and 2:** Historical Watershed Analysis Areas (WAAs) which were the hydrologic delineations used during the 1995 Jackson Creek Watershed Analysis and the current NHD subwatersheds (6th fields).

mixed severity fire regimes of southwest Oregon (Messier, Shatford and Hibbs 2011). Historically fires maintained these areas as spatially patchy, multi-aged stands. More open forest, with gaps where Douglas fir recruited, created the dominant overstory, while unburned patches created higher density areas, thinned by later fires and competition. Fire exclusion has led to denser stand conditions, an increase in White fir recruitment, and slower growth of Douglas fir, which may be replaced by White fir as the dominant overstory species. Reeves et al. (Reeves et al. 1995) reported that disturbance in riparian areas may be a required ecological process to provide coarse woody debris, and multiple riparian successional stages for the proper functioning of the aquatic-land interface. Recommendations from another fire history study comparing uplands with riparian areas published by Everett et al, (Everett et al. 2003) suggest the need to integrate riparian and side slope forests through shared disturbance events (as opposed to keeping fire out of riparian areas) in order to maintain ecosystem function. Silvicultural research has shown that thinning treatments in homogenous, stem exclusion riparian reserves can increase diversity and abundance of a variety of plant and animal species (Chan et al. 2006). Thinning dense, stem exclusion stands can stimulate increased understory species diversity, and an acceleration of the development of multilayered stands characteristic of old-growth Douglas-fir forests (Chan et al. 2006, Bailey and Tappeiner 1998, Garman, Cissel and Mayo 2003, Harrington, Roberts and Brodie 2005). Research also shows that remaining trees in thinned areas increase growth rates from release (Harrington et al. 2005, Garman et al. 2003, Davis and Puettmann 2007). This increase results in trees that are available for larger diameter woody debris recruitment than they would be if unthinned.

The Northwest Forest Plan TMDL Implementation Strategy (USDA/USDI 2010) provides a recent perspective on the topic of Riparian Reserve treatments. This guidance document, recently approved by Oregon Department of Environmental Quality, addresses the fact that vegetation treatment may be necessary to restore, enhance, or maintain the ecological health of sites that were harvested previously or have been degraded due to lack of natural disturbance processes. Riparian Reserve treatments can accomplish the restorative functions of reducing density, diversifying species composition, accelerating development of late successional conditions and enhancing the long-term large wood recruitment potential.

Silvicultural treatments are permitted within RR to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain ACS objectives (NWFP, 1994). In the Jackson Creek watershed densely stocked plantations, suppression mortality and fuel recruitment are increasing. An increased risk of stand replacement fire in Riparian Reserves due to felling and leaving overstocked trees is not desirable nor is it consistent with the need to reduce fire risk in young stands. Restoring a more natural fuel mosaic is desirable in a large portion of the Riparian Reserve network, especially in densely stocked plantations.

The recommendations below from the 1995 Jackson Creek WA recognized some of the benefits of thinning in Riparian Reserves, but restricted such thinning to a very limited area:

- *We recommend retaining the riparian reserve widths which are described in the ROD. We highly recommend vegetative activities within riparian reserves as described later in this chapter. (pg 218) (Listed directly below)*
    - *Specific areas: Riparian Canopy Restoration: Devise and implement silvicultural prescriptions designed to release tall conifers (including western red cedar, western hemlock and Douglas Fir) to increase stream shade and future supply of large wood, in the following specific locations (pg 218):*
    - *Mouth of Squaw Creek and plantations along Squaw Creek.*

- *South side of Jackson Creek (0.5 miles) below Falcon Creek, and above Falcon Creek to the 405 road (0.5 miles).*
- *Southside of Jackson Creek from mouth to Squaw Creek.*

- *Timber harvest in riparian reserves should only occur in those associated with intermittent streams. These activities must be consistent with Aquatic Conservation Strategy Objectives and must benefit the wildlife species given additional protection under Riparian Reserve Scenario 1 (FSEIS). Vegetative manipulation should not occur in riparian reserves of fish-bearing and permanently flowing streams, constructed ponds and reservoirs, lakes or ponds, any wetlands, or unstable or potentially unstable areas, except as described for specific areas described below. (pg 221)*

