Chapter 2

Lobster Creek Watershed
Water Quality Management Plan (WQMP)

Prepared by: Oregon Department of Environmental Quality

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Submissions by: Oregon Dept. of Forestry
United Sates Forest Service
Lincoln Timber LLC and The Campbell Group
Lower Rogue Watershed Council

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CHAPTER 1 - INTRODUCTION

This document is intended to describe strategies for how the Lobster Creek Watershed Total Maximum Daily Load (TMDL) will be implemented and, ultimately, achieved. The main body has been prepared by the Oregon Department of Environmental Quality (DEQ) and includes a description of activities, programs, legal authorities, and other measures for which DEQ and the subbasin's designated management agencies (DMAs) have regulatory responsibilities. This Water Quality Management Plan (WQMP) is the overall framework describing the management efforts to implement the Lobster Creek Watershed TMDL. Appended to this document are DMA-specific Implementation Plans which describe each DMA's existing or planned efforts to implement their portion of the TMDL. This relationship is presented schematically in **Figure 1**, below.

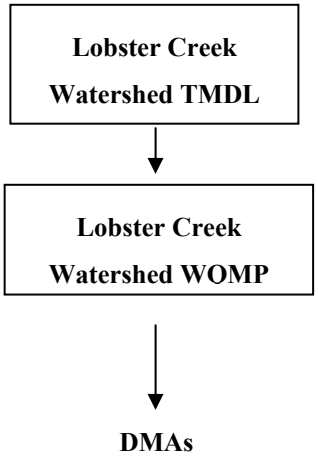


Figure 1 : TMDL/WQMP/Implementation Plan Schematic

The DMAs named in the Lobster Creek Watershed TMDL have submitted preliminary Implementation Plans that are appended to this document. In addition, the USFS, private timber partners, and the Lower Rogue Watershed Council have also participated in the development of the watershed WQMP. Although not identified as formal DMA's these entities have been actively involved in assessment and action planning. These Implementation Plans, when complete, are expected to fully describe DMA efforts to achieve their appropriate allocations, and ultimately, water quality standards. Since the DMAs will require some time to fully develop these Implementation Plans once the TMDL are finalized, the first iteration of the Implementation Plans are not expected to completely describe management efforts.

DEQ recognizes that TMDL implementation is critical to the attainment of water quality standards. Additionally, the support of DMAs in TMDL implementation is essential. In instances where DEQ has no direct authority for implementation, it will work with DMAs on implementation to ensure attainment of the TMDL allocations and, ultimately, water quality standards. Where DEQ has direct authority, it will use that authority to ensure attainment of the TMDL allocations (and water quality standards).

This document is the first iteration of the WQMP for the Lobster Creek Watershed TMDL. As explained in "Element 6" of this document, DMA-specific Implementation Plans will be more fully developed once the current TMDL are submitted to the U. S. Environmental Protection Agency (EPA) and approved. This WQMP will establish proposed timelines (following final TMDL approval) to develop full Implementation Plans. DEQ and the DMAs will work cooperatively in the development of the TMDL Implementation Plans and DEQ will assure that the plans adequately address the elements described below under "TMDL Water Quality Management Plan Guidance".

Adaptive Management

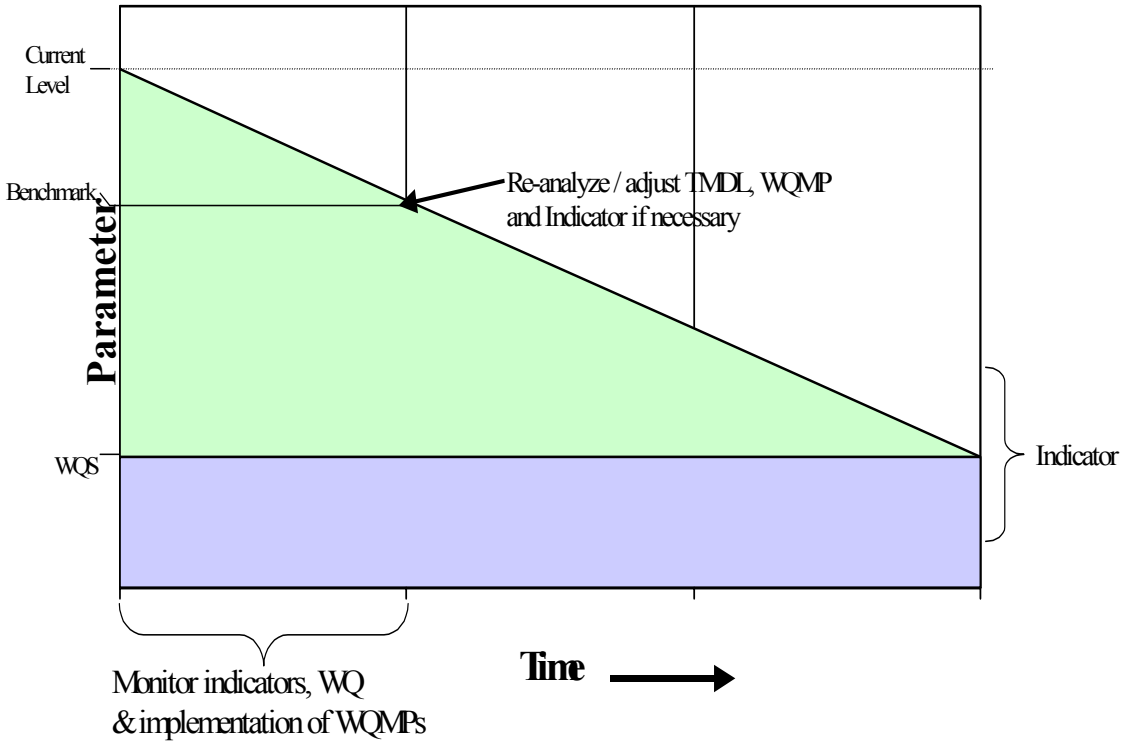
The goal of the Clean Water Act and associated Oregon Administrative Rules (OARs) is that water quality standards shall be met or that all feasible steps will be taken towards achieving the highest quality water attainable. This is a long-term goal in many watersheds, particularly where non-point sources are the main concern. To achieve this goal, implementation must commence as soon as possible.

TMDLs are numerical loadings that are set to limit pollutant levels such that in-stream water quality standards are met. DEQ recognizes that TMDL are values calculated from mathematical models and other analytical techniques designed to simulate and/or predict very complex physical, chemical and biological processes. Models and techniques are simplifications of these complex processes and, as such, are unlikely to produce an exact prediction of how streams and other waterbodies will respond to the application of various management measures. It is for this reason that the TMDL has been established with a margin of safety.

Figure 2 -

ADAPTIVE MANAGEMENT

(Involves all parties)



WQMPs are plans designed to reduce pollutant loads to meet TMDL. DEQ recognizes that it may take some period of time - from several years to several decades - after full implementation before

management practices identified in a WQMP become fully effective in reducing and controlling pollution. In addition, DEQ recognizes that technology for controlling nonpoint source pollution is, in many cases, in the development stages and will likely take one or more iterations to develop effective techniques. It is possible that after application of all reasonable best management practices, some TMDL or their associated surrogates cannot be achieved as originally established. Figure 2 is a graphical representation of this adaptive management concept.

DEQ also recognizes that, despite the best and most sincere efforts, natural events beyond the control of humans may interfere with or delay attainment of the TMDL and/or its associated surrogates. Such events could be, but are not limited to, disease, floods, fire, insect infestations, disease, and drought.. Wildfire suppression policies of the past 100 years have likely reduced the influence of fire as a natural event effecting riparian shade quality.

In the Lobster Creek Watershed TMDL, pollutant surrogates have been defined as alternative targets for meeting the TMDL for some parameters. The purpose of the surrogates is not to bar or eliminate human access or activity in the basin or its riparian areas. It is the expectation, however, that this WQMP and the associated DMA-specific Implementation Plans will address how human activities will be managed to achieve the surrogates. It is also recognized that full attainment of pollutant surrogates (system potential vegetation, for example) at all locations may not be feasible due to physical, legal or other regulatory constraints. To the extent possible, the Implementation Plans should identify potential constraints, but should also provide the ability to mitigate those constraints should the opportunity arise. For instance, at this time, the existing location of a road or highway may preclude attainment of system potential vegetation due to safety considerations. In the future, however, should the road be expanded or upgraded, consideration should be given to designs that support TMDL load allocations and pollutant surrogates such as system potential vegetation.

If a non-point source that is covered by the TMDL complies with its finalized Implementation Plan or applicable forest practice rules, it will be considered in compliance with the TMDL.

DEQ intends to regularly review progress of this WQMP and the associated Implementation Plans to achieve TMDL. If and when DEQ determines that the WQMP has been fully implemented, that all feasible management practices have reached maximum expected effectiveness and a TMDL or its interim targets have not been achieved, the Department shall reopen the TMDL and adjust it or its interim targets and the associated water quality standard(s) as necessary.

The implementation of TMDL and the associated plans is generally enforceable by DEQ, other state agencies and local government. However, it is envisioned that sufficient initiative exists to achieve water quality goals with minimal enforcement. Should the need for additional effort emerge, it is expected that the responsible agency will work with land managers to overcome impediments to progress through education, technical support or enforcement. Enforcement may be necessary in instances of insufficient action towards progress. This could occur first through direct intervention from land management agencies (e.g. ODF), and secondarily through DEQ. The latter may be based on departmental orders to implement management goals leading to water quality standards.

If a source is not given a load allocation, it does not necessarily mean that the source is prohibited from discharging any wastes. A source may be permitted to discharge by DEQ if the holder can adequately demonstrate that the discharge will not have a significant impact on water quality over that achieved by a zero allocation. For instance, a permit applicant may be able to demonstrate that a proposed thermal discharge would not have a measurable detrimental impact on projected stream temperatures when site temperature is achieved. Alternatively, in the case where a TMDL is set based upon attainment of a specific pollutant concentration, a source may be permitted to discharge at that concentration and still be considered as meeting a zero allocation.

In employing an adaptive management approach to the TMDL and the WQMP, DEQ has the following expectations and intentions:

- Subject to available resources, on a five-year basis, DEQ intends to review the progress of the TMDL and the WQMP.

- In conducting this review, DEQ will evaluate the progress towards achieving the TMDL (and water quality standards) and the success of implementing the WQMP.

- DEQ expects that each DMA will also monitor and document its progress in implementing the provisions of its Implementation Plan. This information will be provided to DEQ for its use in reviewing the TMDL.

- As implementation of the WQMP and the associated Implementation Plans proceeds, DEQ expects that DMAs will develop site specific benchmarks for attainment of TMDL surrogates, which can then be used to measure progress. Interim benchmarks were set at 90% of the potential shade increase. Interim benchmarks were not set for areas where the difference between the interim benchmark and final potential shade is smaller than the error margin for the initial shade readings. These areas will be assessed at the identified "Time to Reach Objectives" to determine progress towards meeting system potential shade objectives.

- DEQ will seek to work with DMA's and partners to identify riparian areas where measurable shade increases were predicted by Shadow modeling. The Shadow assessment provides reach specific information regarding current and future potential shading conditions. Although recovery interim benchmarks are very long term and difficult to measure on a watershed scale, site specific shade recovery can be monitored in the near term. Some site specific shade recovery targets exceed 50%. This will support near term adaptive management.

- Where implementation of the Implementation Plans or effectiveness of management techniques are found to be inadequate, DEQ expects management agencies to revise the components of their Implementation Plan to address these deficiencies.

- When DEQ, in consultation with the DMAs, concludes that all feasible steps have been taken to meet the TMDL and its associated surrogates and attainment of water quality standards, the TMDL, or the associated surrogates is not practicable, it will reopen the TMDL and revise it as appropriate. DEQ would also consider reopening the TMDL should new information become available indicating that the TMDL or its associated surrogates should be modified.

CHAPTER 2 - TMDL WATER QUALITY MANAGEMENT PLAN (WQMP) GUIDANCE

In February 2000, DEQ entered into a Memorandum of Agreement (MOA) with the U.S. Environmental Protection Agency (EPA) that describes the basic elements needed in a TMDL WQMP. That MOA was endorsed by the Courts in a Consent Order signed by United States District Judge Michael R. Hogan in July 2000. These elements, as outlined below, will serve as the framework for this WQMP.

WQMP Elements

1. Condition assessment and problem description
2. Goals and objectives
3. Identification of responsible participants
4. Proposed management measures
5. Timeline for implementation
6. Reasonable assurance
7. Monitoring and evaluation

8. Public involvement
9. Costs and funding
10. Citation to legal authorities

This Lobster Creek Watershed WQMP is organized around these plan elements and is intended to fulfill the requirement for a management plan contained in OAR 340-041-0026.

CHAPTER 3 – CONDITION ASSESSMENT AND PROBLEM DESCRIPTION

3.1 Geographic Region of Interest

Lobster Creek, a 5th field watershed located in the Lower Rogue Subbasin, is home to productive forested lands and has the distinction of containing streams with historically abundant salmonid populations. Figure 3 displays a vicinity map. Valuable contributions from forestry, fisheries, and local watershed organizations in the Lower Rogue Watershed have prompted extensive data collection and study of the interaction between land use and water quality. The knowledge derived from these data collection efforts and academic study, some of which is presented in this document, have been used by land managers to design protective and enhancement strategies that are actively being applied to address water quality issues. The development of this TMDL and WQMP provides improved assessment information from which to plan restoration and enhancement efforts.

The primary beneficial use for the water in this watershed is the salmonid fish population. The Lobster Creek Watershed is the most important fish-producing unit in the lower Rogue River.

The decision was made to approach the Lower Rogue Subbasin TMDL assessment in two discrete segments. It was determined that tributaries to the Lower Rogue represent high quality fishery habitat. . Mainstem tributaries are the primary source of salmonid production in the Lower Rogue. They provide important spawning and rearing habitat and provide thermal refugia in a heated mainstem. Working from headwaters downstream in these important tributaries represents a valid approach to TMDL assessment and to fishery enhancement efforts. This decision has resulted in the early production of the Lobster Creek Watershed TMDL and plans to package the remainder of the Lower Rogue Subbasin under a separate TMDL package. This assessment of this important tributary at the 5th field level better supports 7th field planning for restoration and enhancement activities. Figure 4 delineates the Lobster Creek Watershed. Subsequent Lower Rogue Subbasin TMDL assessment will focus on the Rogue River mainstem and two other significant listed tributaries.

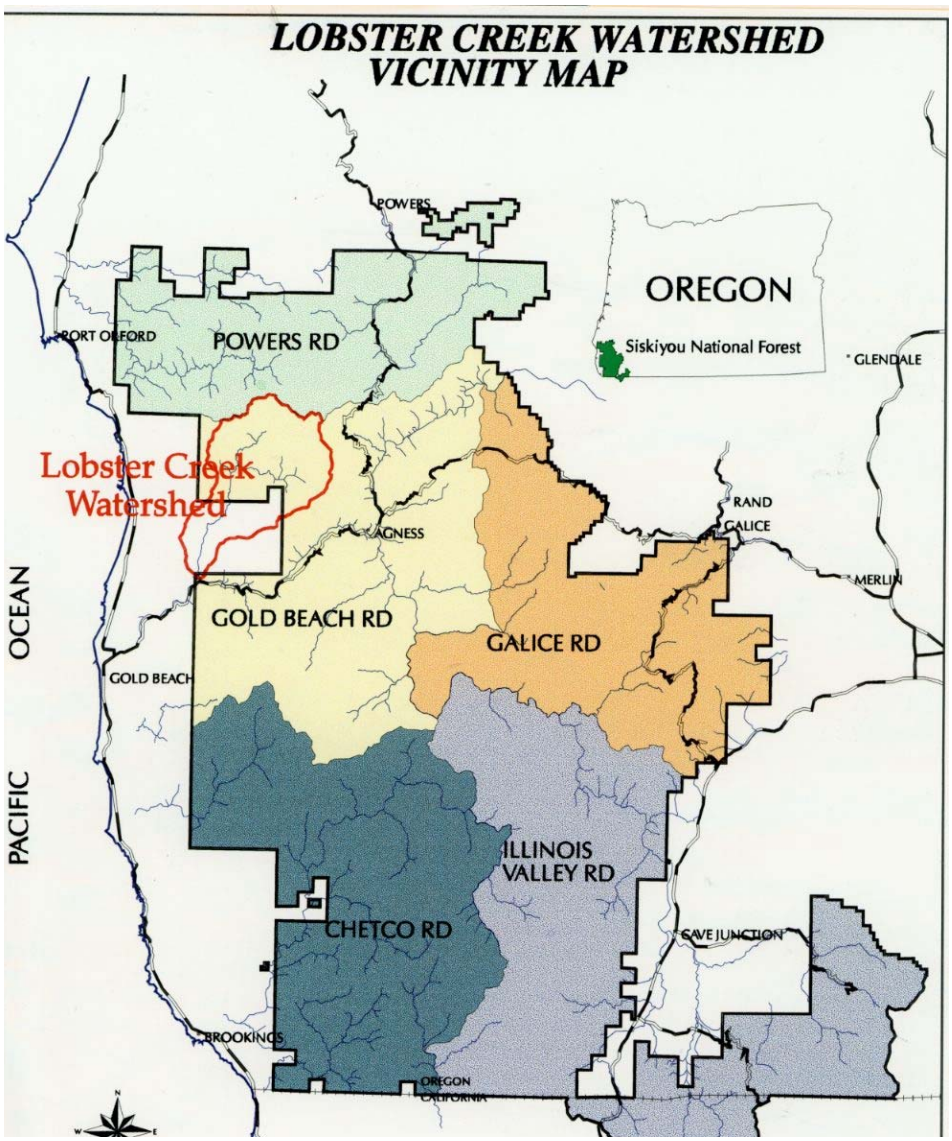
3.2 Beneficial Uses

Oregon Administrative Rules (OAR Chapter 340, Division 41, Table 5) lists the “Beneficial Uses” applicable to tributaries of the Rogue River. Beneficial uses occurring within the Lobster Creek Watershed are identified in **Table 1** below. Numeric and narrative water quality standards are designed to protect the most sensitive beneficial uses.

Table 1. Beneficial uses occurring in the Lobster Creek Watershed
Rogue River tributary - *OAR 340 – 41 – 0365*

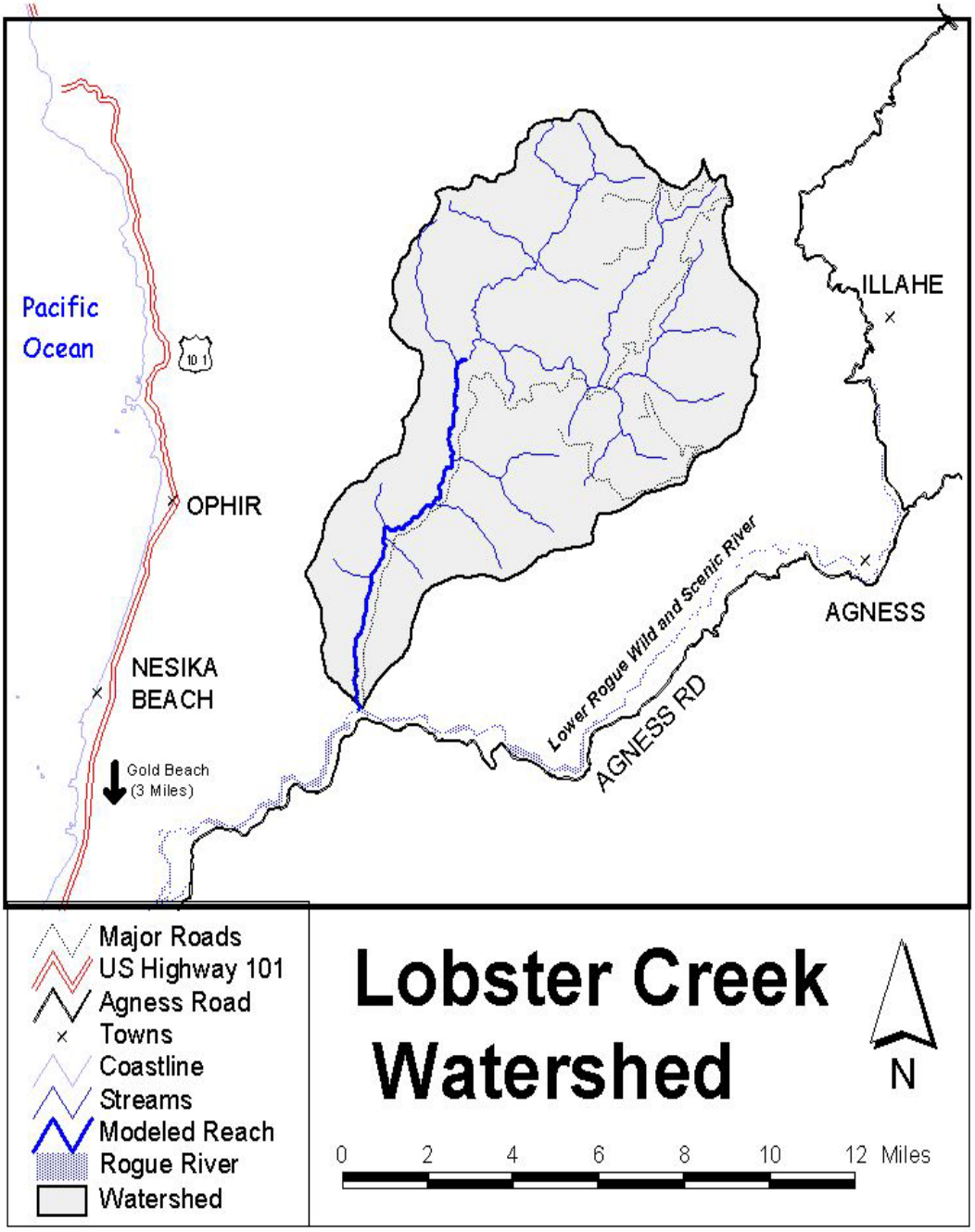
Beneficial Use	***Occurring***	***Beneficial Use***	***Occurring***
Public Domestic Water Supply		Salmonid Fish Spawning	✓
Private Domestic Water Supply		Salmonid Fish Rearing	✓
Industrial Water Supply		Resident Fish and Aquatic Life	✓
Irrigation		Anadromous Fish Passage	✓
Livestock Watering		Wildlife and Hunting	✓
Boating	✓	Fishing	✓
Hydro Power		Water Contact Recreation	✓
Aesthetic Quality	✓	Commercial Navigation & Trans.	

Figure 3 - Vicinity Map



* RD = Ranger District

Figure 4 - Lobster Creek Watershed Map



3.3 Current Conditions

Lobster Creek Watershed water quality limited stream segments and parameters identified on the 1998 Oregon 303(d) List are show below in Table 2. In addition, this table identifies areas of the watershed not specifically identified on the 1998 303d list but included in the watershed TMDL assessment.

Table 2 USFS and Private Timber Managed Lands 303(d) listed Segments, Applicable Water Quality Standards, Stream Miles 303d Listed, and stream miles assessed.			
Lobster Creek Mainstem – Mouth to Headwaters	Temperature 303d listed	*OAR 340-41-0365(2)(b)(A)*	9.5 Miles
No Fork Lobster Ck Mouth to RM3	Temperature 303d listed	*OAR 340-41-0365(2)(b)(A)*	3 Miles
So. Fork Lobster Ck Mouth to Iron Ck	Temperature 303d listed	*OAR 340-41-0365(2)(b)(A)*	3.7 Miles
Significant mainstem tributaries not specifically identified by name on 303 list			31 Miles
Others significant tributaries not specifically identified by name on 303 list			76 Miles
TOTAL STREAM MILES ASSESSED			**123 Miles**
WQL 303d listed segments			**16.2 Miles**

3.4 Existing Sources of Water Pollution

Temperature

Surface water temperatures in the Lobster Creek Watershed have been influenced by human activities. These activities may have either a detrimental or a beneficial impact on river temperature.

Riparian vegetation, stream morphology, hydrology, climate, and geographic location influence stream temperature. While climate and geographic location are outside of human control, the condition of the riparian area, channel morphology and hydrology can be affected by land use activities. Specifically, elevated summertime stream temperatures attributed to anthropogenic sources may result from the following conditions within the Lobster Creek Watershed:

1. Riparian vegetation disturbance that reduces stream surface shading, riparian vegetation height, and riparian vegetation density (shade is commonly measured as percent effective shade),

2. Channel widening (increased width to depth ratios) due to factors such as loss of riparian vegetation and/or increased sediment loading that results in increases in the stream surface area exposed to energy processes, namely solar radiation,

Changes in either sediment input or stream discharge can lead to changes in channel form (Leopold et al., 1964). When the amount of sediment entering a reach exceeds the transport capacity of a stream, the sediment is deposited. This can lead to the channel becoming shallower and/or wider. For the same discharge, a wide, shallow stream will heat up faster than a narrow, deep stream (Brown, 1972). However, when stream water flows subsurface through gravels, it can also be shaded from solar radiation, maintaining cooler temperatures. Management activities can contribute to either process by increasing sediment inputs over natural levels.

CHAPTER 4 – GOALS AND OBJECTIVES

The overall goal of the TMDL WQMP is to achieve compliance with water quality standards for each of the 303(d) listed parameters and streams in the Lobster Creek Watershed. Specifically the WQMP combines a description of all Designated Responsible Participants (or Designated Management Agencies (DMA)) plans that are or will be in place to address the load and wasteload allocations in the TMDL. The specific goal of this WQMP is to describe a strategy for reducing discharges from nonpoint sources to the level of the load allocations and for reducing discharges from point sources to the level of the waste load allocations described in the TMDL. As discussed above, this plan is preliminary in nature and is designed to be adaptive as more information and knowledge is gained regarding the pollutants, allocations, management measures, and other related areas.

The expectations of all DMAs are to:

1. Develop Best Management Practices (BMPs) to achieve Load Allocations and Waste Load Allocations
2. Give reasonable assurance that management measures will meet load allocations; through both quantitative and qualitative analysis of management measures
3. Adhere to measurable milestones for progress
4. Develop a timeline for implementation, with reference to costs and funding
5. Develop a monitoring plan to determine if:
   a. BMPs are being implemented
   b. Individual BMPs are effective
   c. Load and wasteload allocations are being met
   d. Water quality standards are being met

CHAPTER 5 - IDENTIFICATION OF RESPONSIBLE PARTICIPANTS

The purpose of this element is to identify the organizations responsible for the implementation of the plan and to list the major responsibilities of each organization. Figure 5 identifies land ownership in the watershed. What follows is a simple list of those organizations and responsibilities.

