Water Quality Restoration Plan for the Upper Rogue River Watershed

August 2001

Rogue River National Forest
Prospect Ranger District

The Water Quality Restoration Plan for the Upper Rogue River Watershed has been prepared to fulfill a requirement of Section 303(d) of the Clean Water Act. It is organized according to the direction contained in *Guidance for Developing Water Quality Management Plans That Will Function as TMDLs for Nonpoint Sources, November 1, 1997,* Oregon Department of Environmental Quality Water Quality Division.

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Upper Rogue River Watershed Water Quality Restoration Plan

This plan covers the federal land within the Upper Rogue River watershed, Hydrologic Unit Code 1710030701. The Upper Rogue River watershed contains the origin of the Rogue River at Boundary Springs inside Crater Lake National Park. (See Figures 1 and 2) The watershed is approximately 245,000 acres in size. The Rogue River from its origin to the boundary of the National Forest near Prospect is classified as a national Wild and Scenic River. The river is renowned for the high quality of the water in the river and is not considered water quality limited.

Most (93.8%) of the land within this watershed is federal land managed by either the National Park Service (Crater Lake National Park) or the U.S. Forest Service (Rogue River National Forest). There is a small amount of public land managed by Bureau of Land Management or by the State of Oregon. The remainder is in private ownership that is either corporate timberland or in small individual holdings.

Table 1. Ownership in the Upper Rogue River Watershed.

OWNERSHIP	AREA	OWNERSHIP PERCENT
National Forest	167,599	68.33
National Park	62,618	25.53
BLM	33	0.01
State	96	0.04
Private	14,939	6.09

The watershed ranges in elevation from 2,400 feet near Lost Creek Lake to 8,156 feet on the edge of Crater Lake. Annual precipitation ranges from 40 to 70 inches. Much of the winter season precipitation occurs as snow.

Element 1: Condition Assessment and Problem Description

The Upper Rogue River watershed lies within two distinctly different geologic provinces. Runoff characteristics differ markedly between the two. The east side of the watershed is within the High Cascades geologic province. The dominant feature of this province is the deep deposit of pumice from the eruption of Mt. Mazama some 7,000 years ago. Streams with origins in this deposit exhibit relatively steady flows of cold, clear water. Stream discharge from this portion of the watershed contributes most of the water in the Rogue River. Differences between average high and low flows are in the range of two to three times.

Figure 1. Vicinity map for the Upper Rogue River Watershed.

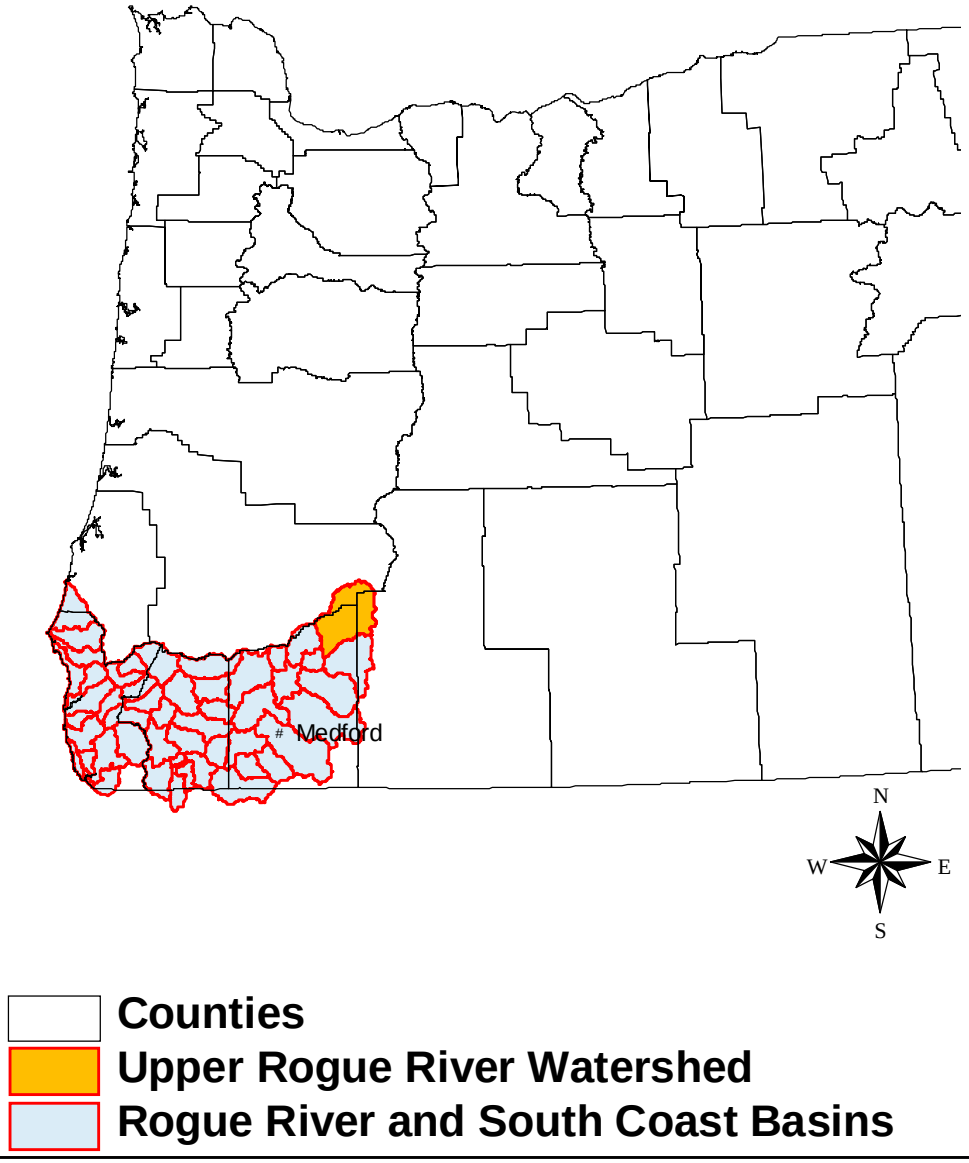
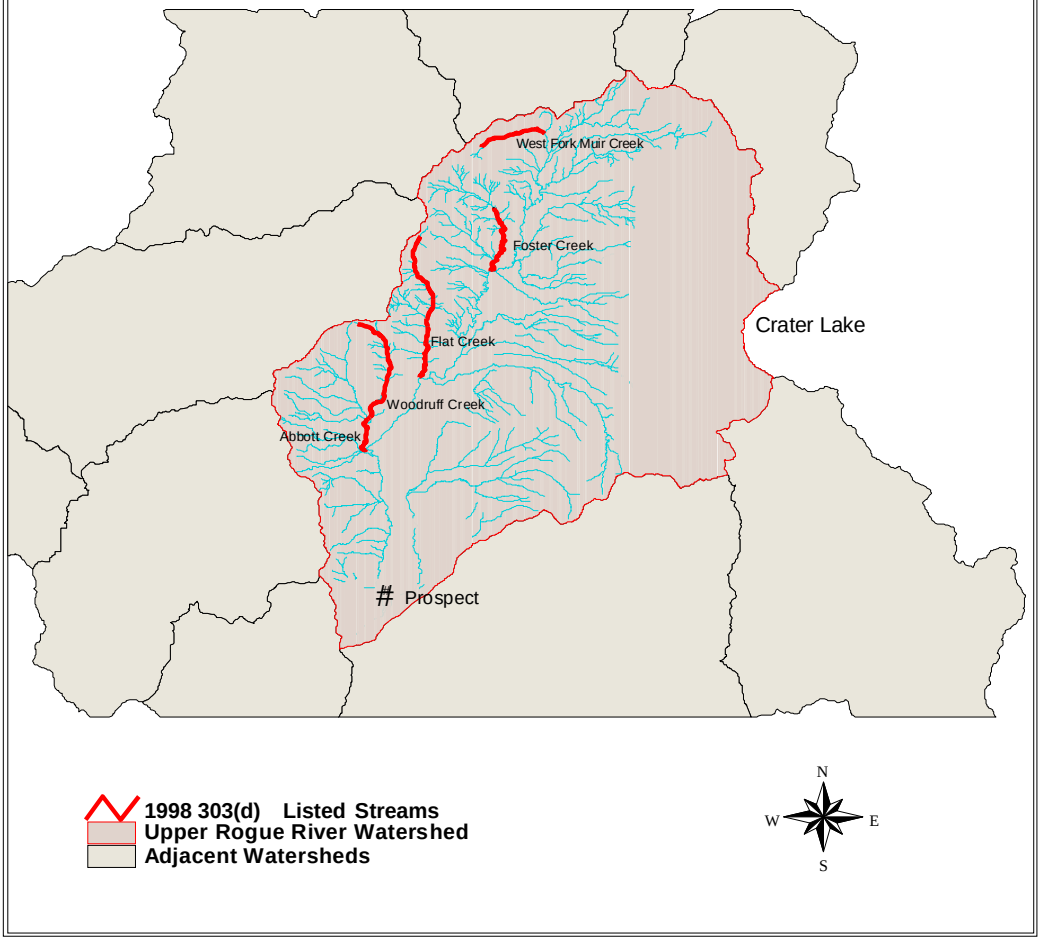