- *Beaver Creek – Inventory and prioritize silvicultural opportunities to accelerate development of late seral riparian communities. Opportunities for this type of project in the short term should be limited to the upper reaches of WAAs Q and R (Pipestone, Fawn, and Maverick Creeks) with only <0.5 mile of class IV stream treated in each WAA. Treatments should be considered experimental and should be followed up with monitoring to determine whether objectives are being met. (pg 230)*

Based on more recent research regarding disturbance and the effects of thinning on riparian areas, and the need to accomplish riparian restoration over a larger area, the above recommendations are replaced with:

- ***For stand treatments in the Riparian Reserve that are commercial-sized, remove thinned trees to facilitate restorative thinning and lower fire risks. The silvicultural prescription will designate the number of leave trees that will be left for short and long-term snags and down wood using the DecAID wood advisor (or other model based on the best available science) for guidance.***

- ***In precommercial-sized stands, thin early in order to limit the amount of thinning slash left on site. The silvicultural prescriptions for precommercial thinning should enhance diversity by varying thinning intensities, provide competitive advantages to tree species other than Douglas-fir, and apply prescriptions that respond to the landscape areas discussed above in this WA iteration.***
- ***For perennial streams & wetlands, apply silvicultural treatments such as thinning, activity fuel treatments, and/or prescribed underburns outside the primary shade zone[1] when it is determined that such activities can benefit effective shade and***

[1] The primary shade zone is an area along a perennial stream that provides shade between 10:00 AM and 2:00 PM. The primary shade zone provides shade throughout the day, while the secondary shade zone contributes shade only when the sun is lower in the sky and less able to lead to stream heating. Though the primary shade zone can be substantially affected by stream orientation (the south bank of an east-west flowing stream is more critical than the north bank), the following table is useful in helping define the primary shade zone based solely on tree height and slope.

| Height Of Tree | %Hill Slope <30 | %Hill Slope 30 to 60 | %Hill Slope >60 |
|---|---|---|---|
| Trees < 20 feet | 12' buffer | 14' buffer | 15' buffer |
| Trees 21 to 60 feet | 28' buffer | 33' buffer | 55' buffer |
| Trees 61 to 100 feet | 50' buffer | 50' buffer | 60' buffer |
| Trees 100 to 140 feet | 70' buffer | 75' buffer | 80' buffer |

***other riparian functions over the long term (USDA/USDI, 2010). Such treatments are recommended when:***

***Vegetation density is high and stand health and structure will benefit from thinning and/or underburning.***

***Vegetation and fuel conditions are contributing to an increased risk of stand replacement fire.***

***Long-term bank stability and sediment delivery would not be, measurably increased as determined by interdisciplinary site-specific evaluations.***

***Treatments within the primary shade zone such as thinning and prescribed fire may be considered when the above criteria apply and when a site specific analysis of the spatial and temporal extent of the treatment shows no risk of temperature increases to listed streams or downstream beneficial uses, and where bank stability, wood recruitment and other riparian functions would be maintained or restored in the long-term.***

- ***For intermittent streams, apply silvicultural treatments such as thinning, activity fuel treatments, and/or prescribed underburns within these Riparian Reserves when it is determined that such activities can benefit the long-term objectives of the land allocation. Variable-width, no treatment buffers would be applied where stream bank, bed, or adjacent upslope stability is a concern, and to prevent sediment delivery associated with logging-caused ground disturbance. The size of such no treatment buffers should be prescribed based on site-specific conditions and in the context of the proposed silvicultural prescription and logging system. Where overall channel stability and sediment delivery are verified not to be a concern, maximizing the amount of restorative treatment and lowering the long-term hazard of stand-replacement fire along streams is the desired outcome.***

## Unique Habitat Buffers

The Umpqua National Forest Land and Resource Management Plan (LRMP) provides direction for protection of unique habitats (USDA 1990b). Prescription C5-I (pg 200-201) applies to the management of unique habitats (1 to 75 acres) and their perimeters such as natural meadows, rock outcrops, talus slopes, or other natural openings with high wildlife values. Prescription C5-III (pg 202-203) applies to fairly large areas (75+ acres) of land with high wildlife value; it concentrates on maintaining the unique components of these mosaic habitats. Mosaics generally are intermixtures of forest openings and conifers.