Oregon Department of Forestry

- Forest Practices Act (FPA) Implementation
- Conservation Reserved Enhancement Program
- Revise statewide FPA rules and/or adopt subbasin specific rules as necessary.
- Regulates riparian area management

Federal Land Management Agencies (Forest Service and BLM)

- Implementation of Northwest Forest Plan

Oregon Department of Environmental Quality – 0700 J General Permit, Recreational Mining

- DEQ permit issuance
- DEQ Permit Compliance and Enforcement
- DEQ Revise permit as required
- DEQ Monitoring to assure permit effectiveness

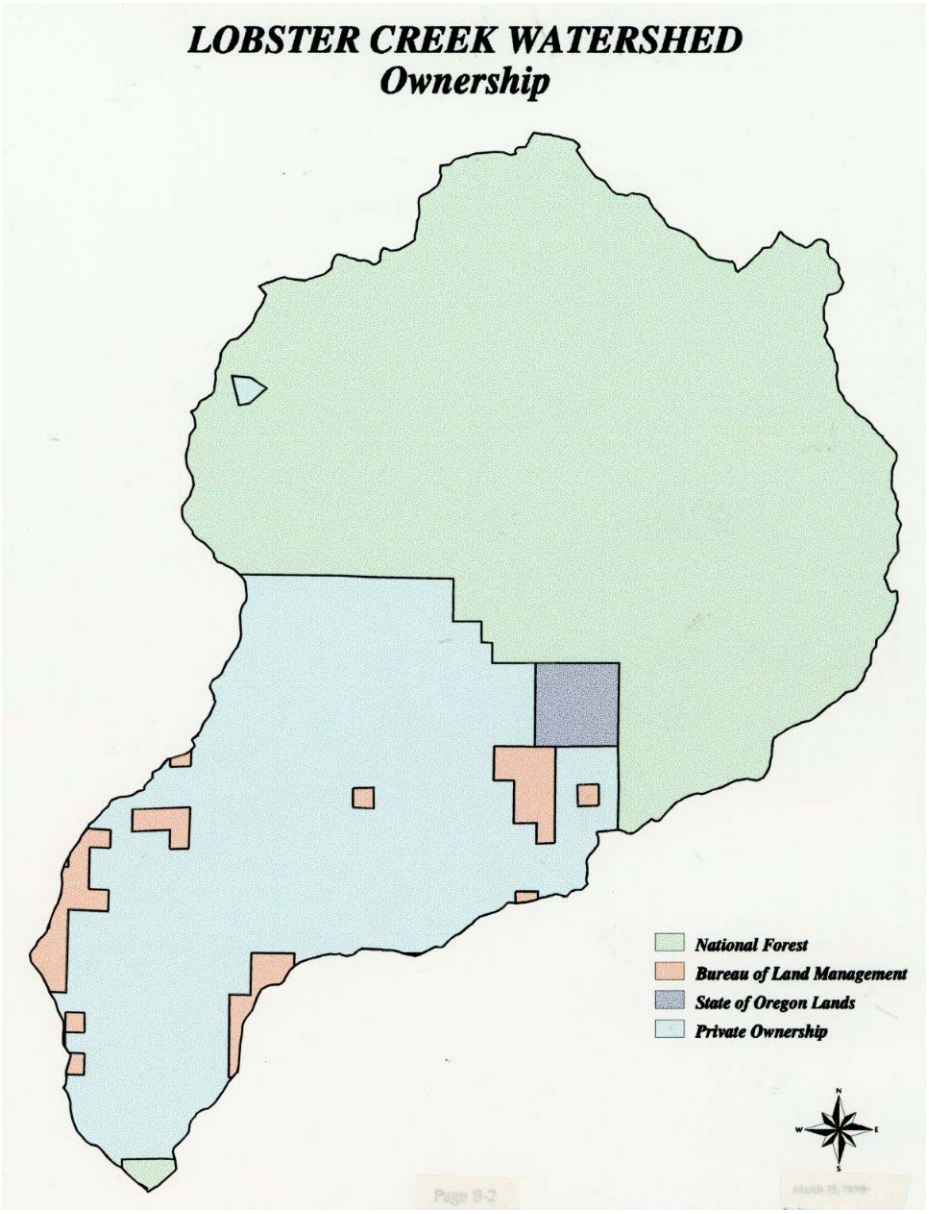
Although not formally identified as Designated Management Agencies (DMA's), Lincoln Timber LLC as managed by The Campbell Group and the Lower Rogue Watershed Council are actively involved in management and enhancement activities in this watershed. These partners are significant contributors to this assessment and management plan. DMA's should seek to work cooperatively with these entities.

Private landowners are responsible for the implementation of water protection rules within the Forest Practices Act. Although ODF reviews notifications, landowners implement the project as designed and "manage" the landscape.

Table 3 below identifies 303d listed stream segments along with the responsible Designated Management Agencies.

Table 3 - 303d listed stream segments along with the responsible Designated Management Agencies		
Lobster Creek Mainstem – Mouth to Headwaters	Temperature 303d listed	Oregon Department of Forestry
No Fork Lobster Ck Mouth to RM3	Temperature 303d listed	United States Forest Service
So. Fork Lobster Ck Mouth to Iron Ck	Temperature 303d listed	United States Forest Service Oregon Department of Forestry

Figure 5 - Land Ownership



CHAPTER 6 – PROPOSED MANAGEMENT MEASURES

This section of the plan outlines the proposed management measures that are designed to meet the wasteload allocations and load allocations of each TMDL. The timelines for addressing these measures are given in the following section.

The management measures to meet the load and wasteload allocations may differ depending on the source of the pollutant. Given below, in table 4 , are categorizations of the sources and a description of the management measures being proposed for each source category. This table is taken from the joint WQMP prepared by DMA's and partners found in Chapter 2 Appendix C.

Table 4 - Proposed Management Measures & Active/Passive Restoration USFS.

Element	Goal/Objective	Passive Management	Active Management (no loss of shading)
Temperature - Shade	Achieve maximum shade value possible per stream reach.	Allow riparian vegetation to grow to target height and density. Follow direction in NWFP for riparian reserves.	Treatments that increase growth rates. Treatments that insure long term health. Plant conifers for future tall shade trees.
Temperature - Channel Form	Decrease management related bedload contributions during large storms.	Allow natural channel evolution to continue toward equilibrium.	Identify and treat roads with high failure potential to reduce risk and magnitude of failure.
	Increase amount of large wood delivered in mass wasting events.	Allow historic failures to revegetate.	Insure that unstable sites retain large wood to increase wood to sediment delivery ratio.

Lincoln Timber LLC has an ongoing program, in partnership with the Lower Rogue Watershed Council (LRWC), to inventory company roads built prior to the 1972 Oregon Forest Practices Act. These "legacy roads" are being evaluated for failing/undersized culverts, chronic sediment discharge, and potential fillslope failures. Significant problems identified are being corrected during maintenance or re-construction efforts. Two cooperative projects with the LRWC (cost-share funding by Oregon Watershed Enhancement Board [OWEB]) have been completed and a third (cost-share funding by DEQ/319 Clean Water Program) is ongoing. Examples of completed and ongoing corrective actions or mitigation procedures include: placing additional ditch-relief culverts; upgrading and enlarging stream culverts; pulling unstable fills on sidecast road sections; and planting riparian species along unshaded sections of the mainstem of Lobster Creek. Yearly summaries of completed projects have been and will be conveyed to the OWEB).

These sediment abatement activities will ensure that channel health and stability are maintained. Table 5 below summarizes Management Measures proposed by Lincoln Timber LLC for riparian restoration. This table is taken from the joint WQMP prepared by DMA's and partners found in Chapter 2 Appendix C.

Table 5 - Proposed Management Measures - Lincoln Timber LLC.

Element	Goal/Objective	Passive Management	Active Management (no loss of shading)
Temperature - Shade	Achieve maximum shade value possible per stream reach.	Allow riparian vegetation to grow to reach target height and density. Follow standards and guidelines in OFPA for riparian reserves.	Treatments that increase growth rates. Treatments that insure long term health. Plant conifers for future tall shade trees.
Temperature – Channel Form	Minimize management related sediment inputs. Increase amount of large wood delivered in mass wasting events.	Allow natural channel evolution to continue toward equilibrium. Allow historic failures to revegetate.	Identify and treat roads with high failure potential to reduce risk and magnitude of failure. Insure that unstable sites retain large wood to increase wood to sediment delivery ratio.

- The natural watershed potentially had a higher large woody debris (LWD) loading than is currently present. LWD loads are strongly correlated to wider, shallower channels. Wider channels have more water volume exposed to solar radiation, and are therefore more prone to heating; hence, higher temperatures. While more LWD can provide local refuge (through pool development) and will likely have great biological value, its short term impact to the stream temperature can be negative.
- Active riparian management activities on private timber holdings would occur when opportunities exist to conduct such activities. These opportunities are usually associated with similar activities that are occurring on adjacent upland sites.

Other Sources

Recreational mining is conducted on federal ownership within the watershed and is considered a point source activity. It is the only point source activity present in the assessment area. As currently conducted, this activity is not affecting riparian and/or channel conditions. This activity is currently managed under the 0700J General NPDES Permit Appendix D. A load allocation of zero was established for current and future point source activities. Point source influences are not allowed to contribute pollutant load to the system. Lincoln Timber LLC lands are not open to the general public for recreational mining activities.

CHAPTER 7 – TIMELINE FOR IMPLEMENTATION

The purpose of this element of the WQMP is to demonstrate a strategy for implementing and maintaining the plan and the resulting water quality improvements over the long term. Included in this section are timelines for the implementation of DEQ activities. Each DMA-specific Implementation Plan will also include timelines for the implementation of the milestones described earlier. Timelines should be as specific as possible and should include a schedule for BMP installation and/or evaluation, monitoring schedules, reporting dates and milestones for evaluating progress.

The DMA-specific Implementation Plans are designed to reduce pollutant loads from sources to meet TMDL, associated loads and water quality standards. The Department recognizes that where implementation involves significant habitat restoration or reforestation, water quality standards may

not be met for decades. In addition, the Department recognizes that technology for controlling nonpoint source pollution is, in some cases, in the development stages and will likely take one or more iterations to develop effective techniques.

For the Lobster Creek Watershed TMDL, shade has been identified as the pollutant surrogate and has been defined as an alternative target for meeting the TMDL for temperature. The purpose of this surrogate is not to bar or eliminate human access or activity in the subbasin or its riparian areas. It is the expectation, however, that the Implementation Plans will address how human activities will be managed to achieve the surrogate target. It is also recognized that full attainment of pollutant surrogates (system potential vegetation, for example) at all locations may not be feasible due to physical, legal or other regulatory constraints. To the extent possible, the Implementation Plans should identify potential constraints, but should also provide the ability to mitigate those constraints should the opportunity arise. For instance, at this time, the existing location of a road or highway may preclude attainment of system potential vegetation due to safety considerations. In the future, however, should the road be expanded or upgraded, consideration should be given to designs that support TMDL load allocations and pollutant surrogates such as system potential vegetation.

The Department intends to regularly review progress of the Implementation Plans. The plans, this overall WQMP, and the TMDL are part of an adaptive management process. Modifications to the WQMP and the Implementation Plans will occur as needed on a frequent basis. Review of this TMDL is expected to occur approximately five years after the final approval of the TMDL, or whenever deemed necessary by DEQ.

Table 6: DMA Water Quality Management Plan Timeline

Activity	2001	2002	2003	2004	2005
DEQ Modification of 0700 General Permit					
DMA (ODF) Development and Submittal of Implementation and Monitoring Plans					
DMA (ODF) Implementation of Plans					
DEQ/DMA/Public Review of TMDL and WQMP					
DMA Monitoring and Progress towards interim benchmarks					

Please refer to Chapter 2 Appendix C, Monitoring Section. This section discusses monitoring commitments made by land managers and Watershed Councils working within this watershed.

Table 7. Lobster Creek Watershed Timeline for WQMP Implementation.

Element (Factor)	Location	Objective	Start Date	Interim Benchmark	Time to Reach Objective
Temperature Shade	Lost Valley Creek**	Increase shade 3%	Current	None	Year 2100
	NF Lobster	Increase shade 2%	Current	None	Year 2100
	SF Lobster below Boulder Creek **	Increase shade 1%	Current	None	Year 2100
	Boulder Creek	Increase shade 5%	Current	None	Year 2100
	SF Lobster above Boulder Creek	Increase shade 3%	Current	None	Year 2100
	Fall Creek	Increase shade 4%	Current	None	Year 2081
	Deadline Creek	Increase shade 3%	Current	None	Year 2076
	Mainstem	Increase shade 9%	Current	Increase shade 7% by the year 2061	Year 2076

Table 7 continued

Element (Factor)	Location	Objective	Start Date	Interim Benchmark	Time to Reach Objective
Temperature-Channel Form	Basin Wide	Reduce Mgmt Related Sediment in Large Storms	Current	% watershed stormproofed	Continuous (design/retrofit to 50 year event)
	Basin Wide	Eliminate/Upgrade Roads in Unstable Terrain	Current	% watershed stormproofed	Continuous (design/retrofit to 50 year event)
	Basin Wide	Eliminate High Risk Stream Crossings	Current	% watershed stormproofed	Continuous (design/retrofit to 50 year event)

* DEQ will seek to work with DMA's and partners to identify riparian areas where measurable shade increases were predicted by Shadow modeling. The Shadow assessment provides reach specific information regarding current and future potential shading conditions. Although recovery interim benchmarks are very long term and difficult to measure on a watershed scale, site specific shade recovery can be monitored in the near term. Some site specific shade recovery targets exceed 50%.

** Lincoln Timber LLC owns lands in these drainages.

High risk stream crossings are those facilities that:

- the risk of failure in a 50 year storm event is present
- unstable terrain are those areas that have the potential for mass failure
- the site has the potential to directly deliver sediment to the stream

The Road Hazard Identification and Risk Reduction Project is a major element of the Oregon Plan. The two major field elements of this project are (1) the surveying of roads using the Forest Road Hazard Inventory Protocol, and (2) the repairing of problem sites identified through the protocol. Road repairs conducted as a result of this project include improving fish passage, reducing washout potential, reducing landslide potential, and reducing the delivery of surface erosion to streams.

Interim benchmarks in these tables were set at 90% of the potential shade increase. Interim benchmarks were not set for areas where the difference between the interim benchmark and final potential shade is smaller than the error margin for the initial shade readings. These areas will be assessed at the identified "Time to Reach Objectives" to determine progress towards meeting system potential shade objectives.

Generally, stream temperatures follow a longitudinal (downstream) heating pattern. Lobster Creek 7 day seasonal maximum average temperature regimes are influenced by cooler groundwater and small tributary inputs. These inputs have a cooling influence on the Lobster Creek mainstem. Summer of 1999 seven-day maximum average temperatures in upper Lobster Creek above Lost Valley Creek occurred in August and reached 65.4°F. Data indicate that longitudinal heating occurs in the mainstem until the cooling influence of flows from Deadline Creek. Lobster Creek mainstem then cools 2.6°F as it moves through the gorge area. This cooling likely occurs due to channel narrowing, topographical shade increases, and cooler groundwater and tributary inputs. Lobster Creek mainstem then heats 0.8°F, as measured at the confluence with the Rogue River. The mainstem warms only 0.9°F over the nearly 10 miles of stream length. Important cool water inputs from relatively small tributaries have large effects on longitudinal heating in this watershed.

It is understood that tributaries to the Lower Rogue mainstem which provide habitat and thermal refugia for cold water salmonid species are important and merit early action. It is becoming more widely recognized that the spatial and temporal patterns in aquatic temperature conditions are important, particularly for salmonids who need well-connected, well-distributed cold water areas throughout the aquatic system. That concept is an important one to recognize and articulate because it affects decisions on which protection and recovery actions will be undertaken and where. This WQMP recognizes the importance of function and connectivity in the basin as a whole and proposes that this approach be maintained as work is done at multiple scales.

CHAPTER 8 – REASONABLE ASSURANCE

This section of the WQMP is intended to provide reasonable assurance that the WQMP (along with the associated DMA-specific Implementation Plans) will be implemented and that the TMDL and associated allocations will be met.

There are several programs that are either already in place or will be put in place to help assure that this WQMP will be implemented. Programs to address non-point sources in this watershed are managed under the auspices of state law for forested lands and voluntary efforts.

8.1 Point Sources

Reasonable assurance that implementation of the point source wasteload allocations will be addressed through the issuance and revision as needed of the 0700 J General NPDES permits.

NPDES Permit Program

The DEQ administers wastewater permits in implementing Oregon Revised Statute (ORS) 468B.050. National Pollutant Discharge Elimination System (NPDES) permits are required for surface water discharge. The NPDES permit is also a Federal permit, which is required under the Clean Water act for discharge of waste into waters of the United States. DEQ has been delegated authority to issue NPDES permits by the EPA. As the 0700 general permit for recreational mining is renewed, it will be revised to insure that all 303(d) related issues are addressed in the permit. This permit activity will help assure that elements of the TMDL WQMP involving channel stability will be achieved.

If needed upon renewal, provisions to address the appropriate waste load allocations (WLAs) will be incorporated into the 0700 General NPDES permit by DEQ. Adherence to permit conditions is required by State and Federal Law and DEQ has the responsibility to ensure compliance.

8.2 Nonpoint Sources

Forestry

The Oregon Department of Forestry (ODF) is the designated management agency for regulation of water quality on non-federal forest lands. The Oregon Board of Forestry (BOF), in consultation with the Environmental Quality Commission (EQC), establish best management practices (BMPs) and other rules to ensure that, to the maximum extent practicable, non-point source pollution resulting from forest operations does not impair the attainment of water quality standards. The Board of Forestry has adopted water protection rules, including but not limited to OAR Chapter 629, Divisions 635-660, which describe BMPs for forest operations. These rules are implemented and enforced by ODF and monitored to assure their effectiveness**.**

By statute, forest operators conducting operations in accordance with the BMPs are considered to be in compliance with Oregon's water quality standards. ODF provides on the ground field administration of the Forest Practices Act (FPA). For each administrative rule, guidance is provided to field administrators to insure proper, uniform and consistent application of the Statutes and Rules. The FPA requires penalties, both civil and criminal, for violation of Statutes and Rules. Additionally, whenever a violation occurs, the responsible party is obligated to repair the damage. For more information, refer to the Management Measures element of this Plan.

ODF and DEQ are involved in several statewide efforts to analyze the existing FPA measures and to better define the relationship between the TMDL load allocations and the FPA measures designed to protect

water quality. How water quality parameters are affected, as established through the TMDL process, as well as other monitoring data, will be an important part of the body of information used in determining the adequacy of the FPA.

As the DMA for water quality management on nonfederal forestlands, the ODF is also working with the DEQ through a memorandum of understanding (MOU) signed in April of 1998. This MOU was designed to improve the coordination between the ODF and the DEQ in evaluating and proposing possible changes to the forest practice rules as part of the Total Maximum Daily Load process. The purpose of the MOU is also to guide coordination between the ODF and DEQ regarding water quality limited streams on the 303d list. An evaluation of rule adequacy will be conducted (also referred to as a "sufficiency analysis") through a water quality parameter by parameter analysis. This statewide demonstration of forest practices rule effectiveness in the protection of water quality will address the following specific parameters:

1) Temperature
2) Sediment and turbidity
3) Aquatic habitat modification
4) Bio-criteria
5) Other parameters

It is expected that this analysis will be completed by the end of 2001[1]. These sufficiency analyses will be reviewed by peers and other interested parties prior to final release. The analyses will be designed to provide background information and assessments of BMP effectiveness in meeting water quality standards. Once the sufficiency analyses are completed, they will be used as a coarse screen for common elements applicable to each individual TMDL to determine if forest practices are contributing to water quality impairment within a given watershed and to support the adaptive management process. See Chapter 2 Appendix B and C for a more detailed description of the non-federal forest lands portion of the WQMP.

Currently ODF and DEQ do not have adequate data to make a collective determination on the sufficiency of the current FPA BMPs in meeting water quality standards within the Lobster Creek Watershed. This situation most closely resembles the scenario described under condition c of the ODF/DEQ MOU. Therefore, the current BMPs will remain as the forestry component of the TMDL. The draft versions of the statewide FPA sufficiency analyses for the various water quality parameters will be completed as noted above. The proposed Lobster Creek Watershed TMDL will be completed by early 2002. Data from an ODF/DEQ shade study was collected over the summer of 1999 and a final report will be completed in 2001, and information from the forest practices ad hoc committee advisory process is currently available. Information from these efforts, along with other relevant information provided by the DEQ, will be considered in reaching a determination on whether the existing FPA BMPs meet water quality standards within the Lobster Creek Watershed.

Federal Forest Lands - **Northwest Forest Plan (NWFP)**

Recovery of the degraded water quality parameters listed on the 303(d) list on federal lands was boosted in 1994 with the amendment of the Siskiyou National Forest Land and Resource Management Plan by the Northwest Forest Plan (NWFP). This guidance document provided means and direction for both active and passive restoration measures. The philosophy focuses heavily on protecting areas with high quality aquatic and terrestrial resources and focusing restoration efforts on areas with the greatest potential for recovery. The intact areas serve as core areas to build out from in the restoration process as well as providing a blue print for desired future conditions.

All management activities on federal lands managed by the U.S. Forest Service (USFS) and the Bureau of Land Management must follow standards and guidelines (S&Gs) as listed in the respective Land Use and Management Plans (LRMPs), as amended, for the specific land management units.

[1] The estimated completion date listed here differs from those dates listed in the MOU. Due to unforeseen circumstances the DEQ and ODF have agreed to revise the dates.

The NWFP revision to the National Forest LRMP's provides interim direction for establishment and management of Riparian Habitat Conservation Areas (RHCAs) and S&Gs for Key Watersheds. The Lobster Creek Watershed is not a tier 1 key watershed as defined in the President's Northwest Forest Plan (USDA,USDI, 1994). Within the National Forest, management activities are limited by the management allocation assigned to that area. The primary federal management allocations within the Lobster Creek Watershed are shown in the table below as well as in Management Areas Map (Chapter 2 Appendix C1.4) .

Table 8 - National Forest Management Allocations

Management Allocation	Percent of National Forest land
Late Successional Reserve	66 %
Matrix	21 %
Riparian Reserve	5 % (perennial and large intermittent streams only)

B. Standards and Guidelines

Specific and general S &Gs found in Forest LRMP's and Biological Opinions are applied to various National Forest management activities such as Timber, Roads, Range, and Fire and Fuels Management. Standards and Guidelines for other forest management activities such as recreation, mining, fisheries restoration, and watershed management can be found in the respective Forest LRMPs (**NORTHWEST FOREST PLAN, 1994).**

The following standards and guidelines from the NWFP have been identified by the USFS in Chapter 2 Appendix C as those that will be primarily used to attain the goals of the Lobster Creek Watershed WQMP:

Stream Temperature - Shade
Aquatic Conservation Strategy: B-9 to B-11, C-30
Standards and Guidelines for Key Watersheds: C-7
Riparian Vegetation: B-31
Riparian Reserves: B-12 to B-17 and ROD 9
Watershed Restoration: B-30

Stream Temperature - Channel Form
Aquatic Conservation Strategy: B-9 to B-11, C-30
Standards and Guidelines for Key Watersheds: C-7
Roads: B-19, B-31 to B-33

Flow Modification
Aquatic Conservation Strategy: B-9 to B-11, C-30
Roads: C-32

In response to environmental concerns and litigation related to timber harvest and other operations on Federal Lands, the United States Forest Service (USFS) and the Bureau of Land Management (BLM) commissioned the Forest Ecosystem Management Assessment Team (FEMAT) to formulate and assess the consequences of management options. The assessment emphasizes producing management alternatives that comply with existing laws and maintaining the highest contribution of economic and social well being. The "backbone" of ecosystem management is recognized as constructing a network of late-successional forests and an interim and long-term scheme that protects aquatic and associated riparian habitats adequate to provide for *threatened species* and *at risk species*. Biological objectives of the Northwest Forest Plan include assuring adequate habitat on Federal lands to aid the "recovery" of late-successional forest habitat-associated species listed as threatened under the Endangered Species Act and preventing species from being listed under the Endangered Species Act.

8.3 The Oregon Plan

The Oregon Plan for Salmon and Watersheds represents a major effort, unique to Oregon, to improve watersheds and restore endangered fish species. The Oregon Plan is a major component of the demonstration of " reasonable assurance " that this TMDL WQMP will be implemented.

The Plan consists of four essential elements:

Coordinated Agency Programs:

Many state and federal agencies administer laws, policies, and management programs that have an impact on salmon and water quality. These agencies are responsible for fishery harvest management, production of hatchery fish, water quality, water quantity, and a wide variety of habitat protection, alteration, and restoration activities. Previously, agencies conducted business independently. Water quality and salmon suffered because they were affected by the actions of all the agencies, but no single agency was responsible for comprehensive, life-cycle management. Under the Oregon Plan, all government agencies that impact salmon are accountable for coordinated programs in a manner that is consistent with conservation and restoration efforts.

Community-Based Action:

Government, alone, cannot conserve and restore salmon across the landscape. The Oregon Plan recognizes that actions to conserve and restore salmon must be worked out by communities and landowners, with local knowledge of problems and ownership in solutions. Watershed councils, soil and water conservation districts, and other grassroots efforts are vehicles for getting the work done. Government programs will provide regulatory and technical support to these efforts, but local people will do the bulk of the work to conserve and restore watersheds. Education is a fundamental part of the community based action. People must understand the needs of salmon in order to make informed decisions about how to make changes to their way of life that will accommodate clean water and the needs of fish.

Monitoring:

The monitoring program combines an annual appraisal of work accomplished and results achieved. Work plans will be used to determine whether agencies meet their goals as promised. Biological and physical sampling will be conducted to determine whether water quality and salmon habitats and populations respond as expected to conservation and restoration efforts.

Private land managers in Lobster Creek watershed will report the results of effectiveness monitoring through the Oregon Watershed Enhancement board reporting process

Appropriate Corrective Measures:

The Oregon Plan includes an explicit process for learning from experience, discussing alternative approaches, and making changes to current programs. The Plan emphasizes improving compliance with existing laws rather than arbitrarily establishing new protective laws. Compliance will be achieved through a combination of education and prioritized enforcement of laws that are expected to yield the greatest benefits for salmon.