Figure 2. Upper Rogue River Watershed.



The west side of the watershed is within the Western Cascades geologic province. The origins of the soils in this province are in older, volcanic materials. Streams with origins in this province are much more varied in flows between winter and summer with differences between average high and low flows being around ten times. USGS records show that August streamflows as a percent of annual flows are much less in the Western Cascades than in the High Cascades. Average August flows are less than 1% of annual on Elk Creek and are 4-6% of annual on the Rogue River. For a given amount of solar radiation, streams with low flows will have higher temperatures than streams with high flows. Therefore, streams from the Western Cascades will show proportionally higher

temperatures than High Cascade streams. Monitoring has shown that the Western Cascades streams have average high temperatures several degrees higher than streams flowing from the High Cascades.

Table 2 shows a comparison between estimated low flows for the five listed streams and the main stem of the Rogue River near Prospect. The estimates for the listed streams are based on a comparison to flows in Elk Creek that lies in the adjacent watershed to the west. Elk Creek lies within the Western Cascades geology. The five listed streams in the watershed all originate in this province. Due to their low flows in the summer when temperatures are greatest, these streams have little influence on temperatures in the Rogue River with its high summer flows.

Table 2. August discharge comparison for the upper Rogue River Watershed streams[1].

Watershed	Area, Acres	Discharge, CFS
Abbott Creek	11,511	2.53*
Woodruff Creek	4,846	1.07*
Flat Creek	8,501	1.87*
Foster Creek	24,013	5.28*
WF Muir Creek	4,396	0.97*
Rogue above Bybee Cr.	99,840	312
Rogue above Prospect	199,680	443

*Flows estimated by comparing measured discharge in the Elk Creek watershed to characteristics of these five subwatersheds.

Past management activities along streams in the watershed have left a mosaic of vegetation age classes in the riparian areas. As a result of timber harvest, some of the stands of trees are not tall enough to shade the streams adequately. Water flowing through such exposed areas exhibits elevated temperatures as a result of being exposed to solar radiation.

The primary reason for elevated stream temperatures in forest streams is an increase in solar radiation reaching the stream surface following logging or road construction[2,3]. Research has shown that shade-producing vegetation is an effective way to prevent elevated water temperatures. Studies have shown that riparian vegetation up to 100 feet back from the streams is effective in reducing solar radiation (Brazier and Brown[4], Beschta, et. al.[5]

[1] R.L. Moffatt, R.E. Wellman, and J.M. Gordon. Statistical Summaries of Streamflow Data in Oregon: Volume 1 – Monthly and Annual Streamflow, and Flow-Duration Values. U.S. Geological Survey Open-File Report 90-118. Portland, Oregon. 413 pg.

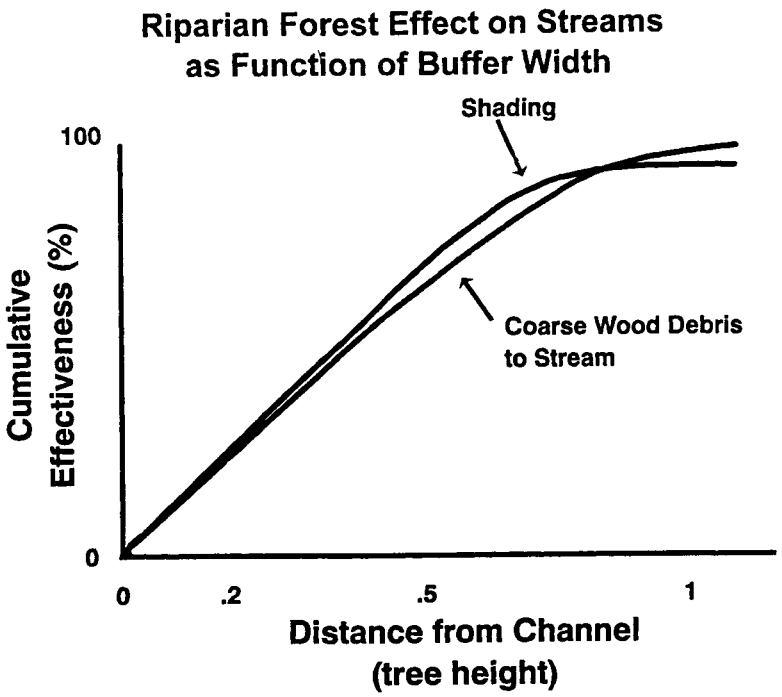
[2] Brown, G.W. and J.T. Krygier. Effects of clearcutting on stream temperature. Water Resources Research 6(4):1133-1140. 1970

[3] Brown, G.W. Forestry and Water Quality. School of Forestry, Oregon State University, Corvallis, OR. 1980.

[4] Brazier, J.R. and G.W. Brown. Buffer strips for temperature control. School of Forestry, Oregon State University, Res. Paper 15. 1972

FEMAT[6]). In theory and in practice, by allowing trees in the riparian areas to grow to their site potential height, streams will be adequately shaded and stream temperatures will decrease. Figure 3 depicts this relationship.

Figure 3.



Generalized curves indicating percent of riparian ecological functions and processes occurring within varying distances from the edge of a forest stand. (Source: FEMAT Figure V-12.)

The Appendix contains charts and a table showing average heights by decade for the riparian reserves along all of the listed streams. These tables show there are currently many different size classes in the riparian reserves. For Woodruff and Foster Creek, the tables show that there will be a portion of the reserves that will always be exposed to direct sunlight. These sections are where the streams run through meadows where there will not be vegetation tall enough to shade the channels.

In addition to being listed for high summer temperatures, Woodruff, Abbott, and Foster Creeks are listed for habitat modification. Information gathered in surveys of each of these streams shows there is a lack of large wood in the channels. The lack of wood resulted in deteriorated conditions in these streams. These streams are located on gentle terrain that has allowed roads to be constructed parallel to the channels. The flat terrain allowed removal of

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[5] Beschta, R.L., R.E. Bilby, G. W. Brown, L.B. Holtby, and T. D. Hofstra. Stream Temperature and Aquatic Habitat: Fisheries and Forestry Interactions. In: Streamside Management – Forestry and Fishery Interactions. University of Washington. 1987.