Under the LRMP, timber harvest within 150 feet of inventoried openings is not permitted. Nor is salvage permitted except where removal of timber killed by catastrophic events such as windthrow, wildfire, drought or severe disease infestation would not further adversely impact wildlife habitat values. In addition, road construction activities should not occur within the unique habitat but are permissible when the road is vital to the implementation of the LRMP and no acceptable alternatives are available. In these cases roads will be designed to minimize the amount of area disturbed (USDA 1990b).

In conjunction with watershed analysis and project planning in the watershed, intensive field inventories of all unique habitats are conducted. Site-specific analysis and individual prescriptions for unique habitats are developed and included in project EAs.

The WA uses the terms “core zone” and “zone of influence” for buffer widths. These terms are not mentioned in the LRMP, nor are they consistent with the buffers required in the LRMP for

unique habitats. The site specific analysis of unique habitats eliminates the need for 'core zone' and 'zone of influence' requirements in the watershed analysis.

The Forest Plan calls for no harvest of timber within 150 feet of unique habitats. This prescription is not always desirable for dry unique habitats which have encountered conifer encroachment and may benefit from treatments within the 150 foot buffer. If needed, a Forest Plan amendment will be written in the environmental document to address any changes discovered during inventories of the unique habitat.

While inventories and prescriptions are required, the methodology and buffer widths in the original WA recommendations are not consistent with the forest plan:

- *In conjunction with watershed analysis and project planning in a WAA, conduct intensive field inventory of all special and unique habitats. Follow inventory procedures developed and outline in (Appendix CC). (pg 223)*

- *Site-specific analysis and prescription for protection and recovery of unique habitats will be developed by district wildlife biologist and botanist team, and include in project EAs. Analysis will include core zone and zone of influence. (pg 223)*

- *Defer timber harvest or road construction activities within core zone, as described in Table 62, unless determined to benefit unique habitat. (pg 223)*

- *For timber harvest within influence zones of unique habitats, minimize risk of impact to unique habitat values as described in Table 62. (pg 223)*

- *Complete intensive field inventory of all special habitats, in conjunction with watershed analysis and project planning in a WAA[2]. [2] Inventory will follow procedures developed and outline in RLMP supplement Appendix XZ (Willamette National Forest Special Habitat Management Guide pp 19-30. (pg 225)*

- *Biologist and botanist team should develop site specific analysis and prescriptions for protection and recovery of habitats for project EAs. Analysis will included identification of core zone, zone of influence, site specific environmental factors controlling the habitat and wildlife use patterns or structures necessary for wildlife habitat within the unique habitat and its zone of influence. (pg 225)*

The original recommendations listed above for the management of unique habitats in the Jackson Creek Watershed are replaced with the recommendations below to follow LRMP direction.

- ***In conjunction with watershed analysis and project planning in the Jackson Creek watershed, conduct field inventory of all unique habitats.***

- ***Site-specific analysis and prescriptions for unique habitats will be developed and included in project-level environmental analyses, such as EAs.***

## Amphibian Breeding Pond Buffers

- *In addition to 300 foot buffer around ponds/lakes, when these habitats are used for breeding ponds for amphibians, maintain an additional 400 feet width of closed forest (>70% canopy closure), with down wood exceeding minimum levels averaged in DFC's described in chapter 6. (pg 224)*

The Jackson Creek WA uses the terms "core zone and "zone of influence" for buffer widths, and recommends minimum sizes for these in a table on pg.224. These terms are not used in the LRMP, nor are they consistent with the buffers required in the LRMP for ponds. It also recommends that prescriptions should be written on a site specific basis, which precludes the need for core zone and zone of influence requirements. This recommendation is also not consistent with Riparian Reserve buffer widths in the NWFP, for meeting ACS objectives.

The above recommendation for pond buffers should be revised with:

**In conjunction with watershed analysis and project planning in the Jackson Creek Watershed, conduct field inventory of ponds.**

**Site-specific analysis and prescriptions for ponds will be developed in the project EAs.**

## Red Tree Vole

In January 2006, Judge Pechman set aside the 2004 Record of Decision and reinstated the January 2001 Record of Decision including any amendments or modifications to the 2001 ROD that were in effect as of March 2004. On October 2006, the court modified the January 2006 injunction to provide relief to the federal agencies; it allowed for four exemptions to the Survey and Manage mitigation measure. Judge Pechman's Order directs: "Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:

A. Thinning projects in stands younger than 80 years old;

B. Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;

C. Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions; and

D. The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old under subparagraph a. of this paragraph."

Survey and Manage protocol has been in flux since its implementation. Currently, the following recommendation from the Jackson Creek WA proposes surveys in all stands even those less than 80 years of age which is not the current protocol for this Survey and Manage species.