8.4 Voluntary Measures

There are many voluntary, non-regulatory, watershed improvement programs (Actions) that are in place and are addressing water quality concerns in the Lobster Creek Watershed. Both technical expertise and partial funding are provided through these programs. Examples of activities promoted and accomplished through these programs include: planting of conifers, hardwoods, shrubs, grasses and forbs along streams; relocating legacy roads that may be detrimental to water quality; replacing problem culverts with adequately sized structures, and improvement/ maintenance of legacy roads known to cause water quality problems. These activities have been and are being implemented to improve watersheds and enhance water quality. Many of these efforts are helping resolve water quality related legacy issues.

8.5 Landowner Assistance Programs

A variety of grants and incentive programs are available to landowners in the Lobster Creek Watershed. These incentive programs are aimed at improving the health of the watershed, particularly on private lands. They include technical and financial assistance, provided through a mix of state and federal funding. Local natural resource agencies administer this assistance, including the Oregon Department of Forestry, the Oregon Department of Fish and Wildlife, DEQ, and the National Resources Conservation Service.

Field staff from the administrative agencies provide technical assistance and advice to individual landowners, watershed councils, local governments, and organizations interested in enhancing the subbasin. These services include on-site evaluations, technical project design, stewardship/conservation plans, and referrals for funding as appropriate. This assistance and funding is further assurance of implementation of the TMDL WQMP.

Financial assistance is provided through a mix of cost-share, tax credit, and grant funded incentive programs designed to improve on-the-ground watershed conditions. Some of these programs, due to source of funds, have specific qualifying factors and priorities. Cost share programs include the Forestry Incentive Program (FIP), Stewardship Incentive Program (SIP), Environmental Quality Incentives Program (EQIP), and the Wildlife Habitat Incentive Program (WHIP).

CHAPTER 9 – MONITORING AND EVALUATION

Monitoring and evaluation has two basic components:
1. Implementation of DMA specific water quality implementation plans identified in this document
2. Physical, chemical and biological parameters for water quality and specific management measures.

This information will provide feedback on progress being made toward achieving TMDL allocations and achieving water quality standards. Data will also be used as we evaluate progress as described under Adaptive Management in Chapter 1: Introduction. Benchmarks and monitoring frequencies for Federal and Private Timber Lands are show in Table 9 and 10 below.

Table 9 Benchmarks and Monitoring Frequencies USFS (DMA)

Element	Site Identification	Management Measure	Monitoring Parameters	Monitoring Frequency
Temperature (Shade)	Lost Valley Creek and North Fork Lobster and tributaries	Passive plus conifer planting & treatments to increase growth and insure long term health	Stand surveys (growth & health) Low flow stream temps	5-yr. Intervals post treatment Annually
Temperature (Shade)	South Fork Lobster and Boulder Creek and tributaries	Passive plus conifer planting & treatments to increase growth and insure long term health	Stand surveys (growth & health) Low flow stream temps	5-yr. Intervals post treatment Annually
Temperature (Channel Form)	Basin wide	Passive channel recovery Eliminate high risk stream crossings Eliminate/ upgrade roads in unstable terrain	 Number of sites treated Number of miles treated	 Annually Annually

Table 10 Benchmarks and Monitoring Frequencies Lincoln Timber LLC (Voluntary)

Element	Site Identification	Management Measure	Monitoring Parameters	Monitoring Frequency
Temperature (Channel form)	Mainstem	Road system stormproofing (To at least a 50 year event)	Number of sites treated Number of miles treated	Annually

Table 11 Benchmarks and Monitoring Frequencies DEQ (Implementation)

Element	Site Identification	Management Measure	Monitoring Parameters	Monitoring Frequency
Temperature – Spawning period	Lower mainstem	Increase riparian shade quality	Instream temperatures during spawning period.	Improve understanding of spawning temperature regimes.
Temperature (Shade)	Pending *	Increase riparian shade quality	% shade	10 year intervals
General Permit (0700) mining	Lobster Creek Watershed	Compliance with and effectiveness of the 0700 General Permit	Channel and riparian impacts	Compliance annually.

DEQ will seek to work with partners to identify riparian areas where measurable shade increases were predicted by Shadow modeling. The SHADOW assessment provides reach specific information regarding current and future potential shading conditions. Although recovery interim benchmarks are very long term and difficult to measure on a watershed scale, site specific shade recovery can be monitored in the near term. Some site specific shade recovery targets exceed 50%.

Rates of tree growth may be used to set reasonable timeframes for attaining Potential Shade. If Potential Shade is established as an indicator for meeting water quality standards, Total Maximum Daily Load (TMDL) site specific benchmarks could consist of average tree heights and shade densities to be achieved within a specified number of years.

Stream Temperature Monitoring

The Gold Beach Ranger District will continue to monitor stream temperatures throughout the National Forest lands of the Lobster Creek Watershed in order to detect any changes in temperature from long term data sets. The district maintains several long-term monitoring sites as well as several other project-specific, short-term sites. Core long-term monitoring sites are maintained at the following locations:

- Mainstem Lobster Creek at Mouth
- North Fork Lobster Creek at Mouth
- South Fork Lobster Creek at Mouth and at Ol Diggins Bridge

The Forest Service may monitor stream shade development over time in representative stream reaches. Any shade monitoring will follow established protocol.

Lincoln Timber LLC will continue long-term monitoring of stream temperatures in partnership with the Lower Rogue WSC at two long term temperature monitoring sites. Temperatures at three tributary sites may be monitored as time permits. Monitoring of stream temperatures flowing from the tributaries and modeling of stream warming may be initiated to test model predictions regarding the relationship between riparian area shade quality and stream temperatures. Data will be collected using accepted DEQ protocol.

Current long term temperature monitoring sites include;

- Mainstem Lobster @ REMAP Site
- Mainstem Lobster below Deadline

Potential tributary temperature monitoring sites include;

- Fall Creek @ Mouth
- Deadline Creek @ Mouth
- Lost Valley @ Mouth

Lincoln Timber LLC may monitor stream shade development over time in representative stream reaches. The interim benchmark for the mainstem will be evaluated in 2061 to determine if the potential shade has developed according to model predictions. Any shade monitoring will follow established protocol.

The ODF has a monitoring program that is currently coordinating separate projects to monitor the effectiveness of the forest practice rules with regard to landslides, riparian function, stream temperature, chemical applications, sediment from roads, BMP compliance, and shade. The results from some of these projects have been released in the form of final reports and other projects will have final reports available in the spring of 2000, 2001 and beyond.

The information generated by each of the agencies/entities gathering data in the Lobster Creek Watershed will be pooled and used to determine whether management actions are having the desired effects or if changes in management actions and/or TMDL are needed. This detailed evaluation will typically occur on a 5 year cycle. If progress is not occurring then the appropriate management agency will be contacted with a request for action.

1. The objectives of this monitoring effort are to demonstrate long-term recovery, better understand natural variability, track implementation of projects and BMPs, and track effectiveness of TMDL implementation. This monitoring and feedback mechanism is a major component of the “reasonable assurance of implementation” for the Lobster Creek Watershed TMDL WQMP

This WQMP and the DMA-specific Implementation Plans will be tracked by accounting for the numbers, types, and locations of projects, BMPs, educational activities, or other actions taken to improve or protect water quality. A more specific Monitoring and Evaluation Plan can be found in Chapter 2 Appendix C.

CHAPTER 10 – PUBLIC INVOLVEMENT

To be successful at improving water quality, a TMDL WQMP must include a process to involve interested and affected stakeholders in both the development and the implementation of the plan. DEQ implements public notice policy and public comment periods associated with TMDL general permit renewals. DMA-specific public involvement efforts will be detailed within the Implementation Plans included in the appendices.

To be successful at improving water quality, a TMDL and WQMP must include a process to involve interested and affected stakeholders in both the development and the implementation of the plan. In addition to the DEQ public notice policy and public comment periods, public interests were involved during development and in drafting this assessment and subsequent management plan. These products have been widely presented in Curry County and the document has been made available during development for input and discussion by resource as well as private entities.

A responsiveness summary document will be prepared by DEQ in reply to comments received at the public hearing and written comments received within the comment period.

Preparation of the USFS WQMP is a procedural step that focuses on water quality using elements of the Northwest Forest Plan (NWFP). It tiers to and appends the Lobster Creek Watershed Analysis. Such watershed analyses are a required component of the Aquatic Conservation Strategy under the NWFP. The Record of Decision (ROD) for the NWFP was signed in April of 1994 following extensive public review. Additionally, any proposed active restoration measures will be subject to public review and comment as required in the National Environmental Protection Act (NEPA).

CHAPTER 11 – COSTS AND FUNDING

Designated Management Agencies will be expected to provide a fiscal analysis of the resources needed to develop, execute and maintain the programs described in their Implementation Plans.

The purpose of this element is to describe estimated costs and demonstrate there is sufficient funding available to begin implementation of the WQMP. Another purpose is to identify potential future funding sources for project implementation. There are many resource enhancement efforts and projects occurring in the subbasin which are relevant to the goals of the plan. These efforts, in addition to proposed future actions are described in the Management Measurers element of this Plan.

11.1 Potential Sources of Project Funding

Funding is essential to implementing projects associated with this WQMP. There are many sources of local, state, and federal funds. The following is a partial list of assistance programs available in the Lobster Creek Watershed.

Program	Agency/Source
Oregon Plan for Salmon and Watersheds	OWEB
Environmental Quality Incentives Program	USDA-NRCS
Wetland Reserve Program	USDA-NRCS
Conservation Reserve Enhancement Program	USDA-NRCS
Stewardship Incentive Program	ODF
Access and Habitat Program	ODFW
Partners for Wildlife Program	USDI-FSA
Conservation Implementation Grants	ODA
Water Projects	WRD
Nonpoint Source Water Quality Control (EPA 319)	DEQ-EPA
Riparian Protection/Enhancement	COE
Oregon Community Foundation	OCF
Jobs In The Woods	BLM
Forest Health	USFS

This is a partial list and individuals are encouraged to contact watershed councils and local agencies for additional grant funding sources. Grant funds are available for improvement projects on a competitive basis. Field agency personnel can be made available to assist landowners in identifying, designing, and submitting eligible projects for these grant funds.

DEQ will continue to work with partners to assist in funding long term monitoring commitments. DEQ TMDL Implementation staff will work with local partners and DMA's on the implementation of monitoring programs described within this document. DEQ will also continue to be a partner in funding sediment abatement projects throughout the watershed.

CHAPTER 12 – CITATION TO LEGAL AUTHORITIES

12.1 Clean Water Act Section 303(d)

Section 303(d) of the 1972 federal Clean Water Act as amended requires states to develop a list of rivers, streams and lakes that cannot meet water quality standards without application of additional pollution controls beyond the existing requirements on industrial sources and sewage treatment plants. Waters that need this additional help are referred to as "water quality limited" (WQL). Water quality limited waterbodies must be identified by the Environmental Protection Agency (EPA) or by a state agency which has been delegated this responsibility by EPA. In Oregon, this responsibility rests with the DEQ. The DEQ updates the list of water quality limited waters every two years. The list is referred to as the 303(d) list. Section 303

of the Clean Water Act further requires that Total Maximum Daily Loads (TMDL) be developed for all waters on the 303(d) list. A TMDL defines the amount of pollution that can be present in the waterbody without causing water quality standards to be violated. An WQMP is developed to describe a strategy for reducing water pollution to the level of the load allocations and waste load allocations prescribed in the TMDL, which is designed to restore the water quality and result in compliance with the water quality standards. In this way, the designated beneficial uses of the water will be protected for all citizens.

The Oregon DEQ is authorized by law to prevent and abate water pollution within the State of Oregon pursuant to the following statute:

ORS 468B.020 **Prevention of pollution** (1) Pollution of any of the waters of the state is declared to be not a reasonable or natural use of such waters and to be contrary to the public policy of the State or Oregon, as set forth in ORS 468B.015.

(2) In order to carry out the public policy set forth in ORS 468B.015, the department shall take such action as is necessary for the prevention of new pollution and the abatement of existing pollution by:

(a) Fostering and encouraging the cooperation of the people, industry, cities and counties, in order to prevent, control and reduce pollution of the waters of the state; and
(b) Requiring the use of all available and reasonable methods necessary to achieve the purposes of ORS 468B.015 and to conform to the standards of water quality and purity established under ORS 468B.048.

12.2 NPDES and WPCF Permit Programs

The DEQ administers two different types of wastewater permits in implementing Oregon Revised Statute (ORS) 468B.050. These are: the National Pollution Discharge Elimination System (NPDES) permits for waste discharge; and Water Pollution Control Facilities (WPCF) permits for waste disposal. The NPDES permit is also a Federal permit and is required under the Clean Water Act. The WPCF permit is a state program. As permits are renewed they will be revised to insure that all 303(d) related issues are addressed in the permit.

12.3 Oregon Administrative Rules

The following Oregon Administrative Rules provide numeric and narrative criteria for parameters of concern in the Lobster Creek Watershed:

Water Quality Standard/Criteria of Concern: Sedimentation

TMDL Parameter: Temperature
Applicable Rules: OAR 340-41-0365(various)
OAR 340-41-026(3)(a)(D)
OAR 340-41-006(54) and (55)

12.4 Oregon Forest Practices Act

The Oregon Department of Forestry (ODF) is the designated management agency for regulation of water quality on non-federal forest lands. The Board of Forestry has adopted water protection rules, including but not limited to OAR Chapter 629, Divisions 635-660, which describes BMPs for forest operations. The Environmental Quality Commission (EQC), Board of Forestry, DEQ and ODF have agreed that these pollution control measurers will be relied upon to result in achievement of state water quality standards.

ODF and DEQ statutes and rules also include provisions for adaptive management that provide for revisions to FPA practices where necessary to meet water quality standards. These provisions are described in ORS 527.710, ORS 527.765, ORS 183.310, OAR 340-041-0026, OAR 629-635-110, and OAR 340-041-00365.

Appendix B – Department of Forestry

Implementation Plan for

Non-Federal Forest Lands

Non-Federal Forest Lands

The purpose and goals of Oregon's Water Protection Rules (OAR 629-635-100) include protecting, maintaining, and improving the functions and values of streams, lakes, wetlands, and riparian management areas. Best management practices (BMPs) in the Oregon Forest Practices Act (FPA), including riparian zone protection measures and a host of other measures described below, are the mechanism for meeting State Water Quality Standards (WQS). There is a substantial body of scientific research and monitoring that supports an underlying assumption of the FPA, that maintaining riparian processes and functions is critical for water quality and fish and wildlife habitat. These riparian processes and functions include: Shade for stream temperature and for riparian species; large wood delivery to streams and riparian areas; leaf and other organic matter inputs; riparian microclimate regulation; sediment trapping; soil moisture and temperature maintenance; providing aquatic and riparian species dependent habitat; and nutrient and mineral cycling. The FPA provides a broad array of water quality benefits and contributes to meeting water quality standards for water quality parameters such as temperature, sediment, phosphorus, dissolved oxygen, nutrients, aquatic habitat and others.

Currently, many streams within the Lobster Creek Watershed exceed the WQS's for the parameters of concern. The water quality impairment(s) in the Lobster Creek Watershed do not result solely from current forestry activities. It is important to note that historic forest practices such forest road construction and maintenance activities, early riparian harvests, as well as the widespread removal of wood from streams may continue to influence current stream conditions and riparian functions.

Water quality parameters are influenced in a number of ways. For example, it is recognized that increasing the level of riparian vegetation retained along forested reaches of streams reduces solar loading, potentially preventing a substantial amount of stream heating. While providing high levels of shade to streams is an important aspect of meeting instream temperature standards it needs to be considered within the context of past management, stream morphology and flows, groundwater influences, site-productivity, insects, fire, and other disturbance mechanisms that vary in time and space across the landscape.

The amount of sediment reaching streams can also affect water quality. For example, it is recognized that, proper road construction and culvert placement, good road maintenance, appropriate road surfacing, locating side-cast and soil waste materials in stable locations, properly placing and removing temporary stream crossings, establishing appropriate water-bars on skid trails, using appropriate harvesting systems and techniques, proper site preparation (including slash disposal), among other sound forestry practices, can reduce or eliminate sediment from entering streams. The FPA deals with these and other forest activities.

As described below, ODF and DEQ are involved in several statewide efforts to analyze the existing FPA measures and to better define the relationship between TMDL load allocations and the FPA measures designed to protect water quality. How water quality parameters are affected, as established through the TMDL process as well as other monitoring data, will be an important part of the body of information used in determining the adequacy of the FPA.

Forest practices on non-federal land in Oregon are regulated under the FPA and implemented through administrative rules that are administered by the Oregon Department of Forestry (ODF). The Oregon Board of Forestry (BOF), in consultation with the Environmental Quality Commission (EQC), establish BMPs and other rules to ensure that, to the extent practicable, non-point source (NPS) pollution resulting from forest operations does not impair the attainment of water quality standards.

With respect to the temperature standard, surface water temperature management plans are required according to OAR 340-041-0026 when temperature criteria are exceeded and the waterbody is designated as water-quality limited under Section 303(d) of the Clean Water Act. In the case of state and private forestlands, OAR 340-041-0120 identifies the FPA rules as the surface water management plan for forestry activities. The DEQ recognizes (through a Memorandum of Understanding with ODF) that the FPA provide the Best Management Practices (BMPs) for forest activities on non-federal forest land in Oregon.

ODF and DEQ statutes and rules also include provisions for adaptive management that provide for revisions to FPA practices where necessary to meet water quality standards. These provisions are described in ORS 527.710, ORS 527.765, ORS 183.310, OAR 340-041-0026, OAR 629-635-110, and OAR 340-041-00365.

Current adaptive management efforts under several of the above statutes and rules are described in more detail following the discussion below on the roles of the BOF and EQC in developing BMPs that will achieve water quality standards.

ORS 527.765 Best management practices to maintain water quality.

(1) The State Board of Forestry shall establish best management practices and other rules applying to forest practices as necessary to insure that to the maximum extent practicable nonpoint source discharges of pollutants resulting from forest operations on forestlands do not impair the achievement and maintenance of water quality standards established by the Environmental Quality Commission for the waters of the state. Such best management practices shall consist of forest practices rules adopted to prevent or reduce pollution of waters of the state. Factors to be considered by the board in establishing best management practices shall include, where applicable, but not be limited to:

(a) Beneficial uses of waters potentially impacted;
(b) The effects of past forest practices on beneficial uses of water;
(c) Appropriate practices employed by other forest managers;
(d) Technical, economic and institutional feasibility; and
(e) Natural variations in geomorphology and hydrology.

ORS 527.770 Good faith compliance with best management practices not violation of water quality standards; subsequent enforcement of standards.

A forest operator conducting, or in good faith proposing to conduct, operations in accordance with best management practices currently in effect shall not be considered in violation of any water quality standards. When the State Board of Forestry adopts new best management practices and other rules applying to forest operations, such rules shall apply to all current or proposed forest operations upon their effective dates.

There are currently extensive statutes and administrative rules that regulate forest management activities in the Lobster Creek Watershed, which address the key water quality issues of stream temperatures, riparian aquatic functions, and sediment dynamics. The following is a list of specific administrative rules describing the purpose and goals of the FPA towards the achievement and maintenance of water quality standards established by the EQC.

OAR 629-635-100 - Water Protection Rules; Purpose and Goals

(3) The purpose of the water protection rules is to protect, maintain and, where appropriate, improve the functions and values of streams, lakes, wetlands, and riparian management areas. These functions and values include water quality, hydrologic functions, the growing and harvesting of trees, and fish and wildlife resources.

(4) The water protection rules include general vegetation retention prescriptions for streams, lakes and wetlands that apply where current vegetation conditions within the riparian management area have or are likely to develop characteristics of mature forest stands in a "timely manner." Landowners are encouraged to manage stands within riparian management areas in order to grow trees in excess of what must be retained so that the excess may be harvested.

(5) The water protection rules also include alternative vegetation retention prescriptions for streams to allow incentives for operators to actively manage vegetation where existing vegetation conditions are not likely to develop characteristics of mature conifer forest stands in a "timely manner."

(6) OARs 629-640-400 and 629-645-020 allow an operator to propose site-specific prescriptions for sites where specific evaluation of vegetation within a riparian management area and/or the condition of the water of the state is used to identify the appropriate practices for achieving the vegetation and protection goals.

(7) The overall goal of the water protection rules is to provide resource protection during operations adjacent to and within streams, lakes, wetlands and riparian management areas so that, while continuing to grow and harvest trees, the protection goals for fish, wildlife, and water quality are met.

(a) The protection goal for water quality (as prescribed in ORS 527.765) is to ensure through the described forest practices that, to the maximum extent practicable, non-point source discharges of pollutants resulting from forest operations do not impair the achievement and maintenance of the water quality standards.

(b) The protection goal for fish is to establish and retain vegetation consistent with the vegetation retention objectives described in OAR 629-640-000 (streams), OAR 629-645-000 (significant wetlands), and OAR 629-650-000 (lakes) that will maintain water quality and provide aquatic habitat components and functions such as shade, large woody debris, and nutrients.

OAR 629-640-000 - Vegetation Retention Goals for Streams; Desired Future Conditions

(1) The purpose of this rule is to describe how the vegetation retention measures for streams were determined, their purpose and how the measures are implemented. The vegetation retention requirements for streams described in OAR 629-640-100 through OAR 629-640-400 are designed to produced desired future conditions for the wide range of stand types, channel conditions, and disturbance regimes that exist throughout forestlands in Oregon.

(2) The desired future condition for streamside areas along fish use streams is to grow and retain vegetation so that, over time, average conditions across the landscape become similar to those of mature streamside stands. Oregon has a tremendous diversity of forest tree species growing along waters of the state and the age of mature streamside stands varies by species. Mature streamside stands are often dominated by conifer trees. For many conifer stands, mature stands occur between 80 and 200 years of stand age. Hardwood stands and some conifer stands may become mature at an earlier age. Mature stands provide ample shade over the channel, an abundance of large woody debris in the channel, channel-influencing root masses along the edge of the high water level, snags, and regular inputs of nutrients through litter fall.

(3) The rule standards for desired future conditions for fish use streams were developed by estimating the conifer basal area for average unmanaged mature streamside stands (at age 120) for each geographic region. This was done by using normal conifer yield tables for the average upland stand in the geographic region, and then adjusting the basal area for the effects of riparian influences on stocking, growth and mortality or by using available streamside stand data for mature stands.

(4) The desired future condition for streamside areas that do not have fish use is to have sufficient streamside vegetation to support the functions and processes that are important to downstream fish use waters and domestic water use and to supplement wildlife habitat across the landscape. Such functions and processes include: maintenance of cool water temperature and other water quality parameters; influences on sediment production and bank stability; additions of nutrients and large conifer organic debris; and provision of snags, cover, and trees for wildlife.

(5) The rule standards for desired future conditions for streams that do not have fish use were developed in a manner similar to fish use streams. In calculating the rule standards, other factors used in developing the desired future condition for large streams without fish use and all medium and small streams included the effects of trees regenerated in the riparian management area during the next rotation and desired levels of large woody debris.

(6) For streamside areas where the native tree community would be conifer dominated stands, mature streamside conditions are achieved by retaining a sufficient amount of conifers next to large and medium sized fish use streams at the time of harvest, so that halfway through the next rotation or period between harvest entries, the conifer basal area and density is similar to mature unmanaged conifer stands. In calculating the rule standards, a rotation age of 50 years was assumed for even-aged management and a period between entries of 25 years was assumed for uneven-aged management. The long-term maintenance of streamside conifer stands is likely to require incentives to landowners to manage streamside areas so that conifer reforestation occurs to replace older conifers over time.

(7) Conifer basal area and density targets to produce mature stand conditions over time are outlined in the general vegetation retention prescriptions. In order to ensure compliance with state water quality standards, these rules include requirements to retain all trees within 20 feet and understory vegetation within 10 feet of the high water level of specified channels to provide shade.

(8) For streamside areas where the native tree community would be hardwood dominated stands, mature streamside conditions are achieved by retaining sufficient hardwood trees. As early successional

species, the long-term maintenance of hardwood streamside stands will in some cases require managed harvest using site specific vegetation retention prescriptions so that reforestation occurs to replace older trees. In order to ensure compliance with state water quality standards, these rules include requirements in the general vegetation retention prescription to retain all trees within 20 feet and understory vegetation within 10 feet of the high water level of specified channels to provide shade.

(9) In many cases the desired future condition for streams can be achieved by applying the general vegetation retention prescriptions, as described in OAR 629-640-100 and OAR 629-640-200. In other cases, the existing streamside vegetation may be incapable of developing into the future desired conditions in a "timely manner." In this case, the operator can apply an alternative vegetation retention prescription described in OAR 629-640-300 or develop a site specific vegetation retention prescription described in OAR 629-640-400. For the purposes of the water protection rules, "in a timely manner" means that the trees within the riparian management area will meet or exceed the applicable basal area target or vegetation retention goal during the period of the next harvest entry that would be normal for the site. This will be 50 years for many sites.

(10) Where the native tree community would be conifer dominant stands, but due to historical events the stand has become dominated by hardwoods, in particular, red alder, disturbance is allowed to produce conditions suitable for the re-establishment of conifer. In this and other situations where the existing streamside vegetation is incapable of developing characteristics of a mature streamside stand in a "timely manner," the desired action is to manipulate the streamside area and woody debris levels at the time of harvest (through an alternative vegetation retention prescription or site specific vegetation retention prescription) to attain such characteristics more quickly.

The Water Protection Rules are an important component of the rules that are designed to achieve and maintain water quality standards. The rules identify seven geographic regions and distinguishes between streams, lakes, and wetlands. The rules further distinguish each stream by size and type. Stream size is distinguished as small, medium, or large, based on average annual flow. Stream type is distinguished as fish use, domestic use, or neither.

Generally, no tree harvesting is allowed within 20 feet of all fish bearing, all domestic-use, and all other medium and large streams unless stand restoration is needed. In addition, all snags and downed wood must be retained in every riparian management area. Provisions governing vegetation retention are designed to encourage conifer restoration on riparian forestland that is not currently in the desired conifer condition. Future supplies of conifer on these sites are deemed desirable to support stream functions and to provide fish and wildlife habitat. The rules provide incentives for landowners to place large wood in streams to immediately enhance fish habitat. Other alternatives are provided to address site-specific conditions and large-scale catastrophic events.

The goal for managing riparian forests along fish-use streams is to grow and retain vegetation so that, over time, average conditions across the riparian landscape become similar to those of mature unmanaged riparian stands. This goal is based on the following considerations:

(1) Mature riparian stands can supply large, persistent woody debris necessary to maintain adequate fish habitat. A shortage of large wood currently exists in streams on non-federal forestlands due to historic practices and a wide distribution of young, second growth forests. For most streams, mature riparian stands are able to provide more of the functions and inputs of large wood than are provided by young second-growth trees.