[6] Forest Ecosystem Management: An Ecological, Economic, and Social Assessment. Report for the Forest Ecosystem Management Assessment Team. 1993.

large logs that were entrained within the channels. At the time of removal, these logs were perceived as being detrimental to the channels. Recruitment of new wood for the channels is dependent on being able to grow large trees in the riparian areas adjacent to the channels. As in the case of growing trees large enough to provide shade, this will be a process that requires many decades of time.

Oregon's Department of Environmental Quality 1998 303(d) list of water quality limited waterbodies includes five streams or stream segments within this watershed. The remaining streams, including the Rogue River, within the watershed are not listed. The five listed streams and the parameters of concern are shown in Table 3.

Table 3. Water quality limited streams in the Upper Rogue River Watershed (Source: 1998 303(d) list)

STREAM	SEGMENT	PARAMETER
Abbott Creek	Mouth to Woodruff Cr.	Habitat Modification
		Summer Temperature
Flat Creek	Mouth to Headwaters	Summer Temperature
Foster Creek	Mouth to Wiley Creek	Habitat Modification
		Summer Temperature
West Fork Muir Creek	Mouth to Headwaters	Summer Temperature
Woodruff Creek	Mouth to Headwaters	Habitat Modification
		Summer Temperature

BENEFICIAL USES AFFECTED: Beneficial uses identified by DEQ for streams in the upper Rogue River Watershed are public and domestic water supply, irrigation, industrial water supply, livestock watering, resident fish and aquatic life, fishing, wildlife, water contact recreation, hydro power.

The reasons that the listed streams exceed water quality standards can be linked directly to management activities on the National Forest as well as to natural conditions. With the exception of West Branch Muir Creek, these streams are relatively flat gradient with roads close by. Logging adjacent to the streams and in their headwaters has removed wood from the channels and opened up the canopies. These activities removed the large wood necessary for channel structure and aquatic habitat. This led to simplified channel morphology and caused the streams to be more exposed to solar radiation. When combined with the naturally occurring summer streamflows, water temperatures increased.

Changes in channel morphology have caused the aquatic habitat to be modified outside of the expected range of conditions for these western Cascade streams. Large wood removal and riparian harvest of large conifers

has greatly reduced the capability of Abbott, Foster, and Woodruff Creeks to produce cutthroat and rainbow trout populations with a diversity of age classes. These streams are lacking the deep pools and complex salmonid rearing habitat required by large trout. Currently large wood is deficient in Abbott Creek, Foster Creek and Woodruff Creek where there is an average of 28 to 31 pieces per mile. It is expected that streams of this size would contain at least 50 pieces of wood per mile. The apparent lack of channel roughness in these channels has adversely affected the number and quality of pools available for rearing salmonids. Quality pools either have a depth greater than three feet; contain large wood complexes or uncut banks that provide overhead cover for salmonids, or both. Currently the average number of quality pools in these three streams ranges from 8 to 10 pools per mile. It is expected that in streams of this size, where wetted stream widths range from 11 feet to 23 feet in width, pools would occur at a frequency of 15 to 40 pools per mile. The numbers of pools per mile translate to pool/riffle ratios that are percentage expressions of the surficial area of pools and riffles in the streams. The low ratios shown in the current condition are indicative of the degraded conditions following removal of streamside trees and roading close to the channels. Table 4 summarizes current and desired aquatic habitat conditions for Abbott, Foster, and Woodruff Creeks.

Table 4. Current and desired aquatic habitat conditions for listed streams in the Upper Rogue River Watershed.

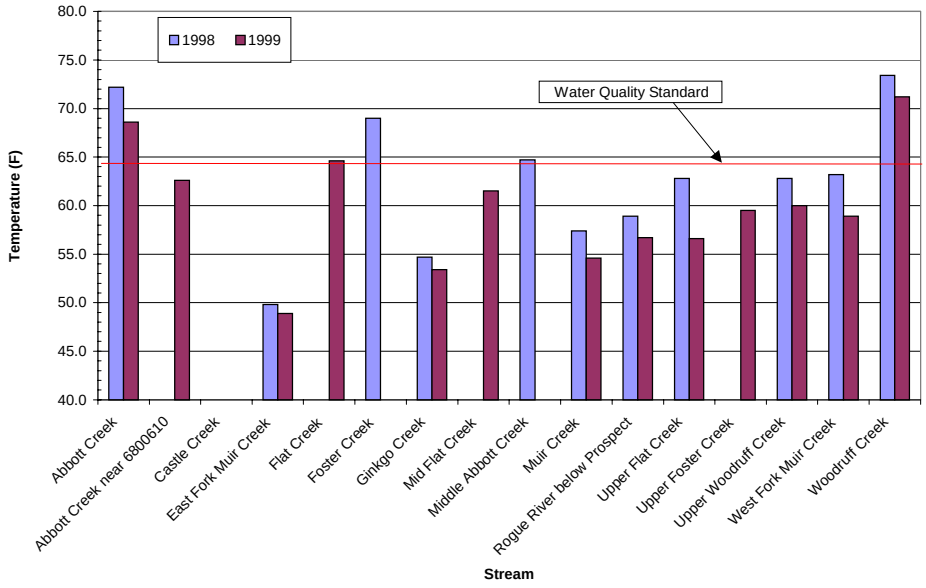
Stream	Current Pieces of Large Wood/mile	Desired Pieces of Large Wood/Mile	Current Pool/Riffle Ratio, %	Desired Pool/Riffle Ratio, %	Years to Reach Potential
Abbott Creek	29	50	26/74	35/65	200-250 years
Foster Creek	31	50	9/91	35/65	200-250 years
Woodruff Creek	28	50	12/88	35/65	200-250 years

Causal activities in the subwatershed for West Fork Muir Creek are different than for other listed streams. West Fork arises in the Rogue-Umpqua Divide Wilderness were there has been no logging or road construction to contribute to the elevated stream temperatures. The activity that led to the water quality concern is grazing by both domestic livestock and native wildlife in the meadows along the stream. However, it is doubtful whether grazing by native wildlife alone would have caused the degradation of the meadows and streams. Heavy grazing removed streamside vegetation, widened the channel, and allowed for increased stream temperatures. Revisions in grazing practices contained in the Rogue River National Forest's Alkali Allotment Management Plan have resulted in less intense grazing along the

stream. Recent monitoring indicates that streamside vegetation is recovering and temperatures are lowering to levels that meet the state water quality standards.

Figure 4 below shows the results of stream temperature monitoring in the watershed in 1998 and 1999. Note that West Fork Muir Creek has met the stream temperature standards for both of these years.

Figure 4. Highest Seven-Day Moving Average of the Daily Maximum Stream Temperatures in the Upper Rogue River Watershed



The five streams of concern are all tributary to the Rogue River. The river itself meets all water quality standards. In fact, the quality of the river is one of the Outstandingly Remarkable Values that led to the River being designated as a Wild and Scenic River.

Element 2: Goals and Objectives

All recovery goals and plans are strongly linked to the philosophy of maintaining those components of the ecosystem that are currently functioning (protective management) and improving those sites that show the greatest potential in the shortest time frame (restorative management). This philosophy maximizes recovery while minimizing expensive, extensive, and risky restoration treatments.

The goal for this watershed is to meet water quality standards by implementing appropriate management. These practices, as displayed in the Rogue River National Forest Land and Resource Management Plan[7] and

[7] USDA Forest Service. Land and Resource Management Plan: Rogue River National Forest. 1990.

amended by the Northwest Forest Plan[8], will provide for recovery of the streams to the desired conditions as identified for the Rogue River Basin under Oregon Administrative Rules (OAR) 340-41-362, "Rogue River Basin Designated Beneficial Uses". Paramount to recovery is adherence to the standards and Guidelines of the NWFP to meet the Aquatic Conservation Strategy. This includes protection and culture of riparian areas as reserves and, although there are no specific plans to do so, could include some silvicultural work to reach vegetative potential most rapidly. Placement of large trees in streams to improve aquatic habitat may be beneficial where there exists favorable channel and riparian conditions.