- *Complete R6 Timber Stand Exams in all stands, prior to project design within, incorporating parameters outlined in PNW GTR-302 Huff et. Al. 1992, to allow evaluation of suitable habitat for the red tree vole (pg 225).*

Based on the need to comply with current Survey and Management direction, the previous recommendation is replaced with the following:

- ***All projects will be required to comply with current Survey and Management guidelines and/or management direction.***

## Snags and Down Wood

There are several sources of management direction for snags and down wood in the Jackson Creek watershed. These include the Umpqua NF LRMP (USDA 1990), which was amended by the Northwest Forest Plan (USDA/USDI 1994), a watershed analysis and a late-successional reserve assessment. The following discussion attempts to consolidate and summarize this information.

Forest plan standard and guidelines and management area prescriptions were considered "mitigation measures" as discussed in the 1990 FEIS for the LRMP (USDA 1990, II-23). The mitigation measures in the FEIS were designed to provide a continuous supply of snags through time as well as providing snags on harvest areas in conjunction with timber harvest activities (USDA 1990, IV-78). The standards and guidelines and management area prescriptions for snags and down wood in the LRMP include:

> Wildlife S&G 1 - Woody material to provide wildlife cover will be retained on 10 percent of the area of all regeneration harvest units (D-22).
>
> Wildlife S&G 2 - Down, dead woody material (20 feet or more in length) and a minimum of 12 inches in diameter at the small end) will be left at the rate of two per acre on each unit that is regeneration harvested. Additional material will be left when logs have little or no commercial value and do not produce an unacceptable fire hazard (D-22).
>
> Wildlife S&G 18 - When possible, wildlife trees (snags and green culls) will be left standing in areas of timber harvest. This habitat will be in addition to that provided by implementing the snag habitat prescriptions (D-23).
>
> Management Area 10 - Focus is to produce timber on a cost-efficient sustainable basis consistent with other resource objectives for wildlife habitat, riparian habitat and water quality, visual quality, and recreation. Adequate snag habitat must be provided in this management area to meet the 60 percent potential population capability (PPC) for cavity nesters (FEIS IV-128).

Modifications for snag habitat prescriptions (and down wood) were provided by the Northwest Forest Plan (1994), which led to watershed analyses and the South Cascades LSR assessment (USDA/USDI 1998). The Jackson Creek watershed analysis provides site-specific information on snags and down wood. These modifications were based on site specific information and the latest scientific information of that time.

More recently, a new source for scientific information and management guidance on snags and down wood has become available. DecAID[2] (Mellen et al.) is a summary of the current

[2] DecAID is a statistical summary of published research data on wildlife and forest inventory data and of professional knowledge on fungi, insects, and pathogens of trees. It is used to help identify snag sized and densities (number of snags/acre, and down wood diameter and percent cover that pertains to wildlife usage.

knowledge and best available data on dead wood in Pacific Northwest ecosystems. The DecAID Advisor is a planning tool intended to advise and guide managers as they conserve and manage snags, partially dead trees, and down wood for biodiversity.

The 1995 Jackson Creek WA (pages 204-216) provides specific CWD levels designed to meet the Desired Future Condition (DFC) of each drainage within the watershed. Recommendations that rely on one or two specific quantities for snag or log retention on a per acre basis across a large landscape are too restrictive given the variable nature of CWD. New methods have emerged that follow NWFP direction to use analytical tools such as snag recruitment models. The following recommendations from the 1995 Jackson Creek WA are obsolete:

- *Manage stands to provide, at least, the snag and down woody debris amounts described in the Described Future Condition. (pg 223).*

- *In addition to 300 foot buffer around ponds/lakes, when these habitats are used for breeding ponds for amphibians, maintain an additional 400 feet width of closed forest (>70% canopy closure), with down wood exceeding minimum levels averaged in DFC's described in chapter 6. (pg 224)*

Based on new research and the on-going improvement of wood and snag modeling tools, the following recommendation replaces all other previous snag and down wood recommendations in the Watershed Analysis:

- ***CWD inventory and/or stand exam data from the natural (unmanaged) landscape strata and information from DecAID (or other model based on the best available science) should be used to provide reference data for appropriate levels of CWD.***