(2) Historically, riparian forests were periodically disturbed by wildfire, wildlife (such as beaver, deer, and elk), windstorms, floods, and disease. These disturbances maintained a forest landscape comprised of riparian stands of all ages ranging from early successional to old growth. At any given time, however, it is likely that a significant proportion of the riparian areas supported forests of mature age classes. This distribution of mature riparian forests supported a supply of large, persistent woody debris that was important in maintaining quality fish habitat.

The overall goals of the riparian vegetation retention rules along Type N and Type D streams are the following:

- Grow and retain vegetation sufficient to support the functions and processes that are important to downstream waters that have fish;
- Maintain the quality of domestic water; and
- Supplement wildlife habitat across the landscape.

These streams have reduced Riparian Management Area (RMA) widths and reduced basal area retention requirements as compared to similar sized Type F streams (Table 1). In the design of the rules this was judged appropriate based on a few assumptions. First, it was assumed that the amount of large wood entering Type N and D channels over time was not as important for maintaining fish populations within a given stream reach. And second, it was assumed that the future stand could provide some level of "functional" wood over time in terms of nutrient inputs and sediment storage. The validity of these assumptions needs to be evaluated over time through monitoring.

Table 1. Riparian Management Area widths for streams of various sizes and beneficial uses (OAR 629-635-310).

	Type F	**Type D**	**Type N**
LARGE	100 feet	70 feet	70 feet
MEDIUM	70 feet	50 feet	50 feet
SMALL	50 feet	20 feet	Apply specified water quality protection measures, and see OAR 629-640-200

For all streams that require an RMA, basal area targets are established that are used for any type of management within the RMA. These targets were determined based on the data that was available at the time, with the expectation that these targets could be achieved on the ground. There is also a minimum tree number requirement of 40 trees per 1000 feet along large streams (11-inch minimum diameter at breast height), and 30 trees per 1000 feet along medium streams (8-inch minimum diameter at breast height). The specific levels of large wood inputs that the rules are designed to achieve are based on the stream size and type. The biological and physical characteristics specific to a given stream are taken into account in determining the quantity and quality of large wood that is functional for that stream. Given the potential large wood that is functional for a given stream, a combination of basal area targets, minimum tree retention, buffer widths, and future regenerated stands and ingrowth are used to achieve the appropriate large wood inputs and effective shade for a given stream.

The expectation is that these vegetation retention standards will be sufficient towards maintaining stream temperatures that are within the range of natural variability. In the design of the Water Protection Rules shade data was gathered for 40 small non-fish-bearing streams to determine the shade recovery rates after harvesting. One to two years after harvest, 55 percent of these streams were at or above pre-harvest shade levels due to understory vegetation regrowth. Most of these streams had a bankfull width averaging less than six feet, and most shade was provided by shrubs and grasses within 10 feet of the bank. Since 1991 there has also been a 120-acre limit on a single clearcut size, which is likely to result in a scattering of harvested area across a watershed over time. In the development of the rules it was assumed that this combined with the relative rapid shade recovery along smaller non-fish-bearing streams would be adequate in protecting stream temperatures and reduce possible cumulative effects. For fish bearing streams it is assumed that a 20-foot no-harvest area, combined with the tree retention requirements for the rest of the RMA, will be adequate to maintain shade levels necessary to achieve stream temperature standards. The monitoring program is currently collecting data to test these assumptions, evaluate the effectiveness of the rules, and evaluate whether or not water quality standards for temperature are being achieved.

In terms of sediment issues specific to forest roads, there are BMPs within the FPA specifically designed to regulate road design, construction and maintenance. The bulk of the BMPs are directed at minimizing

sediment delivery to channels. The primary goals of the road rules are to: (1) protect the water quality of streams, lakes, and wetlands; (2) protect fish and wildlife habitat; and (3) protect forest productivity.

The Board of Forestry revised several BMPs related to road design when the new Water Protection Rules were adopted in the fall of 1994. Significant changes made to the road construction rules include the following:

- The requirement for operators not to locate roads in riparian management areas, flood plains, or wetlands unless all alternative locations would result in greater resource damage.
- The requirement for operators to design stream crossings to both minimize fill size and minimize excavation of slopes near the channel. A mandatory written plan is required for stream crossing fills over 15 feet deep.
- The requirement to design stream crossing structures for the 50-year flow with no ponding, rather than the 25-year storm with no specification of allowable ponding.
- The requirement that stream crossing structures be passable by juvenile fish as well as adult fish.
- The requirement that fish must be able to access side channels.
- The requirement that stream structures constructed under these rules must be maintained for fish passage.

In determining the location of a new road, operators are required to avoid steep slopes, slides and areas next to channels or in wetlands to the extent possible. Existing roads should be used when possible, and stream crossings should be used only when essential. The design of the road grade must vary to fit the local terrain and the road width must be minimized. The operator must also follow specific guidelines for stream-crossing structures (listed above). Cross-drainage structures must be designed to divert water away from channels so that runoff intercepted by the road is dispersed onto the hillslope before reaching a channel. The specific method used is up to the operator, but the end result should be the dispersal of water running off of the road and the filtering of fine sediment before the water reaches waters of the state.

Construction and maintenance activities should be done during low water periods and when soils are relatively dry. Excavated materials must be placed where there is minimal risk of those materials entering waters of the state, and erodible surfaces must be stabilized. Landings must be built away from streams, wetlands and steep slopes.

Road maintenance is required on all active and inactive roads. Regardless of when a road was constructed, if the road has been used as part of an active operation after 1972, it is subject to all maintenance requirements within the current rules. Culverts must be kept open, and surface road drainage and adequate filtering of fine sediment must be maintained. If the road surface becomes unstable or if there is a significant risk of sediment running off of the road surface and entering the stream, road activity must be halted and the erodible area must be stabilized. Abandoned roads constructed prior to 1972 and not used for forest management since that time are not subject to Forest Practices regulatory authority.

All roads in use since 1972 must either be maintained or vacated by the operator. Vacated roads must be effectively barricaded and self-maintaining, in terms of diverting water away from streams and off of the former road surface, where erosion will remain unlikely. Methods for vacating roads include pulling stream-crossing fills, pulling steep side cast fills, and cross ditching. It is up to the landowner to choose between vacating a road and maintaining a road. If a road is not vacated, the operator is required to maintain the road under the current rules whether it is active or inactive, however they are not required to bring the design up to current standards outside of the normal maintenance and repair schedule.

The ODF has a monitoring program that is currently coordinating separate projects to monitor the effectiveness of the forest practice rules with regard to landslides, riparian function, stream temperature, chemical applications, sediment from roads, BMP compliance, and shade. The results from some of these projects have been released in the form of final reports and other projects will have final reports available in the spring of 2000, 2001 and beyond.

Voluntary measures are currently being implemented across the state under the Oregon Plan for Salmon and Watersheds (OPSW) to address water quality protection. These measures are designed to supplement

the conifer stocking within riparian areas, increase large wood inputs to streams, and provide for additional shade. This is accomplished during harvest operations by (1) placing appropriate sized large wood within streams that meet parameters of gradient, width and existing wood in the channel; and (2) relocating in-unit leave trees in priority areas[2] to maximize their benefit to salmonids while recognizing operational constraints, other wildlife needs, and specific landowner concerns.

The measures include the following:

ODF 8S: Riparian Conifer Restoration

Forest practice rules have been developed to allow and provide incentives for the restoration of conifer forests along hardwood-dominated RMAs where conifers historically were present. This process enables sites capable of growing conifers to contribute conifer LWD in a timelier manner. This process will be modified to require an additional review process before the implementation of conifer restoration within core areas.

ODF 19S: Additional Conifer Retention along Fish-Bearing Streams in Core Areas

This measure retains more conifers in RMAs by limiting harvest activities to 25 percent of the conifer basal area above the standard target. This measure is only applied to RMAs containing a conifer basal area that is greater than the standard target.

ODF 20S: Limited RMA for Small Type N Streams in Core Areas

This measure provides limited 20 foot RMAs along all perennial or intermittent small Type N streams for the purpose of retaining snags and downed wood.

ODF 21S: Active Placement of large wood during Forest Operations

This measure provides a more aggressive and comprehensive program for placing large wood in streams currently deficient of large wood. Placement of large wood is accomplished following existing ODF/ODFW placement guidelines and determining the need for large wood placement is based upon a site-specific stream survey.

ODF 22S: 25 Percent In-unit Leave Tree Placement and Additional Voluntary Retention

This measure has one non-voluntary component and two voluntary components:

1) The State Forester, under statutory authority, will direct operators to place 25 percent of in-unit leave trees in or adjacent to riparian management areas on Type F and D streams.
2) The operator voluntarily locates the additional 75 percent in-unit leave trees along Type N, D or F streams, and
3) The State Forester requests the conifer component be increased to 75 percent from 50 percent.

ODF 61S: Analysis of "Rack" Concept for Debris Flows

OFIC members will conduct surveys to determine the feasibility and value of retaining trees along small type N streams with a high probability of debris flow in a "rack" just above the confluence with a Type F stream. The rack would extend from the RMA along the Type F stream up the Type N stream some distance for the purpose of retaining trees that have a high likelihood of delivery to the Type F stream.

ODF 62S: Voluntary No-Harvest Riparian Management Areas

Establishes a system to report and track, on a site-specific basis, when landowners voluntarily take the opportunity to retain no-harvest RMAs.

The voluntary management measures are implemented within priority areas. Several of the measures utilize in-unit leave trees and are applied in a “menu” approach to the extent in-unit leave trees are available to maximize their value to the restoration of salmonid habitat. The choice of menu measures is at the discretion of the landowner, but one or more of the measures is selected.

[2] The Executive Order replaced the concept of “core areas” with “priority areas”. See (1)(f) of the Executive Order (p.5).

The measures can be described as either active restoration measures, or passive restoration measures that provide long-term large wood recruitment. Voluntary measures ODF 8S and 21S are active restoration activities. ODF 8 restores hardwood-dominated riparian areas back to a conifer-dominated condition, where appropriate, using a site-specific plan. Site-specific plans require additional consultation with the ODFW to minimize potential damage to the resource. They often result in conditions that are more protective of the resources than would occur without the site-specific plan. ODF 21S addresses large wood placement if stream surveys determine there is a need. Measures ODF 19S, 20S, 22S, and 62S provide future large wood recruitment through additional riparian protection. This additional protection is accomplished by retaining in-unit leave trees, snags, and downed wood within and along RMAs, and by changing the ratio of in-unit leave trees to 75 percent conifer.

The following application priority has been developed for OPSW voluntary measures for harvest units containing more than one stream type. The list establishes the general priority for placement of in-unit leave trees.

1) Small and medium Type F streams.
2) Non-fish bearing streams (Type D or Type N), especially small low-order headwater stream channels, that may affect downstream water temperatures and the supply of large wood in priority area streams.
3) Streams identified as having a water temperature problem in the DEQ 303(d) list of water quality limited waterbodies, or as evidenced by other available water temperature data; especially reaches where the additional trees would increase the level of aquatic shade.
4) Potentially unstable slopes where slope failure could deliver large wood.
5) Large Type F streams, especially where low gradient, wide floodplains exist with multiple, braided meandering channels.
6) Significant wetlands and stream-associated wetlands, especially estuaries and beaver pond complexes, associated with a salmon core area stream.

The Oregon Plan also has voluntary measures addressing sediment issues related to forest roads. Many forest roads built prior to the development of the FPA or prior to the current BMPs continue to pose increased risk to fish habitat. Industrial forest landowners and state forest lands are currently implementing the Road Hazard Identification and Risk Reduction Project, measures ODF 1S and ODF 2S, to identify risks to salmon from roads and address those risks. The purposes of this project are:

1. Implement a systematic process to identify road-related risks to salmon and steelhead recovery.
2. Establish priorities for problem solution.
3. Implement actions to reduce road related risks.

The Road Hazard Identification and Risk Reduction Project is a major element of the Oregon Plan. The two major field elements of this project are (1) the surveying of roads using the Forest Road Hazard Inventory Protocol, and (2) the repairing of problem sites identified through the protocol. Road repairs conducted as a result of this project include improving fish passage, reducing washout potential, reducing landslide potential, and reducing the delivery of surface erosion to streams.

Roads assessed by this project include all roads on Oregon Forest Industry Council member forestland, plus some other industrial and non-industrial forestland, regardless of when they were constructed. Industrial forest landowners have estimated spending approximately $13 million a year, or $130 million over the next 10 years, on this project for the coastal ESUs alone. However, the effort is not limited to nor bound by this funding estimate. Funding for the implementation for this measure within the other ESUs will be reflective of road problems found.

Under ODF 2S, the State Forest Lands program has spent over $2.5 million during the last biennium (1997-1999) for the restoration of roads, replacement of culverts and other stream crossing structures damaged by the 1996 storm. State Forest Lands are also proposing to spend an additional $2.5 million dollars in each of the next two biennia to improve roads, including stream crossing structures. This effort will upgrade approximately 130 miles of road in each biennium.

In addition to ODF 1S & 2S, there are additional measures under the Oregon Plan that address road management concerns:

ODF 16S - Evaluation of the Adequacy of Fish Passage Criteria: Establish that the criteria and guidelines used for the design of stream crossing structures pass fish as intended under the goal.
ODF 34S - Improve Fish Passage BMPs on Stream Crossing Structures: Ensure that all new stream crossing structures on forestland installed or replaced after the fall of 1994 will pass both adult and juvenile fish upstream and down stream.

Adaptive Management Process

By statute, forest operators conducting operations in accordance with the BMPs are considered to be in compliance with Oregon's water quality standards. The 1994 Water Protection Rules were adopted with the approval of the Environmental Quality Commission as not violating water quality standards. However, there are several provisions within the FPA and rules that require adaptive management.

The ODF is currently in the process of reviewing the effectiveness of the forest practice rules. In January of this year the Governor of Oregon signed Executive Order no. EO 99-01 that directed the Oregon Board of Forestry, with the assistance of an advisory committee, to determine to what extent changes to forest practices are needed to meet state water quality standards and protect and restore salmonids. The committee is directed to consider both regulatory and non-regulatory approaches to water quality protection. To carry out this charge, an ad hoc advisory committee is in the process of developing four separate issue papers on the following topics:

- Fish passage restoration and water classification
- Forest roads
- Riparian functions
- Landslides

The committee represents diverse interests, including environmental, industrial, non-industrial, county, and public advocates. In addition to ODF technical staff, the Oregon Department of Environmental Quality (DEQ) and Oregon Department of Fish and Wildlife (ODFW) have technical staff participating in the process. The committee expects to make recommendations to the Board of Forestry in early 2000. The Board will then consider the recommendations in determining whether revisions to the FPA and additional voluntary approaches are necessary consistent with ORS 527.710.

As the designated management agency (DMA) for water quality management on nonfederal forestlands, ODF is also working with the DEQ through a memorandum of understanding (MOU) signed in June of 1998. This MOU was designed to improve the coordination between the ODF and the DEQ in evaluating and proposing possible changes to the forest practice rules as part of the Total Maximum Daily Load process. The purpose of the MOU is also to guide coordination between the ODF and DEQ regarding water quality limited streams on the 303d list. An evaluation of rule adequacy will be conducted (also referred to as a "sufficiency analysis") through a water quality parameter by parameter analysis. This statewide demonstration of forest practices rule effectiveness in the protection of water quality will address the following specific parameters:

1.) Temperature
2.) Sediment and turbidity
3.) Aquatic habitat modification
4.) Bio-criteria
5.) Other parameters

It is expected that this analysis will be completed by the end of 2001[3]. These sufficiency analyses will be reviewed by peers and other interested parties prior to final release. The analyses will be designed to provide background information and techniques for watershed-based assessments of BMP effectiveness and

[3] The estimated completion date listed here differs from those dates listed in the MOU. Due to unforeseen circumstances the DEQ and ODF have agreed to revise the dates.

water quality assessments for watershed with forest and mixed land uses. Once the sufficiency analyses are completed, they will be used as a coarse screen for common elements applicable to each individual TMDL to determine if forest practices are contributing to water quality impairment within a given watershed and to support the adaptive management process.

There may be circumstances unique to a watershed or information generated outside of the statewide sufficiency process that need to be considered to adequately evaluate the effectiveness of the BMPs in meeting water quality standards. Information from the TMDL, ad hoc committee process, ODF Water Protection Rule effectiveness monitoring program, and other relevant sources may address circumstances or issues not addressed by the statewide sufficiency process. This information will also be considered in making the FPA sufficiency determination. ODF and DEQ will share their understanding of whether water quality impairment is due to current forest practices or the long-term legacy of historic forest management practices and/or other practices. The two agencies will then work together and use their determinations to figure out which condition exists (a, b, c, or d in the MOU). The MOU describes the appropriate response depending on which condition exists.

Currently ODF and DEQ do not have adequate data to make a collective determination on the sufficiency of the current FPA BMPs in meeting water quality standards within the Lobster Creek Watershed. This situation most closely resembles the scenario described under condition c of the ODF/DEQ MOU. Therefore, the current BMPs will remain as the forestry component of the TMDL. The draft versions of the statewide FPA sufficiency analyses for the various water quality parameters will be completed as noted above. The proposed Lobster Creek Watershed TMDL will be completed spring of 2002. Data from an ODF/DEQ shade study will be collected over the summer of 1999 and a final report will be completed in the Summer of 2000. Information from the ad hoc committee advisory process may be available by Summer of 2000. Information from these efforts, along with other relevant information provided by the DEQ, will be considered in reaching a determination on whether the existing FPA BMPs meet water quality standards within the Rogue basin.

The above adaptive management process may result in findings that indicate changes are needed to the current forest practice rules to protect water quality. Any rule making that occurs must comply with the standards articulated under ORS 527.714(5). This statute requires, among other things, that regulatory and non-regulatory alternatives have been considered and that the benefits provided by a new rule are in proportion to the degree that existing forest practices contribute to the overall resource concern.

Appendix C

Water Quality Management Plan (WQMP)
Lobster Creek Watershed

Siskiyou National Forest
Lincoln Timber LLC and The Campbell Group
Lower Rogue Watershed Council
Oregon Department of Environmental Quality

October 2001

Watershed at a Glance	
Watershed	Lobster Creek WS 44,253 acres National Forest 26,862 acres Lincoln Timber LLC 13,300 acres
Watershed Identifier (Hydrologic Unit Code)	1710031007
303(d) listed Parameters • Lobster Creek: Mouth to Headwaters • North Fork Lobster: Mouth to RM3 • South Fork Lobster: Mouth to Iron Cr.	 • Temperature • Temperature • Temperature
Key Resources and Uses	Salmonid Fish, Recreation, Mining
Known Impacts	Roads, Timber Harvest, Mining, Fire, Floods

List of Authors

Connie Risley	Siskiyou NF, Gold Beach RD
Bruce Follansbee	Lower Rogue Watershed Council
Mark Weinhold	Siskiyou NF, Powers RD

Contributors

Cindy Myers	Lower Rogue Watershed Council
Greg Bennett	Siskiyou Research Group
Other watershed council folks	Lower Rogue Watershed Council
Pam Blake	Oregon DEQ
John Hawkins	Siskiyou NF, Gold Beach RD
Chris Park	Siskiyou NF
Kim Buckley	Lincoln Timber LLC as managed by The Campbell Group

Statement of Purpose

This WQMP is prepared to meet the requirements of Section 303(d) of the 1972 Federal Clean Water Act.

Table of Contents

List of Maps and Figures

These maps and figures are referenced clearly throughout the document and have been placed into Chapter 2 Appendix C-1. These visual aids were placed here to facilitate printing, electronic transfer, download, and management of this document.

List of Tables

Element One: *Condition Assessment and Problem Description*

I. Project Overview

The Lobster Creek Watershed is entirely located in Curry County, Oregon and is tributary to the lower Rogue River (See Vicinity and Watershed Maps, WQMP Appendix C 1.1 and 1.2). Lobster Creek has 69 square miles or 44,253 acres in the watershed. The headwaters are near the ridge bordering the Elk River to the north and its confluence with the Rogue River is ten miles upstream from Gold Beach. Over 60 percent of the watershed is under United States Forest Service management, 1% in state and county ownership, and 35% in private ownership. USFS ownership is primarily comprised of the South Fork Lobster, North Fork Lobster, and Lost Valley Creek. Lincoln Timber LLC as managed by The Campbell Group manages most of the land draining into the mainstem of Lobster Creek, plus some of the southern portion of the South Fork. The Bureau of Land Management (BLM), the State of Oregon, Curry County, and other private landowners own or manage smaller portions of the watershed. (See Land Ownership Map Chapter 2 Appendix C-1.3).

The majority of the land in private ownership is held by Lincoln Timber LLC and is managed on contract by The Campbell Group. This plan addresses federally managed ownership's (BLM, USFS) as well as the 13,300 acres owned by Lincoln Timber LLC and managed by The Campbell Group. These private timber lands begin just upstream of the confluence between Lobster Creek and the Rogue River and extend upstream to the National Forest boundary.

The watershed includes a mixture of igneous, metamorphic and sedimentary rock formations. Slopes range from low to moderate averaging from 30-50% in the south half of the watershed and from 40-70% in the north half. Elevations range from 40 feet to over 3800 feet.

The dominant erosion process in the watershed is landslides with surface erosion occurring on exposed surfaces such as roads and landings. The USFS mapped landslides on aerial photos from 1940, 1969 and 1986. The subsequent analysis indicates that the natural background level of landslide activity equaled 7.6 acres/1000 acres in 1940 before significant harvest began. In 1969, natural landslides accounted for 74% of the 16.7 acres/1000 acres. In 1986, natural landslides accounted for 50% of the 6.8 acres/1000 acres.

The mainstem of Lobster Creek was placed on the 1998 303(d) list of water quality limited streams (DEQ, 1998). The mainstem and both forks are listed for "stream temperature – summer" from mouth to headwaters. None of the tributary streams are listed for impaired water quality.

Table 1. 303d Listed Stream Segments.

Mainstem (mouth to headwaters)
North Fork (mouth to RM3)
South Fork (mouth to Iron Creek)

The primary beneficial use for the water in this watershed is the salmonid fish population. Lobster Creek Watershed is the most important fish-producing unit in the lower Rogue River.

Lobster Creek Watershed supports a variety of resident and anadromous fish species. These include coho and chinook salmon, steelhead, searun and resident cutthroat trout, and resident rainbow trout.

Lincoln Timber LLC owns and manages approximately 13,300 acres within the WQMP assessment area. Management emphasis on this land is maximizing wood fiber production consistent with environmental protection standards dictated by state Forest Practice Rules and company guidelines.

This WQMP is being written as a cooperative effort between the Lincoln Timber LLC as managed by The Campbell Group, US Forest Service, and the Lower Rogue Watershed Council.

Federal Lands

The Lobster Creek Watershed is not a tier 1 key watershed as defined in the President's Northwest Forest Plan (USDA,USDI, 1994). Lobster Creek supports a variety of resident and anadromous fish. The list includes coho and chinook salmon, steelhead, searun and resident cutthroats, and resident rainbow trout. Non-salmonid species of fish in Lobster Creek include the anadromous Pacific lamprey and three species of sculpin. The lower mainstem also has redside shiners, northern squawfish, and three-spined sticklebacks. (The known current distribution of these species is shown in Chapter 2 Appendix C1.6.)

Within the National Forest, management activities are limited by the management allocation assigned to that area. The primary federal management allocations within the Lobster Creek Watershed are shown in the Management Areas Map (Chapter 2 Appendix C1.4) and their definition and percent of the land base are shown below.

Table 2. National Forest Management Allocations

Management Allocation	**Percent of National Forest land**
Late Successional Reserve	66 %
Matrix	21 %
Riparian Reserve	5 % (perennial and large intermittent streams only)

The remaining small percentages of National Forest land are designated as botanical, supplemental resource, unique interest areas, and special wildlife sites.

Late Successional Reserves (LSR) are areas designed to serve as habitat for late-seral and old-growth related species. They are to be managed to protect and enhance old-growth forest conditions. No programmed timber harvest is allowed inside the reserves. However, thinning or other silvicultural treatments inside these reserves may occur in young to mature stands if the treatments are beneficial to the creation and maintenance of late-seral forest conditions.

Matrix designated land is the area in which most timber harvest and other silvicultural activities will be conducted. Standards and guidelines assure appropriate conservation of ecosystems as well as provide habitat for rare and lesser-known species.

Riparian Reserves are areas along all streams, wetlands, ponds, lakes, and unstable or potentially unstable areas. Conservation of aquatic and riparian-dependent terrestrial resources receives primary emphasis in these areas. Under the Aquatic Conservation Strategy, Riparian Reserves are used to maintain and restore riparian structures and functions of intermittent streams, confer benefits to riparian dependent and associated species other than fish, 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 between the LSRs. Because of these objectives, the scope and intensity of management activities within the reserves are limited to those measures that will enhance the desired characteristics. Thinning can be an appropriate activity within the reserves. Interim widths necessary to meet the Aquatic Conservation Strategy objectives for different water bodies are established based on ecological and geomorphic factors. These widths are designed to provide a high level of fish habitat and riparian protection until watershed and site analysis can be completed. Initial boundary widths for Riparian Reserves are as follows (ROD, pp C-30 and C-31):

Fish Bearing Streams: Riparian Reserves consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet total, including both sides of the stream channel), whichever is greater.

Permanently flowing nonfish-bearing streams: Riparian Reserves consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, including both sides of the stream channel), whichever is greater.

Seasonally flowing or intermittent streams, wetlands less than one acre, and unstable and potentially unstable areas: This category applies to features with high variability in size and site-specific characteristics. At a minimum the Riparian Reserves must include:

> The extent of unstable or potentially unstable areas (including earthflows),
>
> The stream channel and extend to the top of the inner gorge,
>
> The stream channel or wetland and the area from the edges of the stream channel or wetland to the outer edges of the riparian vegetation, and
>
> Extension from the edges of the stream channel to a distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest.
>
> A site potential tree is the average maximum height of the tallest dominant trees (200 years or older) for a given site class.

Intermittent streams are defined as any non-permanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two physical criteria.

It is clear from the Management Areas Map and the requirements for riparian buffers that the majority of National Forest land is protected from intensive management that might directly affect the 303(d) listed parameters. Where timber harvest other than thinning is scheduled to occur (matrix lands), the large widths of the riparian buffers should guarantee the integrity of the riparian system.