Specifically, the goals for this watershed are:

1) Manage the areas within one to two tree-heights of all streams to benefit the riparian areas including the aquatic habitat. For this watershed, the riparian reserves will be between 156 and 312 feet on each side of the streams. (Protective)

2) Reduce stream temperatures on the listed streams to their natural potential within their natural range of variability. (Protective)

3) Maintain the riparian areas across the watershed so that every stream whether listed or not is at its lowest potential temperature. (Protective)

4) Maintain riparian reserves across the watershed so that every stream will have a sufficient supply of large wood for channel maintenance into the future. (Protective)

5) Improve aquatic habitat through placement of large wood in channels and recovery of riparian vegetation on streambanks. Vegetation will recover by regrowth (passive restoration) and local riparian silviculture work. (Restorative)

Some specific projects planned within the watershed are:

- Decommission roads throughout the watershed to improve drainage, reduce erosion and sediment, and improve wildlife habitat. To date, 128 miles of road in the watershed have been decommissioned, 18.6 miles are approved for decommissioning, and 89 miles are recommended for decommissioning when funding is available. (Restorative. On-Going)

[8] USDA Forest Service and USDI Bureau of Land Management. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl and Standards and Guidelines for Management of Habitat for Late Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. 73 pg + appendices. 1994.

- Accomplish an instream improvement project on Woodruff Creek. This project would reduce the extent of eroding, vertical banks and place large wood and boulders for channel control and habitat improvement in the lower channel. (Restorative. On-Going)

- Instream habitat improvement work on Flat Creek. The work will include placement of large wood in the channel for stabilization and aquatic habitat improvement. (Restorative. On-Going)

- Repair the Flat Creek road 6510 crossing. The culvert at this site was temporarily plugged during the 1997 flood. A portion of the road washed out, but the fill did not fail. The improvement would repair the culvert to allow for fish passage and would stabilize the channel in the vicinity of the road crossing. (Restorative. Summer, 2001)

- Improve the Foster Creek crossing on the 6520 road. This road was damaged during the 1997 flood. The repair will enlarge the culvert size to allow for higher event flows to pass safely under the road. The improved crossing will allow for fish passage. (Restorative. Summer, 2001)

- Recent revisions to range allotment management plans give directions to improve range conditions. Changes depend on the allotment, but include more conservative forage utilization standards in riparian areas, reduction in number of cattle, better movement of cattle through the allotments, and increased monitoring. (Protective. On-Going)

- A new trail system for off-highway vehicles is being constructed on a portion of the watershed. Consideration of soil and water conditions has resulted in modification of the trail design or its location in a number of places. Some examples of design changes are requiring additional drainage, constructing the trail with a raised tread to prevent excessive soil disturbance, and use of different erosion control structures than would be required in different conditions. There is extensive monitoring of soil and water resources along the entire trail system planned to keep on top of conditions that could degrade water quality. (Protective. On-Going)

Element 3: Proposed Management Measures

As is specified in the Aquatic Conservation Strategy (ACS) of the Northwest Forest Plan, all streams in the watershed will be buffered by riparian reserves on each side of the streams. The width of the reserves is determined from the ACS guidelines. The reserve width for the fish-bearing streams in the Upper Rogue River Watershed is 312 feet on each side of the stream. For non-fish-bearing streams the Riparian Reserves will be 156 feet on each side. Figure 5 shows the distribution of fish within this watershed. The area of land

to be managed as Riparian Reserves under this strategy is 51,450 acres, 21% of the watershed. The Riparian Reserves, along with other Northwest Forest Plan land allocations, are show in Figure 6.

Additionally the following Northwest Forest Plan standards and guidelines will be used to meet the goals of the Upper Rogue Water Quality Restoration Plan.

- Stream Temperature – Shade Component
  - Aquatic Conservation Strategy: B9 – B11, C30
  - Riparian Vegetation: B31
  - Riparian Reserves: B12 to B17, ROD 9
  - Watershed Restoration: B30
- Stream Temperature – Channel Form
  - Aquatic Conservation Strategy: B9 – B11, C30
  - Riparian Vegetation: B31
  - Riparian Reserves: B12 to B17, ROD 9
  - Watershed Restoration: B30
  - Roads: B19, B31 to B33
- Habitat Modification
  - Aquatic Conservation Strategy: B9 – B11, C30
  - Riparian Vegetation: B31
  - Riparian Reserves: B12 to B17, ROD 9
  - Watershed Restoration: B30
  - Roads: B19, B31 to B33
  - Instream Habitat Structures: B31

The riparian reserves are of sufficient width to provide shade for the streams. By using the shade curves from the SHADOW[9] model and the projected height growth of the vegetation in the riparian reserves over time, a prediction of shade recovery over time can be made. Curves depicting this relationship are included in the Appendix. Table 5 shows current conditions for the riparian reserves, potential shade, the time it will take to move potential conditions to full recovery, and interim recovery targets.

MARGIN OF SAFETY

For management of shade producing vegetation in the riparian areas, it is apparent from research that the most effective zone for shade producing vegetation and for future supplies of large wood along streams is within 100 feet (30 M) of the streams (FEMAT, 1993). The minimum width of the riparian areas is 156 feet (48 M). There is an adequate margin of safety within the riparian reserves to provide for maintenance of stream temperatures.

[9] USDA Forest Service. SHADOW. Stream Temperature Management Program. Version 2.3. February 1993.

Figure 5. Distribution of fish in the Upper Rogue River Watershed.