## Peak Flows and Hydrologic Recovery

The forest canopy influences snow accumulation, distribution and melting rates. In the transient snow zone warm rain can follow a snow storm causing rapid snowmelt. Activities which remove canopy may increase peak flows; this effect increases as peak recurrence interval decreases, watershed size decreases, or as more canopy is removed. In 1995, it was estimated that nearly 40% of the watershed had been harvested to some extent. The Umpqua LRMP requires an analysis of forest canopy conditions (Watershed Cumulative Effects and Water Quality Standard and Guideline 4) if 25% or more of a watershed would have canopy removed after a proposed project. Peak flows will be analyzed utilizing the Hydrologic Recovery Percentage (HRP) (USDA 1990a) or similar procedure to calculate the hydrologic condition of the project area. If analysis identifies that the planned management activities could reduce canopy enough to affect peak flows, the potential cumulative effects of increased peak flows will be displayed and evaluated. Since the end of clear-cutting on Forest Service land in the mid-1990's, most units have recovered enough canopy that they are no longer affecting peak flow.

Current science suggests that where present, the effects of increased peak flow on channels, are confined to stream reaches where channel gradients are less than approximately 2% or streambeds are composed of gravel and finer material. Potential peak flow effects on channels can be confidently excluded in high-gradient (slopes >10%) which tend to be well-armored, and bedrock reaches, and are likely to be minor in most step-pool systems. On the other hand, if

channels are gravel or sand-bedded, a more detailed hydrologic and geomorphic analysis is warranted (Grant et al. 2008). Earthflow streams have finer substrate than non-earthflow streams of equal gradient, and are more likely to experience increased fluvial erosion due to greater peak flows. Portions of the main stem of Jackson and lower Beaver Creek are the only streams with gradients of two percent or less within the Jackson Creek watershed. .

Based on the best available science, recovery of most of the canopy removed during past clearcutting, and the LRMP requirement to conduct a HRP analysis at the project level for activities that reduce canopy, the following WA recommendations are deleted:

- *North Side Jackson Creek – In WAA C, conduct timber harvest activities only in stands with >70% canopy closure. In stands where timber harvest is conducted, do not reduce canopy closure below 70% as measure by Moosehorn. This threshold should be observed until aquatic desired future conditions are met. One exception to this recommended constraint is restoration of the Oak woodland in T31S, R1E, section 3. (pg 231)*

- *LSR – In portion of WAA E that lies outside of the LSR boundary, conduct timber harvest activities only in stands with > 70% canopy closure. In stands where timber harvest is conducted, do not reduce canopy closure below 70% as measure by Moosehorn. This threshold should be observed until aquatic desired future conditions are being met. (pg 232)*

## Road Construction

The Forest Service Manual (FSM) directs that Best Management Practices (BMPs) will be used to control nonpoint source pollution on all management actions on NFS lands with the potential to affect water quality (FSM 2532). An Umpqua Forest-Scale Roads Analysis (USDA 2003) evaluated access issues for key road systems across the Forest and recommended further evaluations at the watershed and project scales, as needed. The road analysis document acknowledges that roads can affect water quality and the beneficial uses of water. The recommendation states that "whenever road reconstruction and new road construction activities are planned, document whether water quality standards are met downslope and downstream. Plan measures to protect and improve water quality using best management practices, document those measures, and make a finding that water quality standards will be met per the Umpqua Forest Standards and Guidelines."

The following recommendation from the Jackson Creek WA below:

- *Beaver Creek – Defer all road construction until aquatic conditions recover as stated in aquatic DFCs. (pg 229)*

Is further clarified and refined to include current management requirements to protect water quality:

- ***The road density in this drainage is high, so new permanent road construction should be limited and there should be no net increases in permanent road construction in the Beaver Creek drainage. New and temporary road construction will have adequate design criteria and Best Management Practices (BMPs) to avert detrimental impacts to aquatic habitats.***

# References:


Bailey, J. & J. Tappeiner (1998) Effects of thinning on structural development in 40- to 100-year-old Douglas-fir stands in western Oregon. *Forest Ecology and Management,* 108**,** 99-113.

Chan, S. S., D. J. Larson, K. G. Maas-Hebner, W. H. Emmingham, S. R. Johnston & D. A. Mikowski (2006) Overstory and understory development in thinned and underplanted in Oregon Coast Range Douglas-fir stands. *NRC Canadian Journal of Forest Resources,* 36**,** 2696-2711.