Lincoln Timber LLC

The Oregon Forest Practice Rules affect forest management on company lands in a number of ways that may potentially have implications for waterbodies and water quality, including:

1) Clear-cut size limitations. Clear-cut harvest units can generally not exceed 120 acres in size.

2) **Clear-cut adjacency restrictions**. Planned clear-cut harvest units can not be located adjacent to an existing clear-cut area until the prior harvested area has been successfully regenerated with seedlings four feet or taller in average height or at least four years of age.

3) **In-unit leave tree retention**. Two trees per clear-cut harvest acre must be retained following harvest.

4) **Riparian retention zones**. Riparian management areas (RMAs) must be retained on all "Large"- and "Medium"- sized streams, as well as "Small" streams bearing fish and having domestic use. RMA width is a function of size of stream (based upon drainage acreage), presence/absence of fish, and existing basal area of conifers. In most cases the buffer distances are the default width of:

- o Large Fish--100 feet
- o Medium Fish--70 feet
- o Medium No Fish--50 feet
- o Small Fish--50 feet

Non-fish bearing streams occur throughout the Lobster Creek Watershed drainage. Excessive stream gradient and/or outright barriers, such as waterfalls, are responsible for their lack of fish. "Small" streams without fish have no state riparian retention requirements. Landowners are encouraged to retain understory vegetation, non-merchantable trees, and leave trees. Operators are required to minimize disturbances to soils during logging or site preparation.

5) **Domestic water source protection**. Streams serving as registered domestic water sources require protection that is determined on a site-specific basis.

6) **Significant wetlands protection**. Significant wetlands (greater than 8 acres in size) require buffers with retention of 50 percent of live trees by species and size categories.

7) **Written plan requirements.** Approved written plans are required before conducting forest operations within 100 feet of fish use or domestic use streams, 300 feet of significant wetlands, or 100 feet of large lakes. These plans must describe practices and methods to be used to prevent sediment from entering waters of the state.

8) **Site preparation considerations**. Site preparation must be done so that sediment and debris do not enter waters of the state.

9) **Riparian hardwood conversion opportunities**. Landowners have the option of harvesting portions of hardwood-dominated riparian areas, following state review and approval, with a goal of establishing conifers in the riparian areas.

10) **Skidding and yarding considerations**. Methods and equipment of skidding and yarding will be selected to minimize erosion and protect water quality.

11) **Landing size considerations**. Size and location of landings will be selected to minimize risk of material entering streams.

12) **Road construction and reconstruction rules**. New road construction must incorporate a number of environmental mitigations, including: installing stream culverts capable of passing 50-year floods; installing culverts in fish streams capable of passing fish; avoiding, where possible, high slide-risk slopes; avoiding, where possible, roads paralleling close to streams; and requiring, on steep slopes, excavation and endhaul of material to stable disposal sites.

13) **Assessment of "High Risk" slide areas**. Written plans are required when considering harvest or road constructions in high risk slide areas. Field reviews are conducted and mitigation, including foregoing of proposed activities may be required.

14) **Drainage control of landings and trails**. Drainage systems of landings, skid trails, and fire trails are to disperse and filter runoff to minimize sediment entering waters of the State.

In addition to state Forestry Practice Rules, the Oregon Salmon Plan was initiated in 1997 and includes a number of elements that potentially lead to improvements in fisheries and water quality. Pertinent elements include:

1) **Legacy road inventory**. Oregon Forest Industry Council (OFIC) members, including Lincoln Timber LLC, agreed to voluntarily inventory roads built prior to the Oregon Forest Practice Rules (1972). The inventories focus on identifying culverts posing fish passage problems or inability to pass 50-year flood events; road-related sedimentation sources; opportunities to reduce sediment discharge from roads; and identifying fill-slopes having landslide potential.

2) **Legacy road improvement**. Following legacy road inventories, problems are prioritized for correction. Work can be completed during normal maintenance, reconstruction, or on an individual site basis.

3) **In-unit leave tree retention in Riparian Management Areas**. OFIC members are encouraged to locate their harvest unit in-unit leave trees in or adjacent to riparian areas, especially in those streams classified high value to anadromous fish ("Core Area streams").

4) **Voluntary additional riparian protection and enhancement actions**. The Oregon Salmon Plan encourages timberland owners to convert riparian hardwood stands into conifers;

retain conifers above and beyond required forest practice rule requirements along both "Fish" and "No Fish" streams; and complete habitat enhancement projects in streams.

II. Condition Assessment

STREAM TEMPERATURE

The stream temperature standard for western Oregon includes a numeric of 64 degrees Fahrenheit to protect general trout and salmon use during warm summer months (OAR 340-41-0365). This criterion applies where those uses occur or are designated beneficial uses for the stream segment. The unit of measurement in the numeric criteria is the 7-day moving average of the daily maximum temperatures. Chapter 2 Appendix C1.7 shows the Lobster Creek Watershed stream network and both current and historic stream temperature monitoring locations. Temperature data collected at these locations are shown in the Table 3 below:

Table 3. Stream Temperature Monitoring Data (temperatures in degrees Fahrenheit)

Map Site No.	Location	Years of Record	Min 7-day of record	Max 7-day of record	Avg. 7-day of record	Data Source
	Lobster Creek Mainstem					
1	Mouth	1990-1999	66.3	69.8	67.4	USFS
16	In gorge	1999		66.3		WS Council
2	Below Deadline	1997-1999	67.3	70.1	69.0	WS Council
4	REMAP Site	1997 & 1999	69.4	69.0	69.2	WS Council
17	Above Lost Valley	1999			67.2	WS Council
	Tributaries to Mainstem					
3	Deadline Creek at mouth	1997-1999	62.4	63.6	63.0	WS Council
5	Fall Creek at bridge	1997-1999	62.6	63.1	62.8	WS Council
6	Lost Valley Creek at mouth	1997-1999	60.6	61.7	61.2	WS Council
	North Fork Lobster					
7	Mouth	1990-1998	62.6	65.0	64.3	USFS
8	At RM 3	1996			62.7	USFS
	South Fork Lobster					
9	Mouth	1994-1998	66.6	68.6	67.3	USFS
10	At RM 3	1996 & 1998	63.7	64.9	64.3	USFS
11	At Rd 3310 Bridge, RM 4.3	1990-1998	60.2	63.0	62.0	USFS
12	1 Mile above Bridge	1999			59.8	USFS
13	Trib at 1 mile above Bridge	1999			60.0	USFS
14	Boulder Creek at Mouth	1991,1996,1998	63.0	64.1	63.5	USFS
15	Boulder Cr at Rd 3237 Bridge, RM 1.3	1996			61.3	USFS

- The average 7 day of record averages the 7 day maximum average temperature over the period of record.

Stream temperature is driven by the interaction of many variables. Energy exchange with the stream may involve solar radiation, longwave radiation, evaporative heat transfer, convective heat transfer, conduction, and advection (e.g. Beschta, 1984). While the interaction of these variables is complex, certain of them are much more important than others. For a stream with a given surface area and stream flow, any increase in the amount of heat entering a stream from solar radiation will have a proportional increase in stream temperature (Brown, 1972). Solar radiation is singularly the most important radiant energy source for the heating of streams during daytime conditions (Brown, 1984, Beschta, 1997).

Management activities can increase the amount of solar radiation entering a steam by harvesting riparian shade trees and through the introduction of bedload sediment resulting in increases in the stream's surface area. Consumptive water use is not a factor in the Lobster Creek Watershed as there are no water withdrawals in the watershed. The Lobster Creek Watershed WQMP was developed to address stream shade and changes in channel form, as these management factors may contribute to water temperature problems.

Disturbance of the riparian area and stream channel from wild fires and storms can also lead to increases in summer stream temperatures. These are considered natural processes and are expected change agents considered for federal lands in the Aquatic Conservation Strategy (USDA,USDI, 1994). Recovery of riparian vegetation in areas disturbed by disease, fire, and flood will most likely be offset by future events. The gain or loss of riparian vegetation by natural processes will fluctuate within the range of natural variability for this watershed. The influences of these natural processes have not been quantified in the scope of this assessment. Wildfire suppression policies of the past 100 years have likely reduced the influence of fire as a natural event effecting riparian shade quality. The plan focuses on areas where management activities have exacerbated disturbance and possibly affected water quality.

Chapter 2 Appendix C-1.8, 9, and 10 show the 1999 longitudinal profile of Lobster Creek and the 1998 South Fork Lobster Creek longitudinal profile. Figure 10 provides a temperature schematic with the amount of temperature change per mile in 1998. Areas of significant heating per mile suggest those locations in which stream shade increases will be most productive. Initial areas of opportunity are all monitored segments of the South Fork Lobster Creek including Boulder Creek, ranging from 1.2° Fahrenheit per mile to 3.2° per mile. The greatest opportunity would appear to be the 3.2° per mile increase between RM 5.3 and RM 4.3 on the South Fork.

These data indicate that most heating occurs in the South Fork of Lobster Creek between the Road 3310 bridge and the mouth of the South Fork. This heating reach has a broad, shallow channel within a rocky, sparsely vegetated inner gorge. Lobster Creek continues heating until it reaches Deadline Creek, and then cools from there to the mouth. Oregon Department of Fish & Wildlife (ODFW) reports that many subsurface springs in the mainstem offset solar heating in this segment.

Temperature Factor: Stream Shade

When a stream is exposed to midday solar radiation, large quantities of heat energy will be imparted to the stream system, usually resulting in an increase in water temperature. Riparian shade trees play a significant role in reducing this exposure. This assessment systematically determined the existing stream shade conditions and then determined the percent shaded stream for each segment using the SHADOW model (Park, 1993). Aerial photos and field reconnaissance were both used to quantify shade values as well as the potential for recovery and over what time frame. See Chapter 2 Appendix C-2 for the executive summary of methods utilized for the Riparian Shade Assessment. Input variables used for analysis and development of shade curves shown in Chapter 2 Appendix C-4 include low flow wetted stream width, riparian tree height, shade density, and stream orientation. For modeling purposes, these curves assumed a common hillslope gradient and offsets from edge of wetted channel to beginning of riparian vegetation.

Lobster Creek was then divided into representative reaches based on orientation and riparian condition. Tributaries contributing 5 percent or more of the drainage area to the mainstem, as measured at the point of confluence, were assumed to influence mainstem temperatures and were included in the assessment.

For private lands the mainstem and primary tributaries accounted for approximately 240 evaluation reaches. Field measurements at 23 sites included bankfull and low flow channel width, streambank slope, distance from bankfull to riparian vegetation, tree heights, and percent overhang and shade density. Federal Land Managers evaluated approximately 225 reaches.

Existing shade values were calculated from the existing conditions of shade density, stream wetted width, and tree height. Forest Service personnel determined values for stream segments on Lost Valley Creek, North Fork Lobster, and South Fork Lobster except for the first tributary above the mouth of the South Fork. Watershed Council personnel determined values for stream segments on Lincoln Timber LLC land ownership. "Target" shade values were also predicted for the same reach based on expected future riparian tree type and shade characteristics. Reference sites were examined to determine system potential future conditions. The model SHADOW was again used to project future condition shade values. The difference in these two values represents the target shade increase.

It is understood that human and natural disturbances will likely occur within riparian stands in the future; however, these changes would be very difficult to predict or model. Given the likelihood of future riparian area disturbances, especially from disease, flood, or fire, the "target" shade increase values predicted by the SHADOW model should be assumed to be a theoretical goal, based on the potential of undisturbed riparian stands to develop shade. The influences of natural riparian disturbances have not been quantified in the scope of this assessment. Wildfire suppression policies of the past 100 years have likely resulted in some reduction of the impacts that fire may have had on riparian shade quality.

Table 4 below displays the existing and target shade values for Federal Lands inclusive of Lost Valley Creek, the North and South Forks of Lobster Creek, and Boulder Creek, and their primary tributaries. The values shown are weighted averages based on the reach length and total length of perennial stream analyzed. Raw data sets per individual stream segment are available for review upon request.

Table 4: Lobster Creek Watershed Shade Condition Assessment (National Forest Portion)

Location	% Area at Confluence	Existing Shade Percent	Potential Shade Percent	Predicted Shade Increase Percent	Sources of Historical Disturbance
Lost Valley Cr	9	93	96	3	Road/Harvest
NF Lobster	38	94	96	2	Road/Harvest
SF Lobster Below Boulder Cr	62	73	74	1	Road/Harvest And Mining
Boulder Cr	26	87	92	5	Road/Harvest And Mining
SF Lobster Above Boulder Cr	74	93	96	3	Road/Harvest And Mining

Table 5 displays the existing and potential shade values for the mainstem Lobster Creek and its primary tributaries. The values shown are weighted averages based on the reach length and total length of perennial stream analyzed. Raw data sets per individual stream segment are available for review upon request.

Table 5: Lobster Creek Shade Condition Assessment (Lincoln Timber LLC)

Location	Stream Miles	Existing Shade Percent	Potential Shade Percent	Predicted Shade Increase Percent
South Fork Lobster	1.7	90	94	4
Fall Creek	10.2	88	93	4
Deadline Creek	4.6	90	93	1
Mainstem Lobster	25.1	80	88	9

Table 6 displays summary existing and potential shade values for the Lobster Creek Watershed

Table 6: Lobster Creek Watershed Shade Condition Assessment

Location	Existing Shade Percent	Potential Shade Percent	Predicted Shade Increase Percent
South Fork Lobster	89	91	2
North Fork Lobster	94	96	2
Boulder Cr.	87	92	5
Lost Valley	93	96	3
Fall Creek	88	93	4
Deadline Creek	90	93	1
Mainstem Lobster	80	88	9

Loss of shade from management has been primarily due to timber harvest activities prior to the 1990s and possibly from mining activities in the watershed dating from the 1800s to the early 1900s. Small scale suction dredging still occurs over a wide area in the basin but has resulted in relatively little damage to riparian shade or channel form. Recreational mining is concentrated in the Boulder Creek watershed and to a lesser extent along the mainstem South Fork Lobster Creek. Current State law limits suction dredges to a maximum 4-inch diameter nozzle size and the activity requires NPDES permitting.

Floods and fires have also played a role in disturbing riparian vegetation and reducing stream shade values. Openings in the riparian canopy along stream channels were somewhat wider in the 1969 aerial photos than in previous years, probably as a result of the 1955 and 1964 flood events. A summary of natural and anthropogenic disturbance to the riparian area is represented by the Seral Stages Map located in Chapter 2 Appendix 1.8.

Port Orford cedar root rot (Phytophthora lateralis) may have localized effects on riparian shade in some reaches through mortality of Port Orford cedars in the riparian zone. It is not expected that mortality from this disease will have a measurable effect on shade in the Lobster Creek Watershed.

To assess present stream shade condition on perennial streams for the 1999 Lobster Creek Watershed Assessment, the age of riparian vegetation throughout the watershed was estimated based on information available in the Siskiyou National Forest Geographic Information Systems (GIS). Within the National Forest and the State of Oregon land, these data were interpreted from satellite imagery (PMR). On Lincoln Timber LLC and BLM land, the stand origin dates were used. On other privately owned land, an estimate of age was made based on the overall appearance of the vegetation on the 1997 aerial photos. These estimates are general, inconsistent between ownerships, and intended only to give a rough indication of streamside vegetation.

Table 7 below shows a summary of the seral stage of the vegetation throughout the basin. Definitions (based on age) of the various riparian seral stages are given at the end of Table 7.

The widths of riparian areas considered for this GIS data were the interim riparian widths from the Northwest Forest Plan ROD for National Forest lands (USDA and USDI, 1994). For other ownerships, a width of 100 feet each side of Lobster Creek and 50 feet each side of its tributaries was used as an approximation of Oregon Forest Practices riparian widths.

Table 7: Riparian Seral Stages From GIS Data*

Seventh Field WS	Riparian Acres	% Late Seral	% Mid Seral	% Early Seral	% Pioneer	% Rock	% Mid & Late Seral
20L01F	140	4	11	64	16	6	15
20L02W	38	5		95			5
20L03F	86			88	12		
20L04W	48			96			
20L05F	131			94	6		
20L06W	63			89	10		
20L07F	93	3	2	86	9		5
20L08W	67	3	3	94			6
20L09F	225	8	4	77	11	1	12
20L10W	624	37	5	25	33		42
20N01F	543	45	4	30	21		49
20N02W	392	40	3	30	26		43
20N03W	345	33	1	39	26	1	34
20N04W	333	56	5	15	24		61
20N05W	244	63	4	13	19	1	67
20N06W	263	76	2	10	13		78
20N07F	309	64	3	21	12		67
20S01F	635	37	10	24	28	1	47
20S02W	51	16	2	75	6		18
20S03W	62	47	2	39	13		49

Seventh Field WS	Riparian Acres	% Late Seral	% Mid Seral	% Early Seral	% Pioneer	% Rock	% Mid & Late Seral
20S04W	803	33	7	19	39	2	40
20S05W	462	56	6	19	19	1	62
20S06W	317	50	5	15	28	2	55
20S07W	446	57	2	26	15		59
20S08W	402	35	2	43	20		37
20S09F	248	56	5	13	25		61

* Categories below are developed based upon tree height.
  Pioneer- 0 to 10 years
  Early- 11 to 60 years
  Mid- 61 to 100 years
  Late- Over 100 years

This information has been generated utilizing a GIS layer. This layer was developed from imagery providing 30 meter pixel resolution. The predominant seral stage was characterized. Because of the resolution, narrow riparian areas may not be recognized. The shade assessment in this document (Shadow) does provide improved resolution (aerial photo interpretation of 1:24K aerial series).

Only in seventh field watershed 20N06W does the riparian cover approach the 80 percent usually considered by the USFS to be the natural condition for Douglas-fir forest. Aerial photo analysis and field observations could find that actual riparian cover provided by hardwoods and smaller trees is providing good stream shading in other seventh field watersheds. The predominant conifer seral stages are identified and categorized.

Potential tree heights and shade densities were based on measured and estimated tree heights in adjacent areas that had not been disturbed by human activities. Douglas-fir in the watershed can grow to a height of 160 feet and provide densities of 80 %. Potential shade was differs from existing shade in riparian areas that had been harvested, or where it seems reasonable to assume that future vegetation would be different from what is there today, with natural growth.

Temperature Factor: Channel Form (Sediment)

Changes in either sediment input or stream discharge can lead to changes in channel form (Leopold et al., 1964). When the amount of sediment entering a reach exceeds the transport capacity of a stream, the sediment is deposited. This can lead to the channel becoming shallower and/or wider. For the same discharge, a wide, shallow stream will heat up faster than a narrow, deep stream (Brown, 1972). However, when stream water flows subsurface through gravels, it can also be shaded from solar radiation, maintaining cooler temperatures. Management activities can contribute to either process by increasing sediment inputs over natural levels.

Federal Lands

The presence and activity level of many large, naturally occurring mass wasting features most often overshadow management related sediment inputs in this geomorphic province. Geologic factors are assessed as the primary cause of the heating reach on the South Fork of Lobster Creek, from Boulder Creek to its confluence with the North Fork. Several inner gorge landslides along this reach appear on the 1956 aerial photos, prior to harvest and roading. One is a reactivated slide that appeared to be healing on the 1940 photos. These were probably activated by the 1955 flood, which removed riparian vegetation, widened the canopy opening, and aggraded the channel. On the later

photos taken through 1988, these conditions persist with little change along a mile of the segment below the largest slide. Additionally, timber was harvested nearly to the channel along half of this aggraded mile in 1964 and 1965. On the 1997 aerial photos, riparian vegetation has grown and is covering more of the channel than in 1986.

It is difficult to definitively say that management related sediment is the cause of any channel form issues in the Lobster Creek Watershed. The assumption made here is that management related sediment will potentially have an impact on the system, and that efforts to reduce management related inputs will be implemented.

Furniss et al. (1991), concluded that forest roads contributed more sediment than all other forest activities combined on a per unit area basis. Roads are primary sources of sediments to streams, both through chronic erosion and as trigger points of mass failures (Spence et al., 1996). To reduce potential channel plan and profile adjustments initiated by increased sediment loading, potential sources of management related sediment are being identified and treated.

Reducing management related sediment input is a primary focus of the westside Siskiyou National Forest restoration efforts. Techniques include road decommissioning, stormproofing (50 to 100 year events), culvert replacements, and installing diversion-prevention dips over stream crossings. The 1999 Lobster Creek Watershed Analysis includes a summary of the 1998 road and crossing inventories, and identifies priority seventh field watersheds for road treatments. These will be accomplished as funding permits.

Lincoln Timber LLC

Lincoln Timber LLC, as a member of the Oregon Forest Industries Council (OFIC), has agreed to inventory company roads built prior to the 1972 Oregon Forest Practices Act. These "legacy roads" will be evaluated for potential fillslope failures and sediment discharge. Significant problems identified will be corrected during maintenance or re-construction efforts. Examples of completed and expected corrective actions or mitigation procedures include: placing additional ditch-relief culverts; upgrading and enlarging stream culverts; and pulling unstable fills on sidecast road sections. Yearly summaries of completed projects have been and will be conveyed to the Oregon Watershed Enhancement Board (OWEB).

Lincoln Timber LLC also completed a road inventory in 1998, and priority treatment areas were identified in conjunction with the National Forest through the Lobster Partnership. Because of a high level of commitment and more readily available procedures and funding, nearly all of their high priority treatments have been completed.

Temperature Factor: Stream Flow

Temperature change for a given amount of heat is inversely proportional to the volume of water heated, or in other words, the discharge of the stream (Brown, 1985). A stream with less flow will heat faster than a stream with more flow given all other channel and riparian characteristics are the same.

Within the Lobster Creek Watershed, there are no consumptive water withdrawals. Timber harvest has the potential to increase water yield by removing agents of evapotranspiration. This may

increase summer base flows. Road construction has the potential to concentrate water, increasing storm flows thereby reducing upland storage of groundwater. Because of this road building can result in decreasing the amount available for summer base flows. The Lobster Creek Watershed Analysis found the following data:

Table 9. Timber Harvest within past Twenty Years and Road Densities

Subwatershed	Percent Harvested	Road Density, Miles/Sq Mi
Lost Valley Creek	21	3.3
North Fork Lobster	17	2.4
South Fork below Boulder Cr	14	2.9
Boulder Creek	10	2.8
South Fork above Boulder Cr	4	2.5

Fairly low road densities and the percent of the watershed disturbed in the past twenty years indicate a low to moderately low probability that flows have been altered by management activities. Note that areas managed by private timber entities have not been summarized in this chart. Road density and % harvested information is not currently available for the lower Lobster Watershed.

Solar Loading Calculations

Solar energy, calculated for the Lobster Creek Watershed as a maximum of 2440 BTU/square foot/day, can be used to give a numeric value for a Total Maximum Daily Load (TMDL). A load value has been derived (BTU's per square foot per day) based on the calculated shade values. Table 8 displays the existing solar loading and target loading. The target value is the load capacity (TMDL) and provides a reference for calculating the amount of pollutant reduction predicted (solar energy). The methodology used to collect data and derive this value is illustrated further in Chapter 2 Appendix C-3.

Table 8. Target Solar Loading or TMDL

	Target Shade Value	Existing Shade Value	Increase Predicted
USFS lands	93%	91%	2%
Lincoln Timber LLC lands	90%	83%	7%
All lands	92%	88%	4%

	Target Solar Loading or TMDL (BTU/sqft/day)	Existing Solar Loading (BTU/sqft/day)	Reduction Predicted (BTU/sqft/day)
USFS lands	171	220	49
Lincoln Timber LLC lands	244	407	165
All lands	195	293	98

Element Two: *Goals and Objectives*

Goals: ***Federal Lands***

- Reduce Lobster Creek summer stream temperatures leaving the National Forest. Accomplish this by increasing stream shade on the North Fork, South Fork, and other "non listed" tributaries that have been impacted by past management practices, and by decreasing the risk of road related sediment inputs. The Siskiyou National Forest Land and Resource Management Plan (Forest Plan) as amended by the Northwest Forest Plan ROD, specifically the Aquatic Conservation Strategy, provide the policy framework and direction for accomplishing these goals.

Goals: ***Lincoln Timber LLC***

- Reduce summer stream temperatures flowing from company lands. This will be accomplishment by shade canopy development along perennial streams following Oregon Forest Practice Rules and voluntary and discretionary aspects of the Oregon Salmon Plan.

Objectives: Given existing federal management direction as well as federal and state laws and rules governing timber harvest from private lands, and assuming SHADOW riparian stand growth projections, the following water quality objectives are proposed:

Table 10. Lobster Creek Watershed Water Quality Objectives.

Element (Factor)	Location	Current Condition	Projected Value, Based on Lack of Disturbance	Time Frame	Resp. Party
Temperature-Shade	Lost Valley Creek*	Shade = 93 %	Shade = 96 %	100 years	USFS/PVT
	North Fork Lobster	Shade = 94 %	Shade = 96 %	100 years	USFS
	South Fork Lobster below Boulder Cr*	Shade = 73 %	Shade = 74 %	100 years	USFS/PVT
	Boulder Creek	Shade = 87%	Shade = 92%	100 years	USFS
	Fall Creek	Shade = 88%	Shade = 93%	80 years	Lincoln
	Deadline Creek	Shade = 90%	Shade = 93%	75 years	Lincoln
	Mainstem Lobster Creek	Shade = 80%	Shade = 88%	75 years	Lincoln

* Lincoln Timber LLC lands are included in the USFS calculations for this subwatershed. USFS land only values for the South Fork Lobster Creek below Boulder Creek are: Current condition 93 % shade, Projected value 96 % with 100 years for recovery.

The time frame for recovery varies for each stream system. This value was estimated for each assessment reach as the amount of time required for conifer trees to reach their system potential height and condition. The actual time required for the trees to reach this stage is a function of the site class (productivity) of the soils/local environment. The longest time period for any reach within a given stream system was used as the time frame for full recovery in the previous table. Projected shade values, assuming no future disturbance, are based on species specific shade densities and tree heights. Some reaches have projected shade values that are lower than typical because of low productivity soils.

Interim benchmarks, where applicable, between the current and desired future conditions are listed in Table 13 of Element 4: Timeline for Implementation.