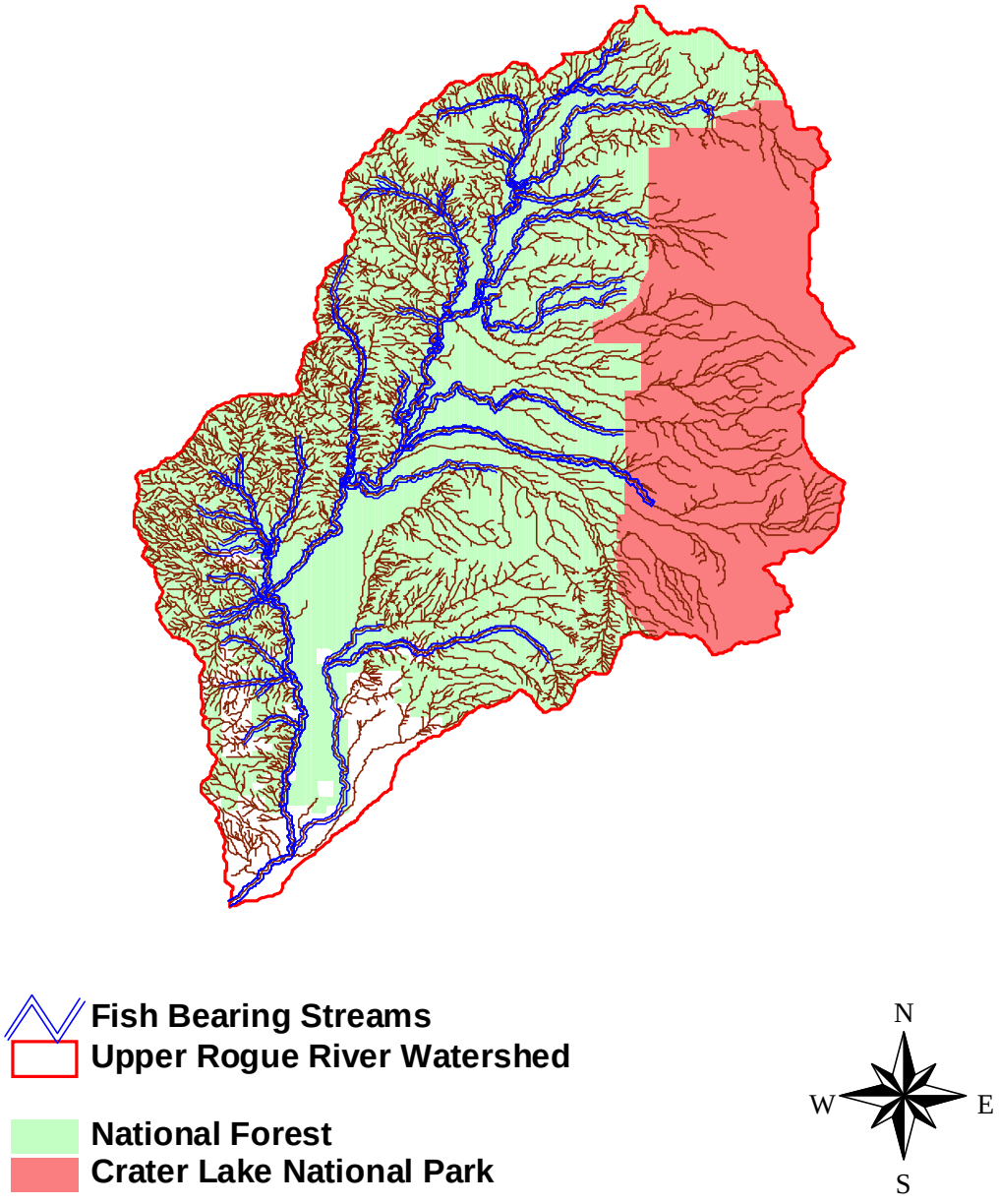
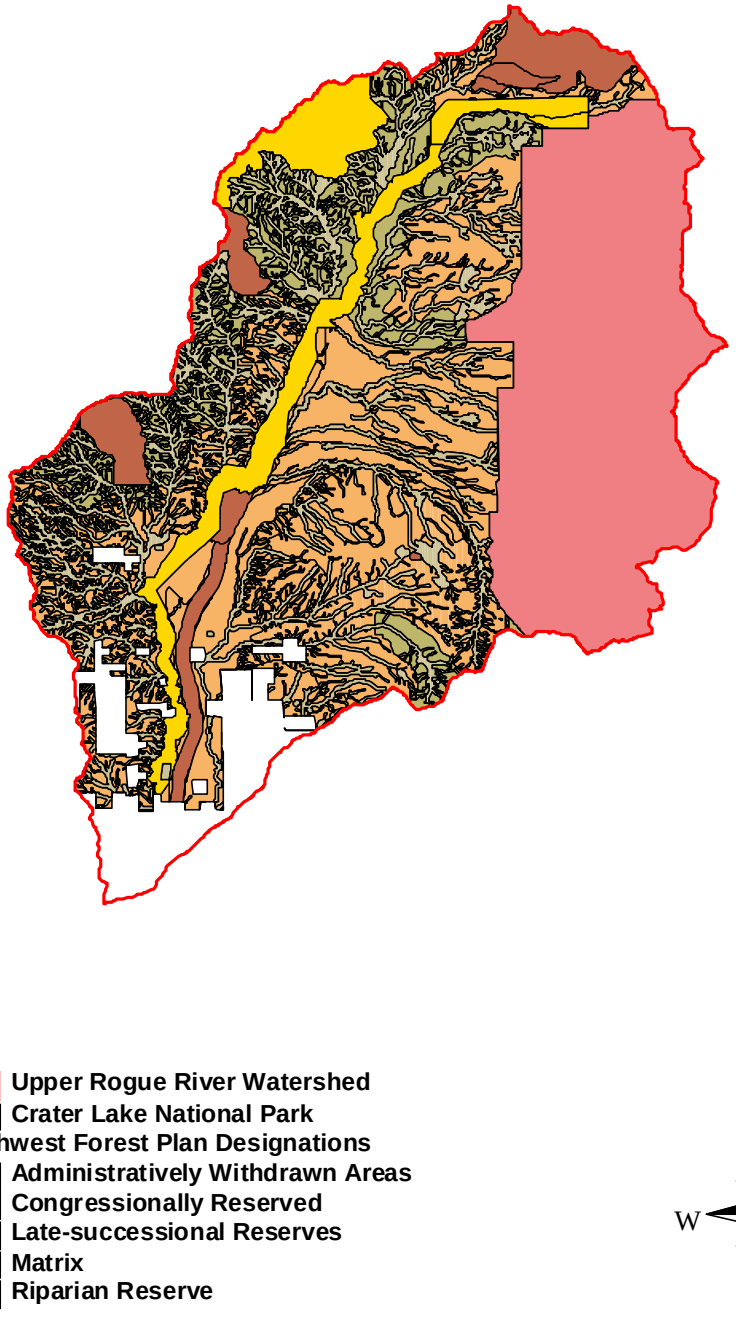


Figure 6. Northwest Forest Plan designations for the Rogue River National Forest in the Upper Rogue River Watershed.



Element 4: Timeline for Implementation

The major provisions of this plan have already been implemented. When the Land and Resource Management plan for the Rogue River National Forest became effective in 1990, riparian areas along all perennial streams were dedicated to water quality and riparian habitat. Then when the Northwest Forest Plan was implemented in 1994, additional area along all streams, not just perennial, was dedicated to improving aquatic and riparian area habitat. Guidance provided by these two plans governs land management on the federal lands within the watershed.

Specific activities designed to improve conditions on the ground will require analysis under the National Environmental Policy Act. The timing for implementation of those activities is dependent on funding levels.

Stream temperature and habitat modification recovery is largely dependent on vegetation recovery. Actions implemented now will not begin to show returns in terms of reduced stream temperatures or improved aquatic habitat for a number of years. Full recovery of these conditions, as shown in Tables 4 and 5, will not occur for many decades. Stream temperatures will begin to decline and will recover before the riparian areas reach their maximum potentials. In some cases, such as along both Foster Creek and Woodruff Creek where there are extensive meadows along the stream, temperatures may never decline to where they are within the standards. However, there is room for greatly increased shade along these streams and large improvements in temperature may be realized.

It will take a longer time for aquatic habitat recovery than for shade recovery. Instream conditions will recover only after mature conifers begin to enter the waterways through one of several delivery mechanisms, e.g. blowdown, debris flows down tributary streams and into fish-bearing reaches, and flooding. Tree growth from the current condition of young conifers to mature age conifers will take approximately 200 to 250 years. This will represent full biological recovery of these stream channels, while temperature recovery and stabilization of streambanks will occur earlier.

Finally, the growth of the vegetation was modeled with the assumption that there will be no management activities such as thinning to enhance growth. Once established, trees in the riparian reserves will be allowed to grow unattended. If cultural activities were to occur, the vegetation would grow more quickly and recovery could be accelerated.

Element 5: identification of Responsible Participants

This plan was produced as a joint activity by the Oregon Department of Environmental Quality and the US Forest Service. As the manager of the land where the listed streams are located, the USFS will implement the actions identified in the plan and will be responsible for improved conditions.

The District Ranger for the Prospect Ranger District is the responsible official for implementation of this plan on the National Forest.

Private landowners are not required to follow the specific provisions contained in this plan. However, all federal land managers are subject to the requirements of the Northwest Forest Plan. The Bureau of Land Management and National Park Service can be expected to implement the basic tenets contained here in the management of the riparian reserves on their land.