Davis, L. & K. Puettmann (2007) Overstory Response to Alternative Thinning Treatments in Young Douglas-fir Forests of Western Oregon. *Northwest Science,* 81.

Everett, R., R. Schellhaas, P. Ohlson, D. Spurbeck & D. Keenum (2003) Continuity in fire disturbance between riparian and adjacent sideslop Douglas-fir forest. *Forest Ecology and Management,* 175**,** 31-47.

Garman, S., J. Cissel & J. Mayo. 2003. Accelerating Development of Late-Successional Conditions in Young managed Douglas-Fir Stands: A Simulation Study. ed. U. F. Service. Pacific Northwest Research Station.

Grant, G. E., S. L. Lewis, F. J. Swanson, J. H. Cissel & J. J. McDonnell. 2008. Effects of Forest Practices on Peak Flows and Consequent Channel Response: A State-of-Science Report for Western Oregon and Washington. In *Gen. Tech. Rep. PNW-GTR-760*. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Harrington, C. A., S. D. Roberts & L. C. Brodie. 2005. Tree and understory responses to variable density thinning in western Washington. ed. U. F. Service, 97-106. Pacific Northwest Research Station.

DecAID, the decayed wood advisor for manageing snags, pratially dead trees, and down wood for biodiversity in forests of Washington and Oregon. 1.10, USDA Forest Service, Pacific Norhtwest Region and acific Northwest Research Station; USDI Fish and Wildlife Service, Oregon State Office.

Messier, M., J. Shatford & D. Hibbs (2011) Fire exclusion effects on riparian forest dynamics in southwestern Oregon. *Forest Ecology Management,* 264**,** 60-71.

Olson, D. L. & J. K. Agee (2005) Historical fires in Douglas-fir dominated riparian forests of the southern Cascades, Oregon. *Fire Ecology,* 1.

Peterson, D., M. Johnson, J. Agee, T. Jain, D. McKenzie & E. Reinhardt. 2005. Forest Structure and Fire Hazard in Dry Forests of the Western United States. ed. U. F. Service. Pacific Northwest Research Station.

Powell, D. C., V. A. Rockwell, J. A. Townsely, J. Booser, S. P. Bulkin, T. H. Martin, B. Obedzinski & F. Zensen. 2001. Forest Density Management. ed. USDA. Pacific Northwest Region.

Reeves, G. H., L. E. Benda, K. M. Burnett, P. A. Bisson & J. R. Sedell (1995) A disturbance based ecosystem approach to maintaining and restoring freshwater habitats of evolutionary significantunits of anadromous salmonids in the Pacific Northwest. *American Fisheries Society Symposium,* 17**,** 334-349.

REIC. 1995. Ecosystem Analysis at the Watershed Scale. Federal Guide for Watershed Analysis version 2.2. ed. R. I. E. Committee, 26 pages. Portland, OR.

USDA. 1990a. Standard and Guideline Procedures for Watershed Cumulative Effects and Water Quality., ed. U. N. F. USDA Forest Service. Roseburg, OR: Umpqua National Forest.

---. 1990b. Umpqua National Forest Land and Resource Management Plan and FEIS., ed. P. N. R. USDA Forest Service. Roseburg, OR.: Umpqua National Forest.
---. 1995. Jackson Creek Watershed Analysis. ed. U. N. F. USDA Forest Service.
---. 2003. Umpqua National Forest Roads Analysis Report: Forest Scale. ed. U. N. F. USDA Forest Service. Unpublished.
USDA/USDI. 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl: Standards and Guidelines for Management of Habitat for Late-Successional and Old-growth Forest Related Species within the Range of the Northern Spotted Owl.
---. 1998. South Cascades Late Successional Reserved Assessment. eds. U. F. Service, U. B. o. L. Management & U. F. Wildlife.
---. 2004. Record of Decision Amending Resource Management Plans for Seven BLM Districts and Resource Management Plans for 19 National Forests within the Range of the Northern Spotted Owl; Decision to Clarify Provisions Relating to the Aquatic Conservation Strategy. ed. U. D. o. A. a. U. D. o. Interior. Portland, OR.
---. 2010. Northwest Forest Plan Temperature TMDL Implementation Strategy. ed. U. B. o. L. M. USDA Forest Service.