Element Three: *Proposed Management Measures*

Federal Lands

Recovery of the degraded water quality parameters listed on the 303(d) list on federal lands was boosted in 1994 with the amendment of the Siskiyou National Forest Land and Resource Management Plan by the Northwest Forest Plan (NWFP). This guidance document provided means and direction for both active and passive restoration measures. The philosophy focuses heavily on protecting areas with high quality aquatic and terrestrial resources and focusing restoration efforts on areas with the greatest potential for recovery. The intact areas serve as core areas to build out from in the restoration process as well as providing a blue print for desired future conditions. The following standards and guidelines from the NWFP will be used to attain the goals of the Lobster Creek Watershed WQMP:

Stream Temperature - Shade
Aquatic Conservation Strategy: B-9 to B-11, C-30
Standards and Guidelines for Key Watersheds: C-7
Riparian Vegetation: B-31
Riparian Reserves: B-12 to B-17 and ROD 9
Watershed Restoration: B-30

Stream Temperature - Channel Form
Aquatic Conservation Strategy: B-9 to B-11, C-30
Standards and Guidelines for Key Watersheds: C-7
Roads: B-19, B-31 to B-33

Flow Modification
Aquatic Conservation Strategy: B-9 to B-11, C-30
Roads: C-32

The following table presents the general management measures addressing each listing parameter along with active and passive restoration approaches required to meet that goal.

Table 11. Proposed Management Measures USFS.

Element	Goal/Objective	Passive Management	Active Management (no loss of shading)
Temperature - Shade	Achieve maximum shade value possible per stream reach.	Allow riparian vegetation to grow to target height and density. Follow direction in NWFP for riparian reserves.	Treatments that increase growth rates. Treatments that insure long term health. Plant conifers for future tall shade trees.
Temperature - Channel Form	Decrease management related bedload contributions during large storms. Increase amount of large wood delivered in mass wasting events.	Allow natural channel evolution to continue toward equilibrium. Allow historic failures to revegetate.	Identify and treat roads with high failure potential to reduce risk and magnitude of failure. Insure that unstable sites retain large wood to increase wood to sediment delivery ratio.

Each of the management measures is straightforward in its intent, application, and expected outcome. These types of treatment have been/are widely used and accepted as viable means of attaining the stated objective. With that in mind, no additional databased analysis to demonstrate the effectiveness of these measures is provided.

Each of the detailed management measures are designed to have a specific measurable result that can easily be verified by monitoring. This follow-up monitoring process (See Element Seven: Monitoring and Evaluation) will determine the effectiveness of the management measures. Based on that monitoring, it will be determined whether the recovery is occurring as desired or if the management measures need adjustment to produce the desired future outcome. Adjustment of the management measures could be as simple as slight field modifications of the type or locations of the proposed measures. More significant modifications on federal lands, if different from the original proposed action, may require additional public comment and a new decision notice from the District Ranger.

For an explanation of the mechanisms by which the application of these measures will be assured, see Element Six: Reasonable Assurance of Implementation.

Lincoln Timber LLC

Additional Oregon Forest Practice Rules, enacted in 1994, were designed to buffer streams in manners that effectively provided sediment filtering, retained stream shading, and maintained healthy summer-time water temperatures. These rules are recognized in statute as adequate to protect beneficial uses and meet water quality standards. DEQ has signed an agreement with Oregon Department of Forestry that provides a review of the rules, if needed, on a watershed-by-watershed as well as a statewide basis. Adhering to the Forest Practice Rules in the future will continue to provide water temperature and water quality protection to assessment area streams. Following existing riparian rules are predicted to result in increases in stream shading levels over time, as shown on Table 5. In addition, Lincoln Timber LLC, in strong support of the Oregon Salmon Plan, will consider a number of voluntary and discretionary actions, on a case-by-case

basis. These actions have the potential of speeding shade recovery and improving water quality, including:

1) Locating in-unit leave trees along the edges of streams where possible and appropriate. Highest priority will be along streams or stream-segments flowing North-South or quartering at North-West to South-East or North-East to South-West directions.

2) Avoidance of hardwood conversions in riparian areas on the south side of streams or along streams having the greatest potential of summer time warming (e.g., North-South flowing stream segments).

3) Inventory "legacy roads" (those constructed prior to 1972) and fish passage potential of stream culverts; potential sediment discharge to streams; and fillslope landslide potential. Significant problems will be prioritized for improvement with the work being accomplished during either regular maintenance operations, periodic road reconstruction activities, or specific contracts to deal with individual problems.

4) Place straw bales and/or construct sediment catchment basins as needed along roads.

5) Replace culverts creating fish passage problems.

6) Install cross-drains to divert ditchflow to gentle sediment settling areas rather than streams.

7) Limit use of unsurfaced roads during wet seasons.

Lincoln Timber LLC has an ongoing program, in partnership with the Lower Rogue Watershed Council (LRWC), to inventory company roads built prior to the 1972 Oregon Forest Practices Act. These "legacy roads" are being evaluated for failing/undersized culverts, chronic sediment discharge, and potential fillslope failures. Significant problems identified are being corrected during maintenance or re-construction efforts. Cooperative projects with the LRWC (cost-share funding by Oregon Watershed Enhancement Board [OWEB] and DEQ/319) have been completed and are ongoing. Examples of completed and ongoing corrective actions or mitigation procedures include: placing additional ditch-relief culverts; upgrading and enlarging stream culverts; pulling unstable fills on sidecast road sections; and planting riparian species along unshaded sections of the mainstem Lobster Creek. Yearly summaries of completed projects have been and will be conveyed to the OWEB). These sediment abatement activities will ensure that channel health and stability are maintained and improved.

Active riparian management activities on private timber holdings would occur when opportunities exist to conduct such activities. These opportunities are usually associated with similar activities that are occurring on adjacent upland sites.

Table 12: Proposed Management Measures Lincoln Timber LLC.

Element	Goal/Objective	Passive Management	Active Management (no loss of shading)
Temperature - Shade	Achieve maximum shade value possible per stream reach.	Allow riparian vegetation to grow to reach target height and density. Follow standards and guidelines in OFPA for riparian reserves.	Treatments that increase growth rates. Treatments that insure long term health. Plant conifers for future tall shade trees.
Temperature – Channel Form	Minimize management related sediment inputs. Increase amount of large wood delivered in mass wasting events.	Allow natural channel evolution to continue toward equilibrium. Allow historic failures to revegetate.	Identify and treat roads with high failure potential to reduce risk and magnitude of failure. Insure that unstable sites retain large wood to increase wood to sediment delivery ratio.

Element Four: *Timeline for Implementation*

The time frame for accomplishing the interim benchmarks and objectives of the WQMP are shown in Table 13. Both interim benchmarks and plan objectives are based on the assumption of no natural or man-caused disturbances to riparian areas that would affect their shade-producing attributes. It is possible that natural disturbances may affect predicted riparian canopy development or that SHADOW may not precisely predict riparian shade development. If so, it is understood that either the interim benchmarks and plan objectives may require adjustment. The influences of natural processes are not quantified in the scope of this assessment. Wildfire suppression policies of the past 100 years have likely reduced the influence of fire as a natural event on riparian shade quality.

Table 13. Lobster Creek Watershed Timeline for WQMP Implementation.

Element (Factor)	Location	Objective	Start Date	Interim Benchmark	Time to Reach Objective
Temperature-Shade	Lost Valley Creek**	Increase shade 3 %	Current	None	Year 2100
	NF Lobster	Increase shade 2 %	Current	None	Year 2100
	SF Lobster below Boulder Creek **	Increase shade 1 %	Current	None	Year 2100
	Boulder Creek	Increase shade 5 %	Current	None	Year 2100
	SF Lobster above Boulder Creek	Increase shade 3 %	Current	None	Year 2100
	Fall Creek	Increase shade 4 %	Current	None	Year 2081
	Deadline Creek	Increase shade 3 %	Current	None	Year 2076
	Mainstem	Increase shade 9 %	Current	Increase shade 7% by the year 2061	Year 2076
Temperature - Channel Form	Basin Wide	Reduce Mgmt Related Sediment in Large Storms	Current	% watershed stormproofed	Continuous (design/retrofit to 50 year event)
	Basin Wide	Eliminate/Upgrade Roads in Unstable Terrain	Current	% watershed stormproofed	Continuous (design/retrofit to 50 year event)
	Basin Wide	Eliminate High Risk Stream Crossings	Current	% watershed stormproofed	Continuous (design/retrofit to 50 year event)

** Lincoln Timber LLC owns lands in these drainages.

High risk stream crossings are those facilities that:

- the risk of failure in a 50 year storm event is present
- unstable terrain are those areas that have the potential for mass failure
- the site has the potential to directly deliver sediment to the stream

Interim benchmarks were set at 90% of the potential shade increase. Interim benchmarks were not set for areas where the difference between the interim benchmark and final potential shade is smaller than the error margin for the initial shade readings. These areas will be assessed at the identified "Time to Reach Objectives" to determine progress towards meeting system potential shade objectives.

* DEQ will seek to work with DMA's and partners to identify riparian areas where measurable shade increases were predicted by Shadow modeling. The Shadow assessment provides reach specific information regarding current and future potential shading conditions. Although recovery interim benchmarks are very long term and difficult to measure on a watershed scale, site specific shade recovery can be monitored in the near term. Some site specific shade recovery targets exceed 50%.

The implementation plan for federal ownership targets treatment at the sources of the water quality problems prior to expending funds elsewhere. Management activities that adversely affect shade characteristics in riparian zones have been discontinued so that current planting and thinning operations can be expected to be functional and effective over the long term. Similarly,

anthropogenic sediment sources affecting channel form are being identified and treated prior to any instream treatments or channel side planting.

Federal operations are targeted at the watershed at a whole, with priority actions going to areas with a high potential to adversely impact water quality and high recovery potential. This does not always coincide with the concept of working from the top of the watershed to the bottom.

Element Five: *Identification of Responsible Participants*

Federal Lands

As shown previously in Table 10, the Siskiyou National Forest will be responsible for implementing the practices aimed at improving water quality within the National Forest. The commitments, benchmarks and timelines were listed previously.

Lincoln Timber LLC

Responsibility for actions on Lincoln Timber LLC lands will be with Lincoln Timber LLC. The amount of other private lands ownership within riparian areas is minimal. Practices on these lands are governed by the Oregon Forest Practices Act. Other private lands are considered beyond the scope of Lincoln Timber LLC stated intentions within this WQMP.

Element Six: *Reasonable Assurance of Implementation*

Federal Lands

The US Forest Service is responsible for the implementation of the WQMP for the Siskiyou National Forest land of the Lobster Creek Watershed. Implementation of the plan is insured by the amendment of the Siskiyou National Forest Land and Resource Management Plan by the Northwest Forest Plan in 1994. The standards and guidelines set forth in the Record of Decision implemented the Aquatic Conservation Strategy, which encompasses the objectives and practices laid out in this WQMP. The protective elements of this plan have been in effect since 1994 and many of the restorative elements are already under way. Action by the Legislative or Executive branch of the Federal Government would be necessary to change the policy aspects of the NWFP. Therefore, addressing the issue of enforcement on "bad actors" is not relevant to the federal ownership. Financial conditions will determine the rate of the restorative aspects. See Element 10: Discussion of Costs and Funding for more details regarding budgets.

As previously stated, the model and assumptions used in predicting riparian shade development over time are based on the notion of neither anthropogenic or natural disturbances to riparian stands. These assumptions, even considering their inherent flaws, were used due to the difficulty of incorporating impacts of stochastic disturbance events into the model. Hence, the predicted shade increases depicted in this WQMP should be considered as goals to be striven toward and that monitoring will indicate if these goals are actually attainable. The influences of natural riparian disturbances have not been quantified within the scope of this assessment. Wildfire suppression policies of the past 100 years have likely resulted in some reduction of the impacts that fire may have had on riparian shade quality.

Lincoln Timber LLC

Existing Oregon Forest Practice Rules currently requires many of Lincoln Timber LLC actions proposed in this document. The Oregon Department of Forestry reviews harvest, reforestation, and road-related projects on private lands to ensure these rules are followed. If violations are identified, citations and repair orders may be issued. In addition, prosecution and civil penalties are possible.

Lincoln Timber LLC is a strong supporter of the Oregon Salmon Plan and expects to continue with the voluntary and discretionary actions covered in that plan. Potential projects covered under this voluntary plan were discussed in previous sections.

Element Seven: *Monitoring and Evaluation*

The goal of the monitoring program is to insure treatments are being implemented properly and to detect improvements in water quality conditions as well as progress toward reaching the water quality standard. The parameter of evaluation will vary depending on the treatment.

TEMPERATURE

Federal Lands

Stream Temperature

The Gold Beach Ranger District will continue to monitor stream temperatures throughout the National Forest lands of the Lobster Creek Watershed in order to detect any changes in temperature from long term data sets. The district maintains several long-term monitoring sites as well as several other project-specific, short-term sites. Core long-term monitoring sites are maintained at the following locations:

- Mainstem Lobster Creek at Mouth
- North Fork Lobster Creek at Mouth
- South Fork Lobster Creek at Mouth and at Ol Diggins Bridge

Monitoring will continue annually by district personnel using automatic temperature recorders. Data reported typically includes 7-day maximum, instantaneous peak and day, days over the numeric criteria of 64°F for juvenile cold water fish rearing, and maximum diurnal fluctuation (delta t). Sampling methods and quality control will follow DEQ protocol. Sampling strategies and QA/QC are reviewed annually at a regional meeting in Coos Bay with DEQ, BLM, USFS, and private landowners.

Table 14. Benchmarks and Monitoring Frequencies USFS

Element	Site Identification	Management Measure	Monitoring Parameters	Monitoring Frequency
Temperature (Shade)	Lost Valley Creek and North Fork Lobster and tributaries	Passive plus conifer planting & treatments to increase growth and insure long term health	Stand surveys (growth & health) Low flow stream temps	5-yr intervals post treatment Annually
Temperature (Shade)	South Fork Lobster and Boulder Creek and tributaries	Passive plus conifer planting & treatments to increase growth and insure long term health	Stand surveys (growth & health) Low flow stream temps	5-yr intervals post treatment Annually
Temperature (Channel Form)	Basin wide	Passive channel recovery Eliminate high risk stream crossings Eliminate/ upgrade roads in unstable terrain	 Number of sites treated Number of miles treated	 Annually Annually

Shade

The Forest Service may monitor stream shade development over time in representative stream reaches. Any shade monitoring will follow established protocol. Riparian stand treatments will continue to occur in the future along perennial streams (active restoration). These active management activities will not adversely impact existing riparian shade quality. These stands will be surveyed using Region 6 Stand Exam Standards prior to, and following treatment. These data will determine whether silvicultural prescriptions are accelerating growth rates and/or maintaining stand health such that shade and large wood supply objectives are met.

Future iterations of watershed analyses will also consider a basin-wide context for the health of riparian stands such that our ability to maintain and/or improve shading and large wood supply is addressed.

Sediment

Efforts to reduce the anthropogenic sources of bedload will focus on reducing the number and effects of road failures and in increasing the proportion of wood to sediment delivered during mass failures. The District will monitor and report the miles of road decommissioned and/or stormproofed along with the number of stream crossings treated for capacity or diversion potential on an annual basis. This data will be entered and stored on a GIS layer for the Gold Beach Ranger District. Because watershed restoration is an evolving science, it is anticipated that other techniques will be introduced during the recovery period that this plan covers. These new techniques will be included in this plan as appropriate.

Data Management
Data from all monitoring on the National Forest will be analyzed, managed, and stored at the district office by aquatic physical scientists or biologists in the Resources Department. Data are stored in both electronic and paper files. Data summaries are available to anyone interested.

Collected data will either confirm or disprove the effectiveness of the actions being implemented. If recovery indicators are not appearing, adjustment of the treatment measures may be required. However, treatment measures proposed such as increasing shade, riparian thin/release, and reduction of anthropogenic sediment sources are widely accepted to be effective. Consequently, improvement of water quality parameters is expected.

Funding for monitoring has historically been covered under the annual allocation of salaries. Although a specific line item for monitoring does not exist, it is required under the forest plan and is conducted annually as time and priorities dictate.

Lincoln Timber LLC

The goal of the monitoring program is to insure treatments are being implemented properly and to detect improvements in water quality conditions as well as progress toward reaching the water quality standard. The parameter of evaluation will vary depending on the treatment.

Stream Temperature
Lincoln Timber LLC will continue long-term monitoring of stream temperatures in partnership with the Lower Rogue WSC at two long term temperature monitoring sites. Temperatures at three tributary sites may be monitored as time permits. Monitoring of stream temperatures flowing from the tributaries and modeling of stream warming may be initiated to test model predictions regarding the relationship between riparian area shade quality and stream temperatures. Data will be collected using accepted DEQ protocol.

Current long term temperature monitoring sites include;

- Mainstem Lobster @ REMAP Site
- Mainstem Lobster below Deadline

Potential tributary temperature monitoring sites include;

- Fall Creek @ Mouth
- Deadline Creek @ Mouth
- Lost Valley @ Mouth

Shade
Lincoln Timber LLC may monitor stream shade development over time in representative stream reaches. The interim benchmark for the mainstem will be evaluated in 2061 to determine if the potential shade has developed according to model predictions. Any shade monitoring will follow established protocol.

Current summertime water temperatures result, in part, from existing riparian vegetation and channel conditions. Other influences include weather, flow, stream aspect, elevation, gradient, and topographic shading. Changes in water temperatures as riparian vegetation develops in the future can only be predicted by models. Because of the importance of these predictive models, Lincoln

Timber LLC may test existing models regarding their applicability in the Lobster Creek drainage. It is possible that existing models can be improved over time. In that case, Lincoln Timber LLC may re-evaluate the shade development projections stated in this document and the water temperature change-predictions in subsequent Total Maximum Daily Load document iterations.

Sediment

Table 15. Benchmarks and Monitoring Frequencies Lincoln Timber LLC

Element	Site Identification	Management Measure	Monitoring Parameters	Monitoring Frequency
Temperature (Channel form)	Mainstem	Road system stormproofing (To at least a 50 year event)	Number of sites treated Number of miles treated	Annually

Reporting

Road improvement and habitat enhancement projects completed each calendar year have been and will be summarized and conveyed to the Oregon Watershed Enhancement Board. OWEB manages a statewide database and produces a yearly report summarizing private and state land accomplishments.

Temperature data is reviewed and statistics extracted on an annual basis. Yearly temperature summaries are available at the Lower Rogue Watershed Council.

Element Eight: *Public Involvement*

The DEQ procedure for public review of this document includes a 30-day public comment period prior to submission of this WQMP document to EPA with the TMDL. DEQ will provide appropriate public notice requesting comments on the information contained in the document and stating that the document is pending submission to EPA. The public notice provides opportunity for public hearings for persons to appear and submit written or oral comments if:

- Submitted comments indicate significant public interest, or
- Written requests from 10 or more persons are received, or
- An organization representing at least 10 persons requests a public hearing

DEQ has decided to provide at least one public hearing opportunity during the public comment period for this document.

Federal Lands

Preparation of this WQMP is a procedural step that focuses on water quality using elements of the Northwest Forest Plan (NWFP). It tiers to and appends the Lobster Creek Watershed Analysis. Such watershed analyses are a required component of the Aquatic Conservation Strategy under the NWFP. The Record of Decision (ROD) for the NWFP was signed in April of 1994 following extensive public review.

Additionally, any proposed active restoration measures will be subject to public review and comment as required in the National Environmental Protection Act (NEPA).

Lincoln Timber LLC

Lincoln Timber LLC plans to continue active management on its lands and follow the requirements of the Oregon Forest Practice Act. Lincoln Timber LLC has proposed in this WQMP a combination of efforts on company lands to enhance water quality. These include:

1) Follow existing state riparian management rules. This will ensure shade density improvement over existing conditions.
2) Riparian areas with scant vegetation cover will be assessed for potential enhancement. Areas having a moderate or higher possibility of success will be planned for reforestation.
3) Company roads will be inventoried for potential sediment input into streams. Corrective actions will be taken during maintenance or reconstruction projects.
4) Monitoring of riparian and stream conditions will be continued to compare actual changes, over time, with those changes predicted by models.

Element Nine: *Maintenance of Effort Over Time*

Federal Lands

This WQMP outlines a long-range plan for recovery of impacted water quality parameters throughout the Lobster Creek Watershed. This plan is congruent with the Northwest Forest Plan (particularly the Aquatic Conservation Strategy), and the Siskiyou National Land and Resource Management Plan. Long-term maintenance of effort directed at implementation and monitoring of the WQMP is guaranteed as long as the previously listed documents are in effect to direct management activities on federal lands.

Lincoln Timber LLC

This WQMP outlines a long-range plan for improvement of water quality throughout the Lobster Creek Watershed. This plan is congruent with the Oregon Forest Practice Rules. As such, long term maintenance of effort directed at implementation and monitoring of the WQMP is guaranteed as long as the previously listed documents are in effect to direct management activities on private lands.

Element Ten: *Discussion of Costs and Funding*

Federal Lands

The amount of restoration funds distributed to the Forest depends on the amount of money appropriated each year by the Regional Office. Annually each of the five ranger districts on the Siskiyou National Forest submits a list of prioritized restoration projects. Prioritization is based on whether sites are located in a key watershed and the benefits to the resources the project provides.

The submitted projects for all the districts are then evaluated at the forest level using similar criteria. The amount of funds distributed to the districts is based on a forest wide priority.

In addition to the appropriated restoration funds, timber sales provide restoration funds from the Knudsen-Vandenburg (KV) Program. In fiscal year 1998 the Forest received a quarter of a million dollars from the KV program for watershed restoration. The limitation on this money is that it must be spent within the timber sale area from which it was collected.

The Lobster Creek Watershed is a not a key watershed under the NWFP, but is a high priority for restoration because of its contribution to the Lower Rogue fishery, and the commitment to the Lobster Partnership. The Siskiyou National Forest will seek necessary funds for the implementation and monitoring components of the WQMP as a high priority. However, due to the limitations of the federal budget process, these funds cannot be guaranteed.

Lincoln Timber LLC

Lincoln Timber LLC will seek a continuing source of funding for the voluntary monitoring, project implementation, and planning efforts discussed in this WQMP. However, due to the limitation of the private budget process, and the possibility of unforeseen future events, this funding cannot be guaranteed.

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LOBSTER CREEK WATERSHED WATER QUALITY MANAGEMENT PLAN (WQMP) COMPONENTS

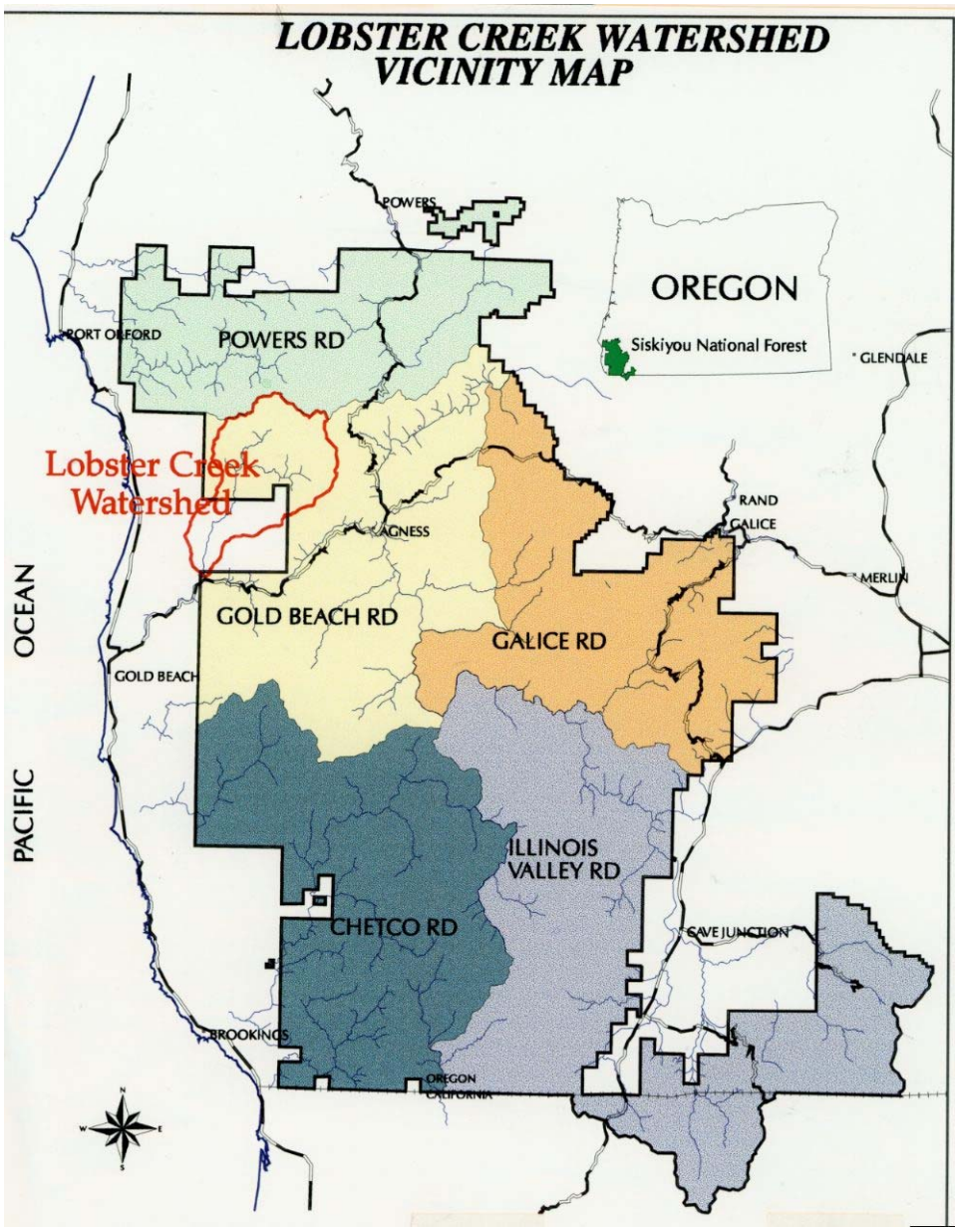
Appendix C-1

List of Maps and Figures

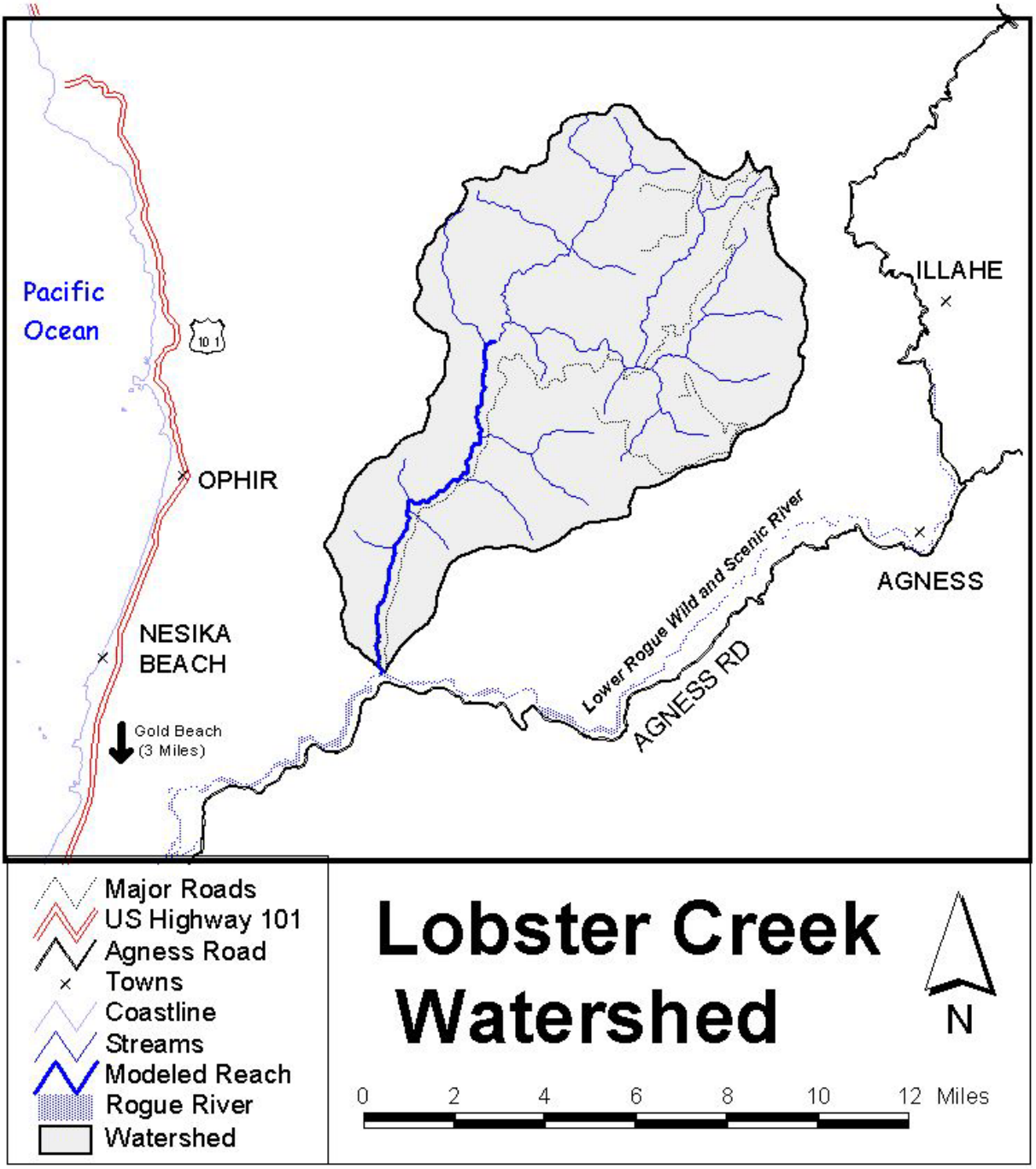
These maps and figures are referenced clearly throughout the document and have been placed into Appendix C-1. These visual aids were placed here to facilitate printing, electronic transfer, download, and management of this document.