Table 5. Current conditions and recovery timelines for shade along streams in the Upper Rogue River Watershed.

Stream	Existing Shade % *	Potential Shade %	Difference between Potential and Existing Shade %	Type of Disturbance	Interim Benchmark for Year 2030, % Shade	Years to Reach Potential
Lower Woodruff	**56**	**79**	**23**	**Logging,**	**68**	**130**
Upper Woodruff	**80**	**88**	**8**	**Logging,**	**81**	**130**
Foster Creek	**67**	**75**	**12**	**Logging,**	**70**	**120**
Abbott Creek	**63**	**76**	**13**	**Logging,**	**67**	**120**
West Fork Muir Creek	**61**	**80**	**19**	**Grazing**	**69**	**120**
Lower Flat Creek	**62**	**79**	**17**	**Logging,**	**68**	**120**
Middle Flat Creek	**69**	**81**	**12**	**Logging,**	**73**	**120**
Upper Flat Creek	**68**	**79**	**11**	**Logging,**	**72**	**120**

* Shade is measured as percent of the stream surface shaded by streamside vegetation.

Element 6: Reasonable Assurance of Implementation

The Forest Service is committed under the terms of the Northwest Forest Plan and Rogue River National Forest Land and Resource Management Plan to management of the aquatic resources in a manner that will produce water of acceptable quality. An annual monitoring report documenting

accomplishments in these areas is produced. If monitoring indicates that sufficient progress toward the goals contained in this plan are not being made, the goals and activities will be revisited and changes made as necessary to the action plan to assure attainment of water quality standards.

Element 7: Monitoring and Evaluation

1 *Implementation Monitoring - Riparian Reserve Vegetation Condition*

This Water Quality Restoration Plan will serve as a guidance document, in addition to the Northwest Forest Plan, the Rogue River National Forest Land and Resource Management Plan, and the Upper Rogue River Watershed Analysis, to provide direction to District personnel engaged in project planning. This will insure that the recommendations for riparian treatments are given full consideration at every opportunity.

Also, the Prospect Ranger District will require timber sale administrators (TSO's) to certify that harvest operations have maintained the prescribed riparian reserves. This type of implementation monitoring will occur annually and will continue until water quality standards in the listed segments have been met for at least 5 consecutive years.

2 Implementation Monitoring - Stream Channel Condition

Restoration actions designed to improve stream channel and riparian conditions will be reported as part of the Forest-wide annual monitoring report.

3 Effectiveness Monitoring - Riparian Reserve Vegetation Condition

Guidelines in the Northwest Forest Plan specify that vegetation management activities that occur within the Riparian Reserves must have a goal of improving riparian conditions. Prior to these treatments, the existing level of shade provided by the adjacent riparian stand will be determined. Measurement of crown closure will be made in a manner that can be repeated within the portion of the adjacent stand within one tree height of the stream bank at bank full width. The measurement will occur within the stand, and not be influenced by the opening over the actual stream channel. Immediately after treatment, the shade measurement procedure will be repeated to verify that the treatment met the prescribed goals.

4 Effectiveness Monitoring - Stream Channel Condition

Aerial photo interpretation will be the most efficient means by which to monitor the establishment and development of riparian vegetation in and around stream channels on a large scale. Aerial photos are produced on an irregular schedule. A goal will be to have aerial photos of the riparian areas produced on at least a

decadal basis in order to monitor progress toward the interim and final shade densities.

Changes in average wetted width of treated stream reaches will be monitored by repeated application of the Regional Level II Stream Survey Methodology 5 and 10 years after project implementation (USDA, 1999).

District or contract personnel will complete this part of the monitoring plan. Results will be included in the annual Forest Monitoring Report, which is available from the Supervisor's Office of the Rogue River National Forest.

5 Effectiveness Monitoring - Stream Temperature

The Rogue River National Forest will continue annual monitoring of water temperature throughout the watershed. At a minimum monitoring will continue on the five listed streams until such time as they reach the state standard. Additionally, monitoring will continue on the baseline station on Muir Creek.

Generally, stream temperatures will be monitored from June 1 to September 30 to insure that critical high temperature periods are covered. Measurements will be made with sensors programmed to record hourly samples. Qualified personnel will review raw data and erroneous data due to unit malfunction or other factors will be deleted. Valid data will be processed to compute the 7-day rolling average of daily maximum temperature at each site. The resulting files will be stored in the agency computer system. A summary of the data will be forwarded annually to the Oregon Department of Environmental Quality and provided to the District Ranger.

After the 10th year, the Forest will analyze the stream temperature data that has been collected against the types of activities that have occurred in the watershed and make recommendations as to which activities have been effective, and which have not. At that time, the Forest will re-evaluate this plan and submit any proposed revisions, as well as the results of the data collection and analysis to the Department of Environmental Quality for consideration and concurrence.

Discussion of the results of all monitoring associated with compliance with this plan will be published annually in the Forest Monitoring Report.

Element 8. Public Involvement

Many of the elements that are contained in this plan are derived from existing land use planning documents such as the Rogue River National Forest LRMP the and Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (ROD). These documents received broad based public comment during scoping prior to development of alternatives and during public appeal of both documents. Both documents also received numerous responses to the Draft Environmental Impact Statement that was published for review, prior to

development of the Final Environmental Impact Statement and Record of Decision.

The Oregon Department of Environmental Quality has lead responsibility for creating Total Maximum Daily Loads (TMDLs) and Water Quality Management Plans (WQMP) to address water quality impaired streams in Oregon. This Water Quality Restoration Plan will be provided to DEQ for incorporation into an overall WQMP for the Upper Rogue River Watershed. DEQ has a comprehensive public involvement strategy, which includes informational sessions, mailings, and public hearings. The Forests Service will provide support and participated in this public outreach.

Element 9. Maintenance of Effort Over Time

Recent advancements in technology have made stream temperature monitoring effort much more time efficient. Regular water temperature monitoring by Forest Service personnel on the Prospect Ranger District has been a regular part of the District's watershed program in recent years. The Forest Service is committed to maintenance of these monitoring efforts. Funds are regularly designated specifically for water temperature monitoring and stream surveys.

Element 10. Discussion of Costs and Funding

Implementation of all aspects of this plan involves the collective efforts of personnel from several departments and funding from several programs within the District's total operations. Money for ongoing support of the plan is not likely to be allocated as a separate budget item but will continue to be multi-financed from many sources. It is important to note that many of the specific management practices contained in the plan represent mitigation of existing management activities such as timber harvest, fuels management etc. These practices are not dependent on funds allocated for soil and water improvement.

With the exception of the direct stream temperature monitoring and the stream surveys, most elements of this plan will be implemented through special emphasis within other programs such as vegetation management and monitoring, and regularly scheduled stream surveys. These activities have funding sources that are not tied to the Water Quality Restoration Plan.

Actions specifically necessary to implement the plan include the field monitoring of stream temperature, the processing and storage of computer files, and the writing of management plans and monitoring reports. The cost of these activities is estimated to be between $7,500 and $10,000 per year.