1. Vicinity Map
2. Watershed Map
3. Land Ownership
4. National Forest Management Areas
5. Seventh Field Watersheds
6. Fish Distribution
7. Temperature Monitoring Sites and Stream Network
8. Seral Stages
9. Lobster Creek Longitudinal Profile
10. South Fork Lobster Creek Longitudinal Profile
11. Temperature Increase Schematic

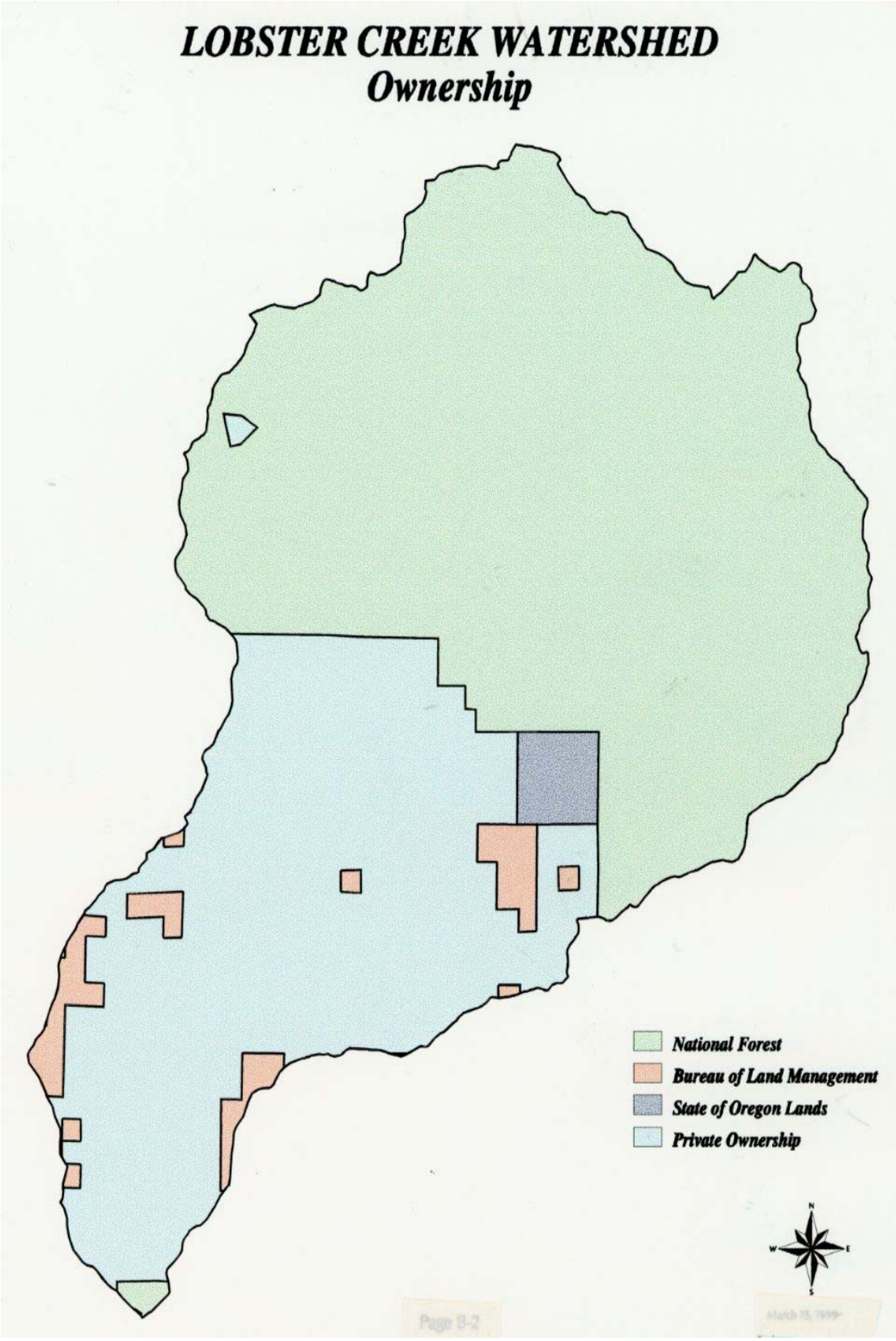
1.) Vicinity Map



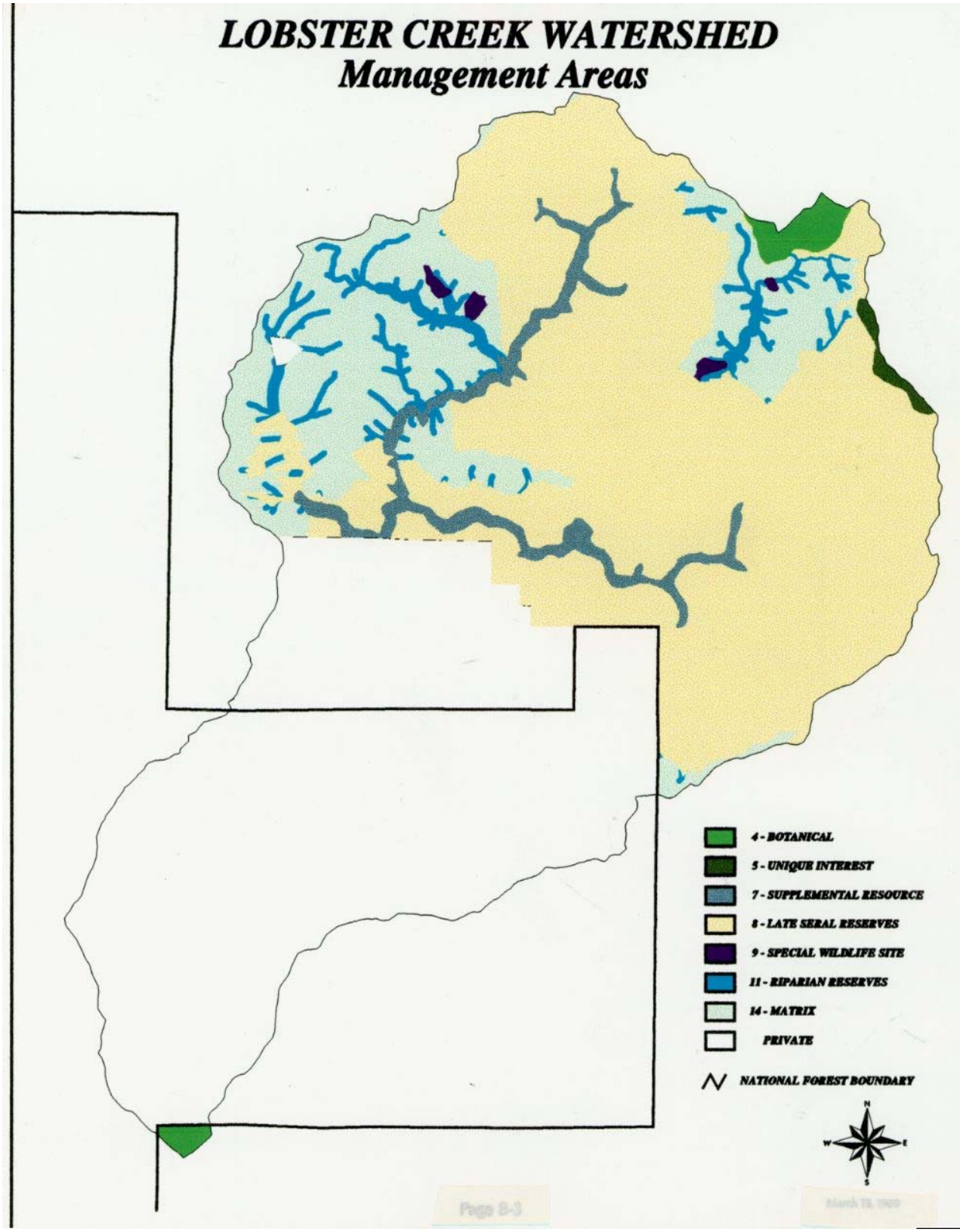
2.) Lobster Creek Watershed Map



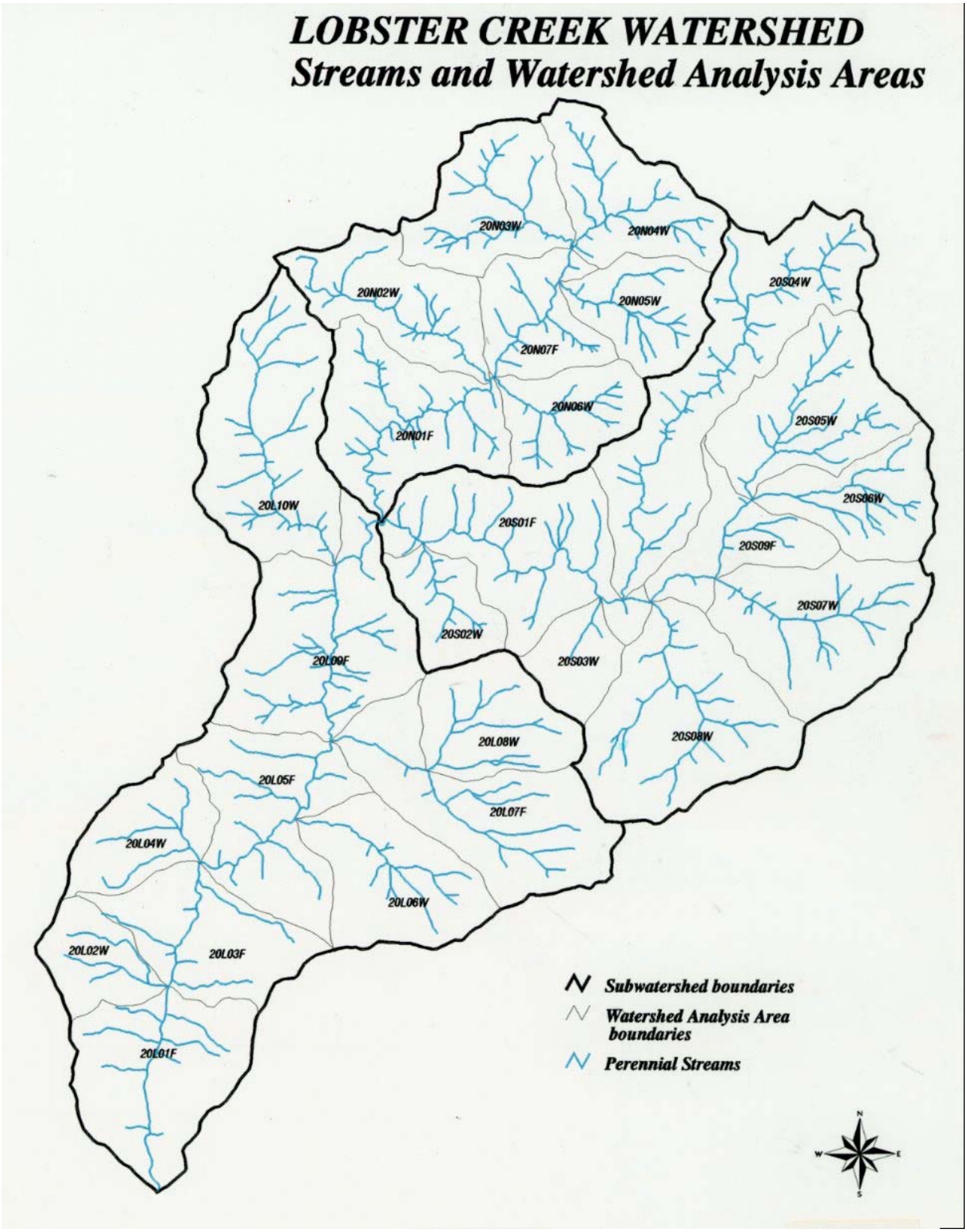
3.)Land Ownership



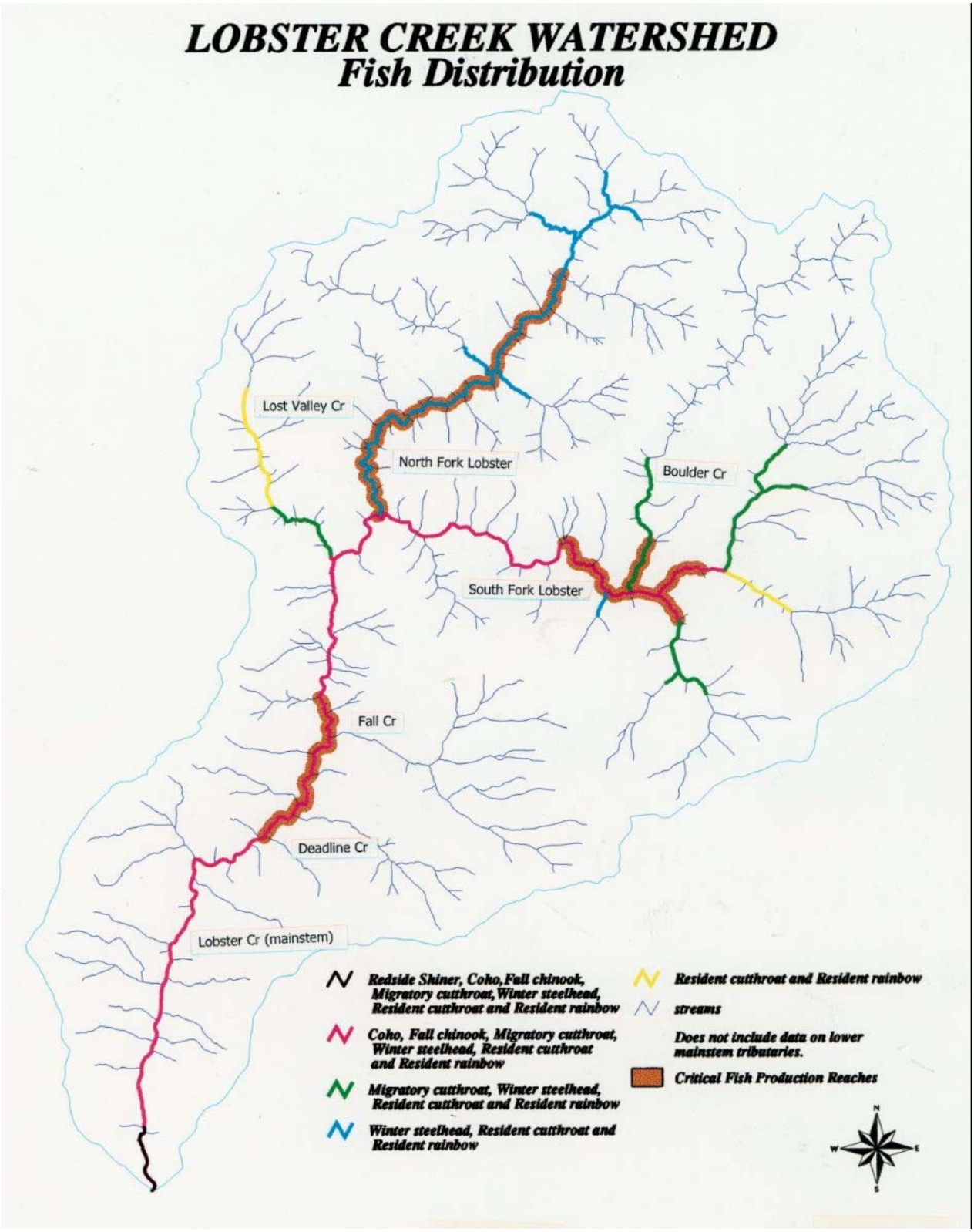
4.) National Forest Management Areas



5.) Seventh Field Watersheds

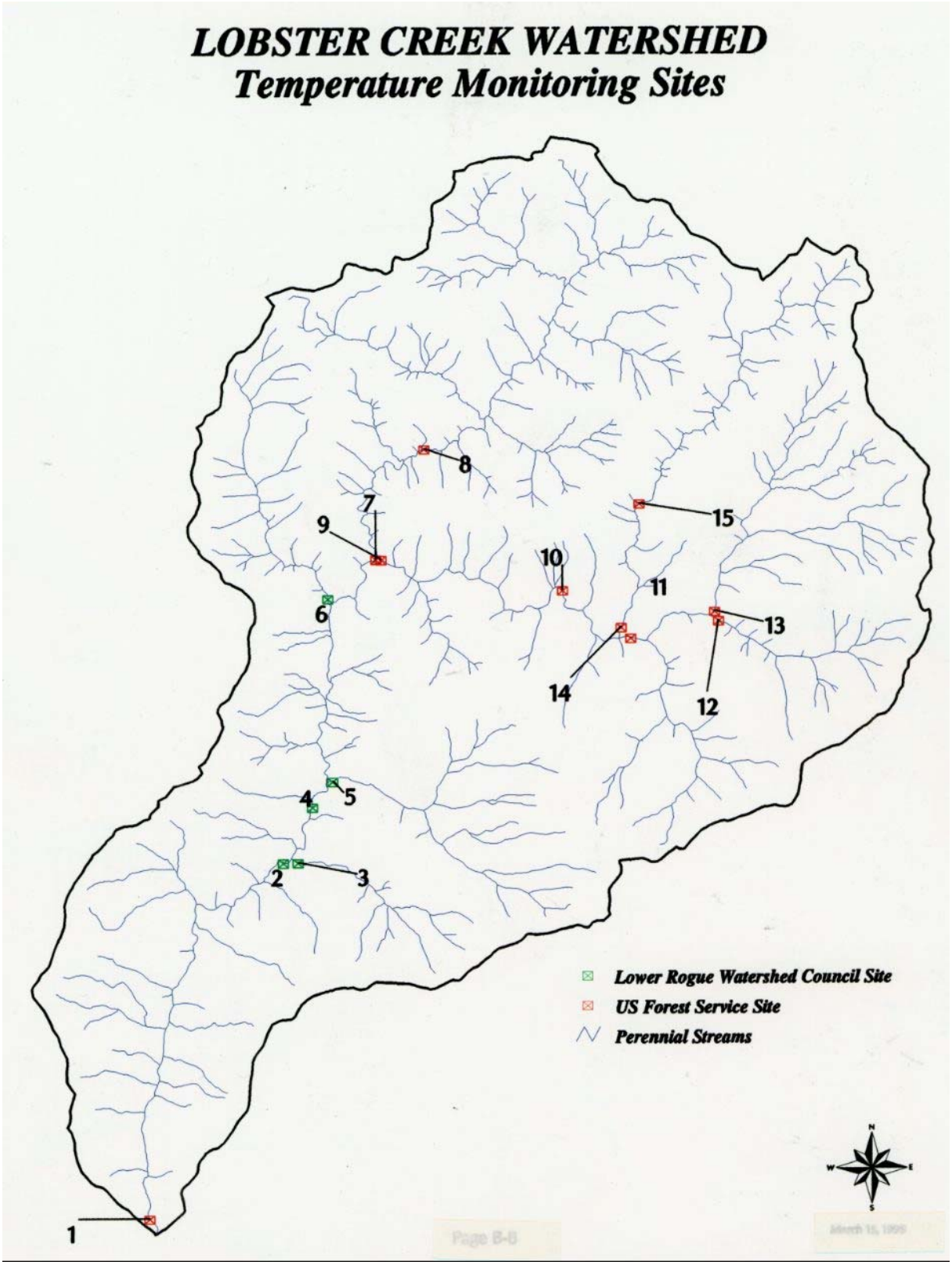


6.) Fish Distribution

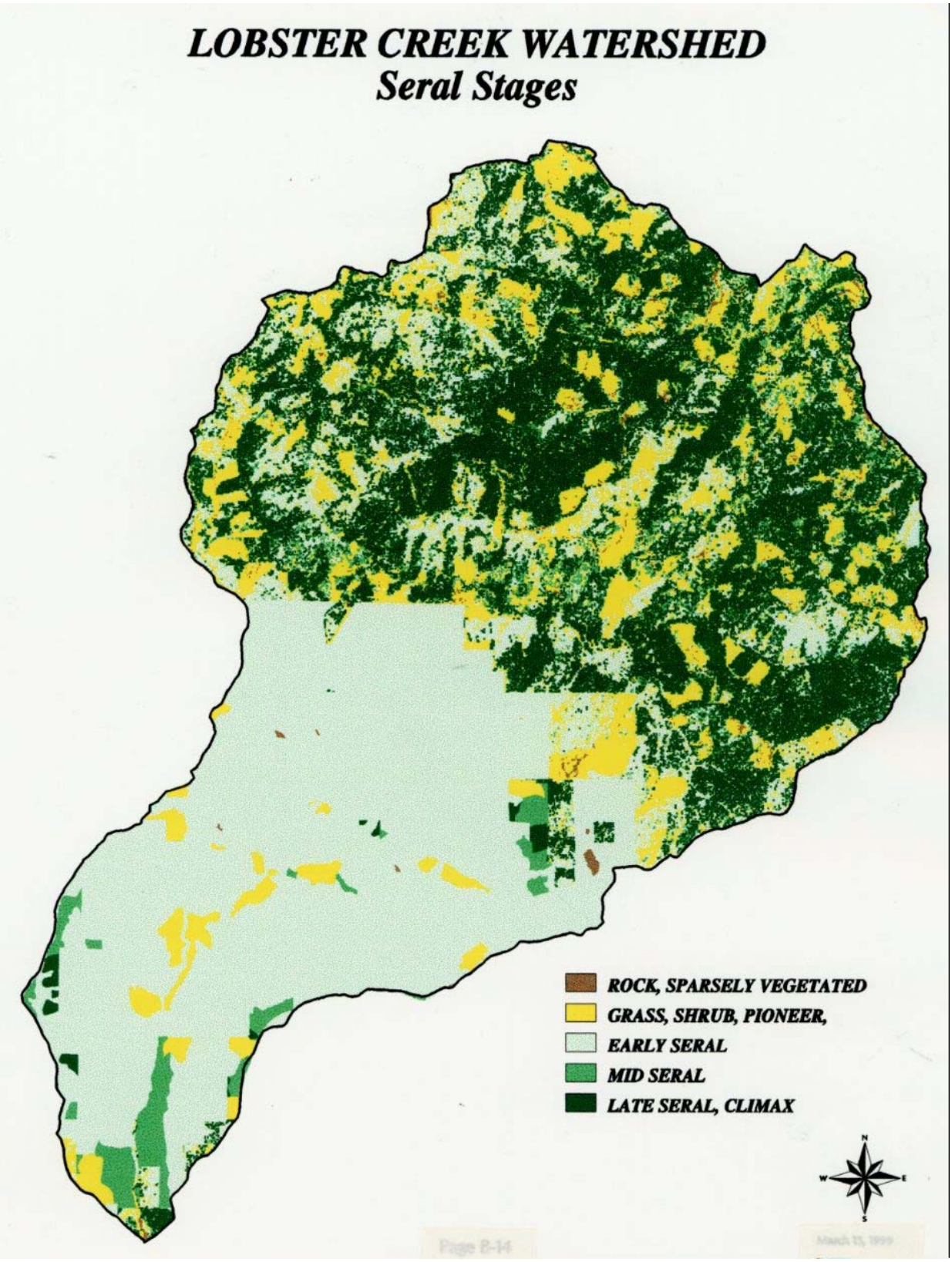


* Fall and Deadline Creeks have been identified as fish bearing streams. ODFW is in the process of generating updated fish distribution maps in digital format.