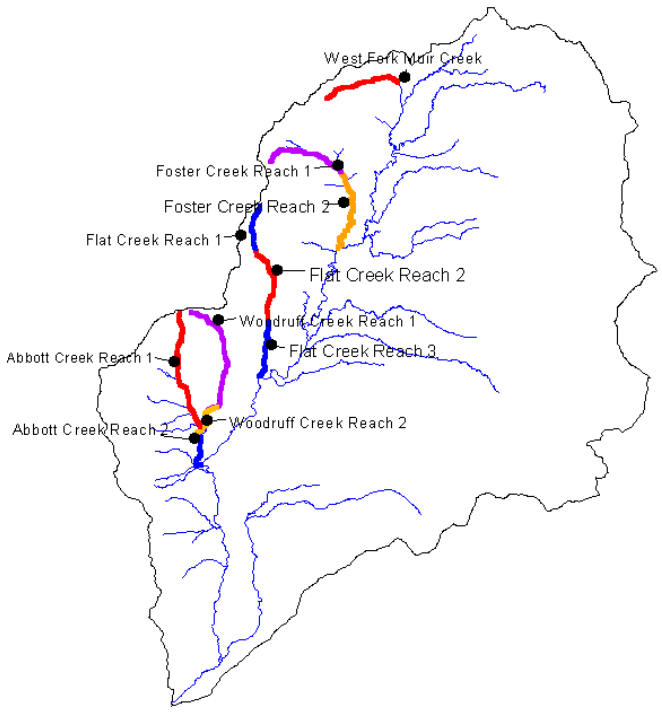
The Rogue River National Forest receives an annual budget allocation specifically for soil and water improvements and operations. While it is not possible to discuss outyear budgeting with any degree of assurance, the amount in recent years has varied between $80,000 and $125,000 for the Forest. This

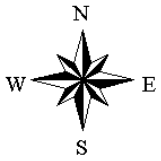
money is available, in addition to funding for the District programs discussed above, to pay for projects aimed at improving water quality or other watershed conditions.

Appendix

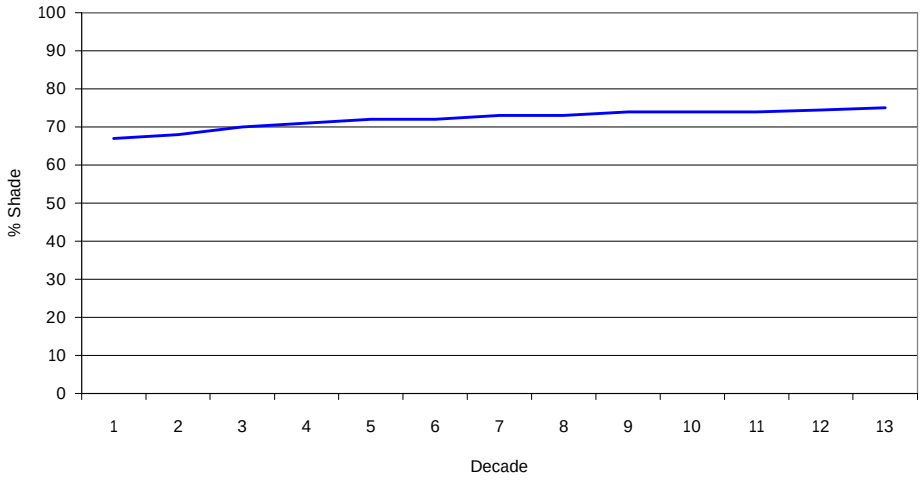
Shade recovery curves and description of Landscape Vegetation Prediction Tool

Upper Rogue River WQMP
Reach Breaks for Shade Calculations

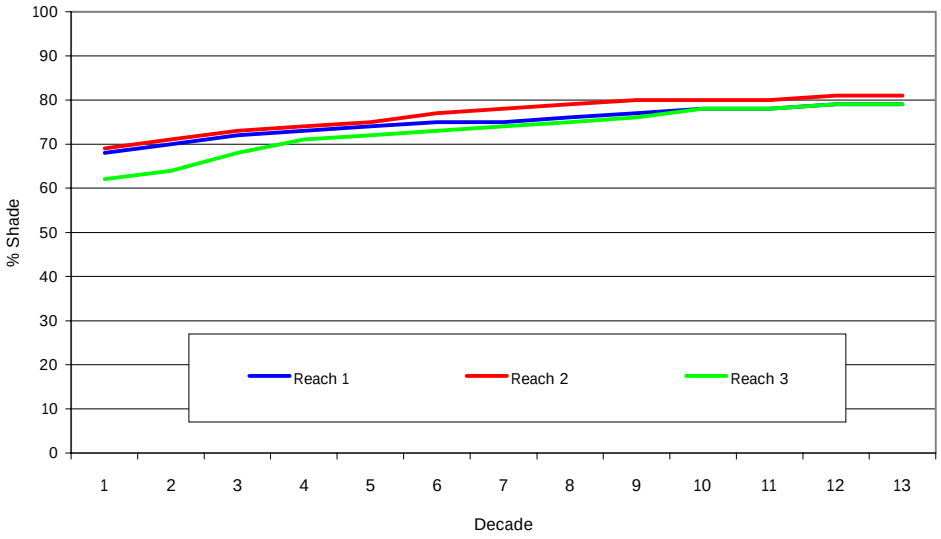




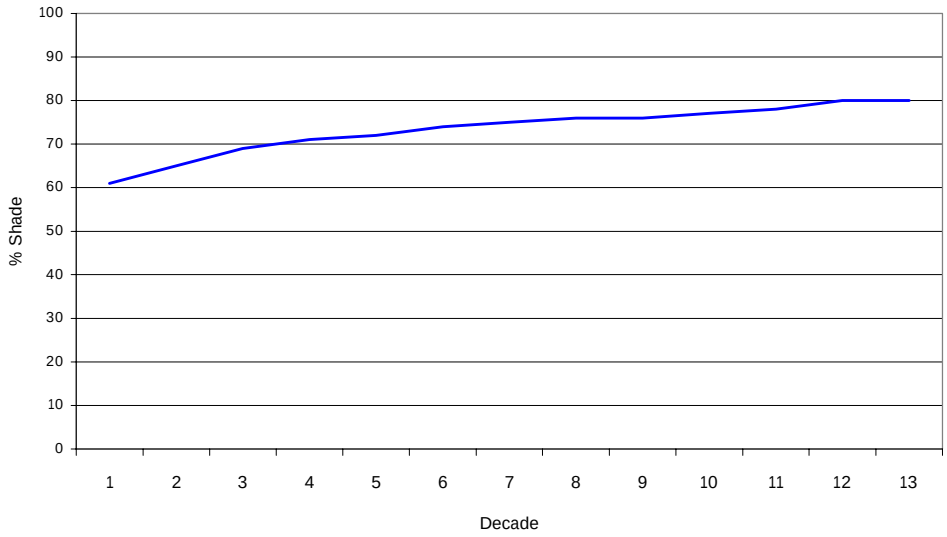
Shade Recovery for Foster Creek Reach 2 (below Wiley Creek)



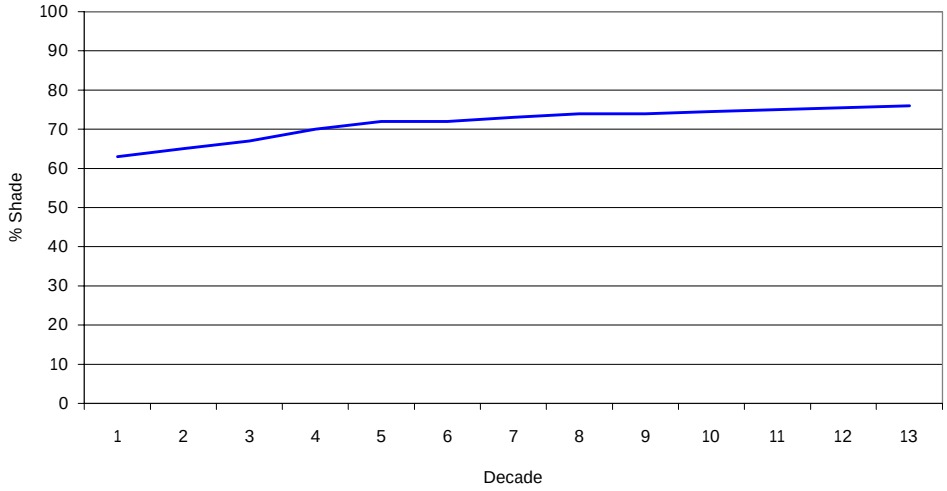
Shade Recovery for Flat Creek

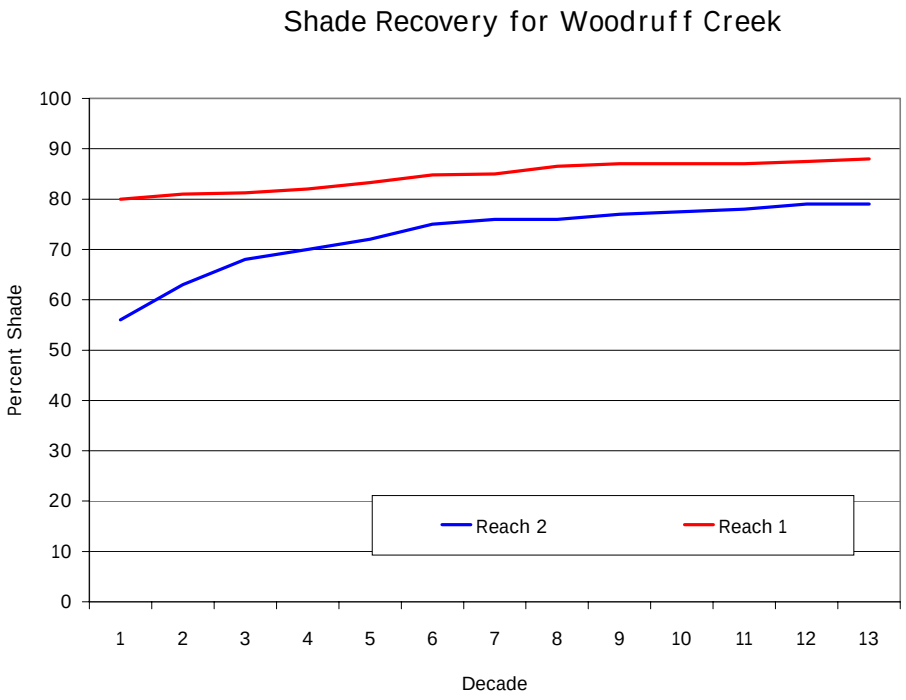


Shade Recovery for West Fork Muir Creek



Shade Recovery for Abbott Creek Reach 2 (below Woodruff Creek)




Shade Recovery for Woodruff Creek
Percent Shade
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
6
7
8
9
10
11
12
13
Decade
Reach 2
Reach 1

Average height and percent shade for all stream reaches modeled.

	Decade	1	2	3	4	5	6	7	8	9	10	11	12	13
West Fork	Avg Ht	90	94	98	101	104	106	108	110	111	113	114	115	115
	% Shade	61	65	69	71	72	74	75	76	76	77	78	80	80
Flat Creek	Height	72	79	85	89	94	98	102	105	109	111	113	115	116
	% Shade	68	70	72	73	74	75	75	76	77	78	78	79	79
Flat Creek	Height	75	83	90	96	102	107	112	116	120	123	126	128	130
	% Shade	69	71	73	74	75	77	78	79	80	80	80	81	81
Flat Creek	Height	65	75	83	89	96	103	108	113	118	122	125	127	129
	% Shade	62	64	68	71	72	73	74	75	76	78	78	79	79
Foster Cre	Avg. Ht.	87	92	97	101	105	108	111	114	117	119	120	122	123
	% Shade	67	68	70	71	72	72	73	73	74	74	74	75	75
Abbott Cre	Avg. Ht.	67	74	80	86	91	96	99	103	106	108	111	112	114
	% Shade	63	65	67	70	72	72	73	74	74	75	75	76	76
Woodruff (	Height	78	86	92	97	103	108	113	117	120	123	126	128	131
	% Shade	80	81	81	82	83	84	85	86	87	87	87	88	88
Woodruff (	Height	52	62	70	76	83	90	95	99	104	107	110	113	115
	% Shade	56	63	68	70	72	75	76	76	77	78	78	79	79

LANDSCAPE VEGETATION PREDICTION TOOL
12/6/99

Determining the best way to schedule and arrange harvest treatments over a large landscape can be a very complex process when there are numerous or conflicting resource goals to meet, now and in the future. Werner Bruckner and Stan Marshall have developed a tool to help simplify this process. This tool projects vegetation condition over a landscape through time, hence the current name (Landscape Vegetation Prediction Tool – LVPT). The current version of LVPT uses three readily available pieces of information to make its projections:

- Current age histogram (percent of landscape by 10 year age classes based on GIS Vegetation Condition Class Layer).
- Stand prescriptions for all stands in the analysis area. Standard prescription assumptions are made based on Condition Class for stands without a current prescription.
- Vegetation goals for the landscape being analyzed. These goals would include Standards and Guides from the Forest Plan as well as proposed goals that may need to be tested. An example would be exceeding visual regeneration guidelines in order to treat disease areas.

Height and diameter projections are based on the Rogue River National Forest Growth and Yield Tables. Basically, LVPT can be used to show how landscape or stand conditions change over time. Since vegetation condition determines the condition of many other resource values such as wildlife habitat, hydrologic function, visuals, etc., LVPT can be used to analyze and project how well different harvest alternatives will meet a variety of resource objectives through time.

A potential list of LVPT resource analysis opportunities would include but not be limited to the following:

Wildlife Habitat/Range

- Thermal cover
- Forage
- Hiding cover
- Dispersal habitat
- Late seral habitat
- Cumulative effects
- Fragmentation
- Connectivity
- Recovery

Hydrology/Fisheries

- Cumulative effects e.g. equivalent road acres
- Recovery from impacts to Riparian Reserve
- Temperature limited stream recovery

Soils

- Cumulative effects

Socio-economic

- Sustainability
- Timber outputs

Visuals/Recreation

- Foreground retention opening status projection
- Wild and Scenic viewshed
- Wilderness viewshed
- 3-D landscape perspective visualization with tree cover
- Recovery

Botany

- Predict harvest/burning impacts to botanical resources

Engineering

- Road use

Fuels

- Landscape fuels projection
- Treatment prioritization

To date, LVPT has been or is being used to:

- Schedule and arrange harvest entries over a landscape.
- Predict sustainability of harvest alternatives.
- Predict recovery of riparian reserve vegetation for temperature limited streams.
- Project amounts of wildlife habitat such as thermal cover, optimal thermal cover, late seral habitat, and forage.
- Analyze visual management strategy opening status.

Currently, the spreadsheet version of LVPT can do a statistical analysis of the effects of a harvest alternative on resource objectives in a few hours. In order to create maps and do special analysis, the current version of LVPT depends on a manual link to GIS. Dr. John Sessions, OSU Forest Engineering professor has offered to help us adapt state-of-the-art software that he has developed, if we will make a presentation to his graduate students on how we used it. His software would provide a GIS link for our model, give it optimization capabilities and reduce the amount of manual manipulation. This would greatly enhance our spatial analysis and mapping capabilities. We are also working with Dr. Chad Oliver, professor at the University of Washington and his graduate student, Morris Johnson, to possibly provide a link to LMS (Landscape Management System). This is a model that would allow us to create three-dimensional pictures of the landscape with trees for different alternatives for any future point in time.

Even without these upgrades, LVPT can be used to develop and analyze harvest alternatives. The model can save time by eliminating unacceptable alternatives and reduce the amount of area that needs more intensive inventory and detailed prescriptions.

-Stan Marshall-