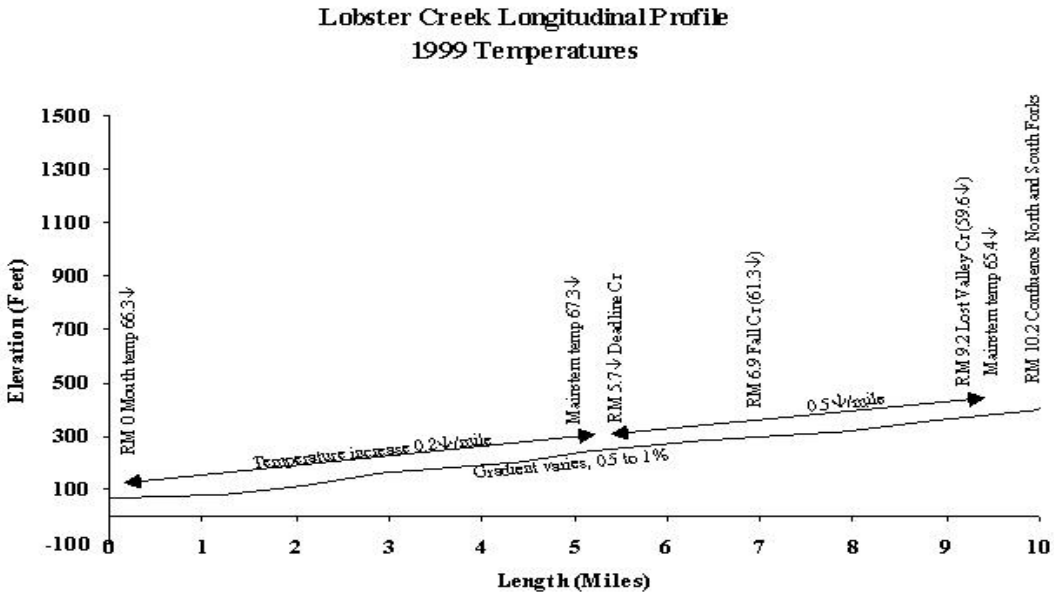
7.) Temperature Monitoring Sites and Stream Network



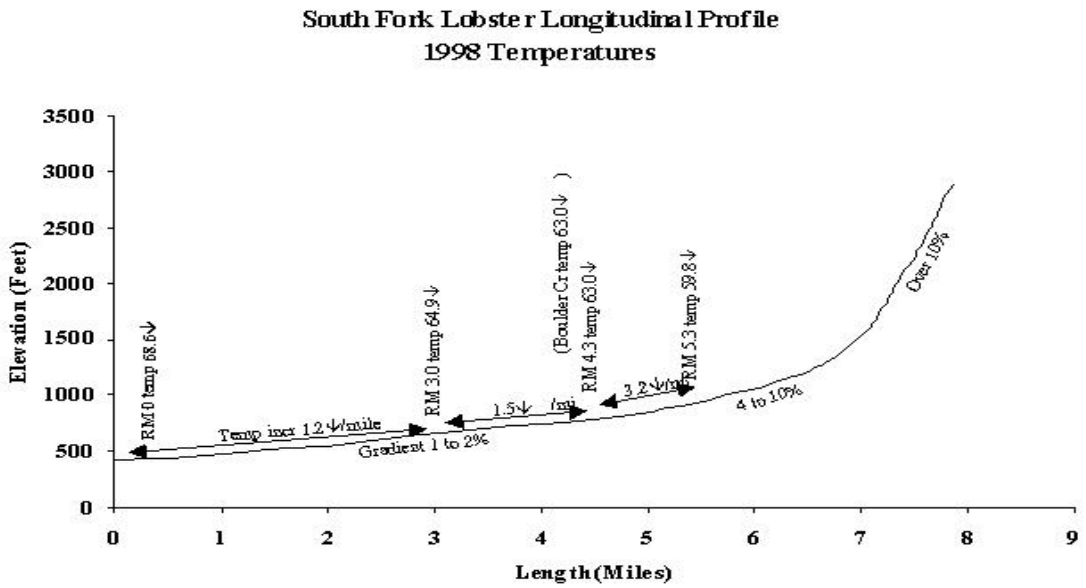
8.) Seral Stages



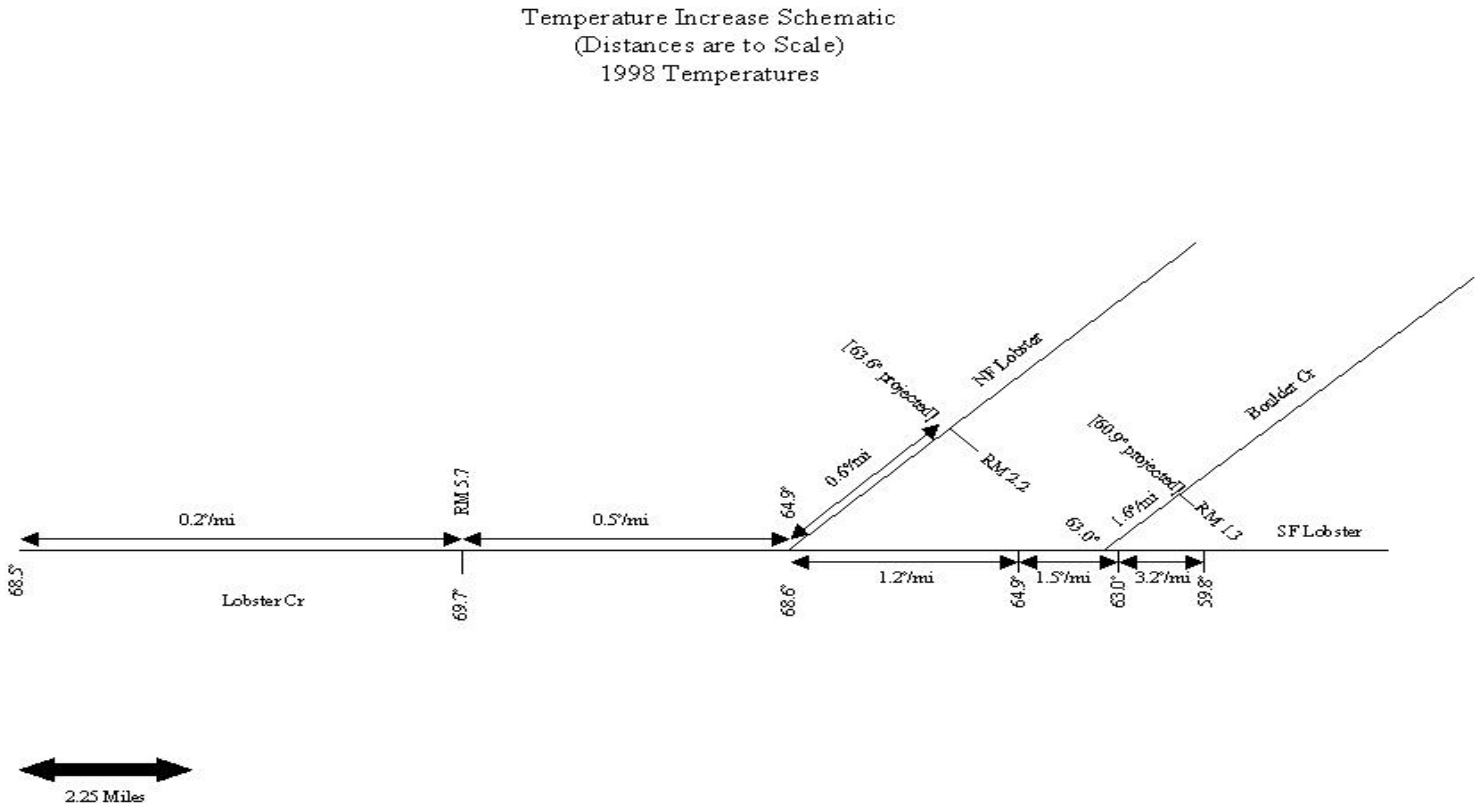
8.) Lobster Creek Longitudinal Profile



9.) South Fork Lobster Creek Longitudinal Profile



10.) Temperature Increase Schematic



Appendix C-2

Riparian Shade Assessment Procedures

For Water Quality Management Plan

June 2000

Part 1 – Federal Lands
Part 2 – Private Timber Lands

Part 1 – Federal Lands

Upper Lobster Creek Watershed
North Fork Lobster, South Fork Lobster, and Lost Valley Creek

Riparian Shade Assessment

For Water Quality Management Plan

June 2000

Connie Risley
Westside Hydrologist
Gold Beach and Chetco Ranger Districts
Siskiyou National Forest
USDA Forest Service

Executive Summary

An assessment of riparian condition was designed to estimate existing and potential shade on perennial streams in the portion of the Lobster Creek Watershed managed by the USDA Forest Service. Subwatersheds included North Fork Lobster, South Fork Lobster, and Lost Valley Creek (which drains into the mainstem Lobster just below the confluence of North and South Forks). This assessment is patterned after the one completed by the Lower Rogue Watershed Council, Cindy Ricks Myers, October 1999, for the rest of the Lobster Creek Watershed, which is owned or managed by private timber companies and other agencies. The data are intended to be combined with the Watershed Council data, and used by the Oregon Department of Environmental Quality in developing a Water Quality Management Plan (WQMP) for the Lobster Creek Watershed.

Maps and aerial photos were used to divide streams into 230 segments based on differences in riparian vegetation, orientation, and tributary confluences. Field measurements at 15 sites included bankfull and low flow channel width, streambank slope, distance from bankfull to riparian vegetation, tree heights, percent overhang, and shade density.

Existing shade was estimated using a computer spreadsheet program known as SHADOW. SHADOW uses the angle of the sun on August first to determine how far a tree projects a shadow across a stream during each hour of the day. For each stream segment data from the map and aerial photo inventory, field measurements and photos, and stream survey data on file at the Gold Beach Ranger District office were entered into the SHADOW model. The model estimates shade for each stream reach based on its aspect, which we grouped into diagonal, north-south, or east-west categories. The USFS WQMP gives details on assumptions that were made for the data. Unlike the Watershed Council assessment, all fields of the SHADOW model were completed, allowing the model to calculate existing stream temperatures as well as shade. The model was calibrated by comparing the resulting stream temperatures to temperatures monitored by the Gold Beach District since 1990, and the data with the highest level of approximation were adjusted to bring the modeled temperatures within 2° of measured 7-day average maximums.

The potential shade is obtained from SHADOW in the same way, assuming a tree could grow to a certain height in the next 100 years. Potential shade was different from existing shade only in riparian areas that had been harvested, or where it seemed reasonable to assume that future vegetation would be different from what is there today, with natural growth. The potential tree heights and shade densities were based on measured and estimated tree heights in adjacent areas that had not been disturbed by human activities. No changes in channel morphology were assumed.

Based on these data and assumptions, the following shade percentages were found:

Stream	**Av monitored 7-day Max T**	**Modeled Existing T**	**Future T**	**Change In T**	**Modeled Existing %Shade**	**Future Shade %**	**Change in Shade %**
South Fork Above Boulder	62.0	63.3	58.5	-4.8	93	96	3
Boulder Cr	63.8	65.1	61.0	-4	87	92	5
South Fork Below Boulder	67.3	68.9	67.3	-1.6	73	74	1
North Fork	64.3	59	57	-2	93%	96%	2%
Lost Valley Cr	61.2	60	57	-3	94	96	2

Methods and Assumptions

The riparian data, including map and aerial photo inventories and field measurements, were collected by Greg Bennett of Siskiyou Research Group, under contract to the USDA Forest Service. This contract produced a report describing the process and field data collection sites, completed office data forms, field data forms, photos taken at field sites, a 1:63360 map showing field site locations, and a 1:24000 composite quad map overlay with coding for existing and potential vegetation. Connie Risley entered the data into the SHADOW model, stratified and interpreted between field sites, calibrated, and ran the model.

This Riparian Shade Assessment covers the area above the National Forest Boundary in the Lobster Creek Watershed. Based on agreement with the Watershed Council, this includes all of the North Fork Lobster, South Fork Lobster, and Lost Valley Creek subwatersheds. Perennial streams were defined as those that appear as lines on the USGS 1:24000 7.5' maps, with lines extended to any point that drains 60 acres (based on Watershed Council assumptions). Only those perennial streams that contribute 5% or more of the flow at their confluence with the next larger stream were analyzed (based on a convention established for the Sucker-Grayback WQMP).

Greg measured the stream flow in South Fork and North Fork at their confluence, and in Boulder Creek at its mouth. From these measured flows, cubic feet per second per square mile (csm) was calculated as:
North Fork 0.7 csm
South Fork 0.4 csm
Boulder Creek 0.4 csm
These were applied to the drainage areas of each tributary. Areas were determined by running the "DRAINAGE" macro in the Siskiyou NF GIS ARC program.

Table 2: Percent Flow Contributions

Subwatershed	Acres	Flow(cfs)	Percent Flow
Lost Valley Creek	2583	2.8	9
20N North Fork Lobster	9904	10.8	38
20N02W	1507	1.6	19
20N03W	1553	1.7	50
20N04W	1555	1.7	50
20N05W	1086	1.2	26
20N06W	1124	1.2	18
20S South Fork Lobster	16130	10.1	62
20S02W	815	0.5	5
20S03W Iron Cr	665	0.4	5
20S04W Boulder Cr	3212	2.0	26
20S05W	1901	1.2	60
20S06W	1244	0.8	40
20S07W	2146	1.3	34
20S08W	2702	1.7	30

Streams were divided into segments at confluences and changes in aspect, using three aspect classes: diagonal, north-south, and east-west. Initially, streams were categorized into gradient classes, based on computer calculations of stream length between 40 foot contours digitized from the quad maps. Segment breaks based on changes in gradient class were later dropped in order to reduce the number of short segments.

For vegetation mapping, USFS/BLM 1997 color aerial photographs (1:12000) were used. Vegetation types were identified with stereoscope and mapped on a mylar overlay over a 1:24000 composite quad map. The following vegetation types were mapped:

Line type	Vegetation type
Solid blue	Large conifer > 100' tall
Solid green	Medium conifer 40-99' tall
Green slashes	Hardwoods (primarily alder)
Green dots	Short conifer 20-39' tall
Red dots	Pioneer conifer
Solid red	Brush < 20' tall
Solid yellow	Sparse conifer < 50% shade density, any height

Segment numbers follow the method given in SHADOW documentation, with the convention SF 001 for the South Fork Lobster, SFT 002 for segments of tributaries to SF Lobster, and SF 008E, SF 008W where vegetation type differed for each stream bank. Right and left banks were determined using the criteria in SHADOW documentation.

Segment lengths were measured with a map wheel.

Stream flow for each segment was calculated by multiplying the square miles draining into the segment by the csm calculated from measured flows. Lost Valley Creek was assumed to be the same as North Fork, because of similar geologic and vegetation characteristics.

The Watershed Council latitude and declination values of 42.5 and 19 were used.

Stream orientation values used were:
North-south 2 (to avoid any problems in the SHADOW calculations
Diagonal 45
East-west 90

Active channel width was taken as the measured width at the field site, estimated between sites based on apparent confinement on the quad maps, photos from field sites and prior stream surveys, and personal knowledge of some of the stream segments. No attempt was made to correlate the active channel width to stream order, because of the large variation in geomorphology. I narrowed these widths substantially from what Greg listed at the field sites, based on his photos. His wider widths appear to be "wetted width" instead of "flow width," which is what determines temperature (based on consultation with Chris Park).

Terrain slope (the percent slope of the ground between the bankfull edge of stream channel and the beginning of riparian vegetation) was estimated based on field site measurements (highly variable), photos from field sites and prior stream surveys, and quad map topology. This latter method is the one recommended in the SHADOW documentation, but it has low accuracy because of the low correlation between the small scale of the bankfull-riparian site and the large scale of the 1:24000 map with 40' contours.

Tree-channel distance was subject to interpretation. The distance observed on photos and in personal field observations is generally 0 to 2 feet to the first line of trees. However, these may be alder or other hardwood species. The distance to the first large conifers may be 0 to 20 feet. A tree channel distance of one foot to a 30-foot tall alder could produce a different shade value than a 12 foot distance to a 120-foot tall Douglas fir, depending on solar angle. For the SHADOW data, I reduced the tree channel distance to correspond to where the trees appear on the photos taken at the field sites.

The solar pathfinder was used at the field sites to determine the density of riparian shade, not to verify the SHADOW percent shade for the segment, as the Watershed Council used it.

After running SHADOW, the resulting shade values were summarized for Lost Valley Creek, North Fork Lobster Creek, South Fork Lobster Creek above Boulder Creek, Boulder Creek, and South Fork below

Boulder Creek. The reach weighted percent shaded stream was calculated for each of these five analysis streams using the following formula: (Segment length * percent shade) / total length of analysis stream

Part 2 – Private Timber Lands

Riparian Shade Assessment Private Timber Lands

Executive Summary

An assessment of Riparian Condition was designed to estimate Existing and Potential Shade on perennial streams in the Lobster Creek Watershed. Shade is one of the factors that controls summer stream water temperatures. Streamflow and groundwater, channel width/depth, and bedrock/substrate heating are other factors to be considered, but are not included in this assessment. Specific site locations and mapping products mentioned below can be accessed through the Lower Rogue WSC.

Maps and aerial photos were used to divide streams into 240 reaches (segments) based on differences in riparian vegetation, orientation (aspect), size (order), and gradient. Field measurements at 23 sites (shown as black X's on the vegetation overlay) included bankfull and low flow channel width, streambank slope, distance from bankfull to riparian vegetation, tree heights, percent overhang, and shade density. Existing percent shade was also measured at each site in the middle of the bankfull channel with a Solar Pathfinder. This device allows the user to estimate the percent of solar radiation shaded by riparian vegetation for any day.

Existing Shade was estimated using a computer spreadsheet program known as SHADOW. SHADOW uses the angle of the sun on August 1st to determine how far a tree projects a shadow across a stream during each hour of the day. For each stream reach, we used our map/photo information along with the field measurements to estimate a bankfull channel width and existing tree height SHADOW estimates Shade for each stream reach based on its aspect, which we grouped into diagonal, north-south, or east-west categories. The WQMP gives details on assumptions that were made for streambank slope, distance from bankfull to riparian vegetation, percent overhang, and shade density.

The Potential Shade is obtained from SHADOW in the same way, assuming a tree could grow to a certain height over time. Based on measurements of Douglas-firs in the watershed, it has been assumed that trees can grow to a height of 160 feet. Using a different tree height results in a minor change in estimated shade. For example, on a stream with a wetted width of 30 feet and a diagonal aspect, 120 foot-high trees produce 60% shade, while 140 foot-high trees increase shade to 65%.

Percent Existing Shade is color coded in 20% increments on a map overlay to show the current condition on all perennial streams in the watershed. The percent of Increased Shade is obtained by subtracting Existing Shade from Potential Shade, and mapped on an overlay to show where vegetation could be managed to gain the most shade.

Average channel widths, bank slopes and tree heights were used to create the Existing Shade map overlay. Local conditions differ from assumed conditions and will determine the actual shade along any particular stream reach. Landowners can obtain more specific estimates of Potential Shade for any set of field conditions. SHADOW can also be used to calculate widths of riparian vegetation

that are shading in the primary (11:00 AM-1:00 PM) and secondary (before 11:00 AM and after 1:00 PM) zones.

Rates of tree growth may be used to set reasonable timeframes for attaining Potential Shade. If Potential Shade is established as an indicator for meeting water quality standards, Total Maximum Daily Load (TMDL) benchmarks could consist of average tree heights and shade densities to be achieved within a specified number of years.

Conifers are taller and longer-lived than alders. Where conifers were once harvested and replaced by alder, converting stands back to conifer will provide increased shade for the long term. Riparian areas dominated by alder are shown as blue dots on the vegetation overlay. Field surveys would be needed to determine the suitability of these stands for treatment.

Partners will seek to digitize the riparian vegetation overlay information to facilitate queries and site prioritization.

WQMP Appendix C-3

Calculation of TMDL for Solar Energy

Methods for Field Data Collection

Temperature Sets

Instantaneous stream temperatures were taken throughout the summer at four locations within the Lobster Creek mainstem and three tributary locations using calibrated and audited logging devices. Each logger data set was reviewed, and it was determined that the data from 7/22/1999 was most suitable for a basin-wide Heat Source simulation. Each data set, if required, was thinned to 24 hourly observations for the day.

Stream Discharge Measurements

Flow measurements were taken at all seven mainstem and tributary sites on 7/15/1999. Measurements were via hand-held current meters. Measurement transacts were chosen in areas with wadeable cross-sections and good stream velocities. Each transect consisted of a minimum of 10 individual measurements.

Stream/Shade Conditions

Riparian characteristics relating to shade quality and quantity were measured from aerial photography, digital imagery and on site field measurements. The shading values so calculated were: shade height, shade density and shade overhang. Values assumed for the "future condition" simulation was based on forest characteristics appropriate to this ecoregion, soil class, species composition and expected tree density. Channel wetted width was also determined via field measurements.

Weather Data

Air temperature data used was from the "Gorge" site (most downstream temperature logging site). Humidity and wind speed data used were from the Agness RAWS reporting site.

Model Inputs

Below is a summary of the model parameters used, how they were derived, and if that parameter was changed between the calibration and the future condition simulations. Parameters in italic type are those used for model calibration.

Data Class	Parameter	Method (measured/calculated)	Source	Future Condition Different from Calibration
Stream	Elevation	Measured	DEM Data	No
	Gradient	Calculated	Model	No
	Topographic Shade	Calculated	GIS Utility	No
	Stream Reach Aspect	Calculated	GIS Utility	No
Flow	Volume	Measured	Field Measurement	No
	Velocity	Model Calculated -Fit to Field Data	Model	No
	Depth	Model Calculated -Fit to Field Data	Model	No
Channel	*Zone of Disturbance Width*	Measured	Field Measurement	No
	Wetted Widith	Measured	Field Measurement	No
	Channel Substrate	Measured	Field Measurement	No
Shade	Height	Measured	Field Measurement	Yes
	Width	Measured	Field Measurement	Yes
	Density	Measured	Field Measurement	Yes
	Overhang	Measured	Field Measurement	Yes
Stream Temperature	Main Stem	Measured	Field Measurement	---
	Tributaries	Measured	Field Measurement	No
Weather	*Humidity*	Measured	Field Measurement	No
	Wind Speed	Measured	Field Measurement	No
	Air Temperature	Measured	Field Measurement	No

Target Solar Loading or TMDL

Target Shade Value	Existing Shade Value	Increase Predicted
92%	88%	4%
Target Solar Loading or TMDL	**Existing Solar Loading**	**Reduction Predicted**
195 BTU/sqft/day	292 BTU/sqft/day	97 BTU/sqft/day

Calculation of TMDL for Solar Energy

The solar loading on the system, inclusive of tributaries, is determined from the amount of unshaded stream and the available solar radiation. **The amount of unshaded stream was calculated as a weighted average of all the reaches in the basin, including all perennial tributaries.** For Lobster Creek above the confluence with the Rogue River, the above table shows the existing and target shade values and the desired increase in shade.

Current percent of stream that is unshaded = (100%) - (existing shade value)
= 100% - 88% = 12%

Target percent of stream that is unshaded = (100%) - (target shade value)
= (100%) - 92% = 8%

The available solar radiation is a constant value for a given latitude on a given day assuming clear sky conditions. For 42 degrees latitude on August 1, the available solar radiation is 2440 BTU's per square foot per day. This potential flat plane BTU loading of 2440 per square foot per day was utilized in setting loading capacity and loading allocations.

The existing solar loading is calculated as the existing unshaded area multiplied by the available solar radiation.

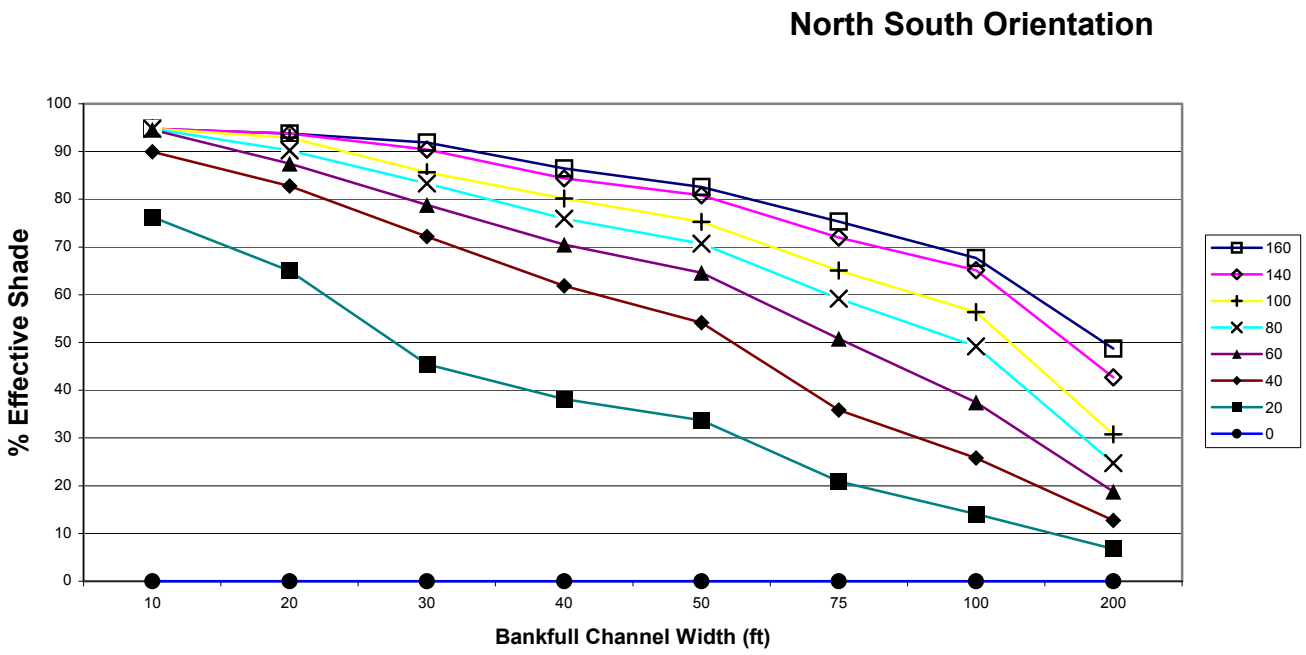
Existing solar loading = (existing unshaded value) X (available solar radiation)
293 BTU/sq. ft./day = 12% X 2440 BTU/sq. ft./day

Target solar loading = (existing unshaded value) X (available solar radiation)
195 BTU/sq. ft./day = 8% X 2440 BTU/sq. ft./day

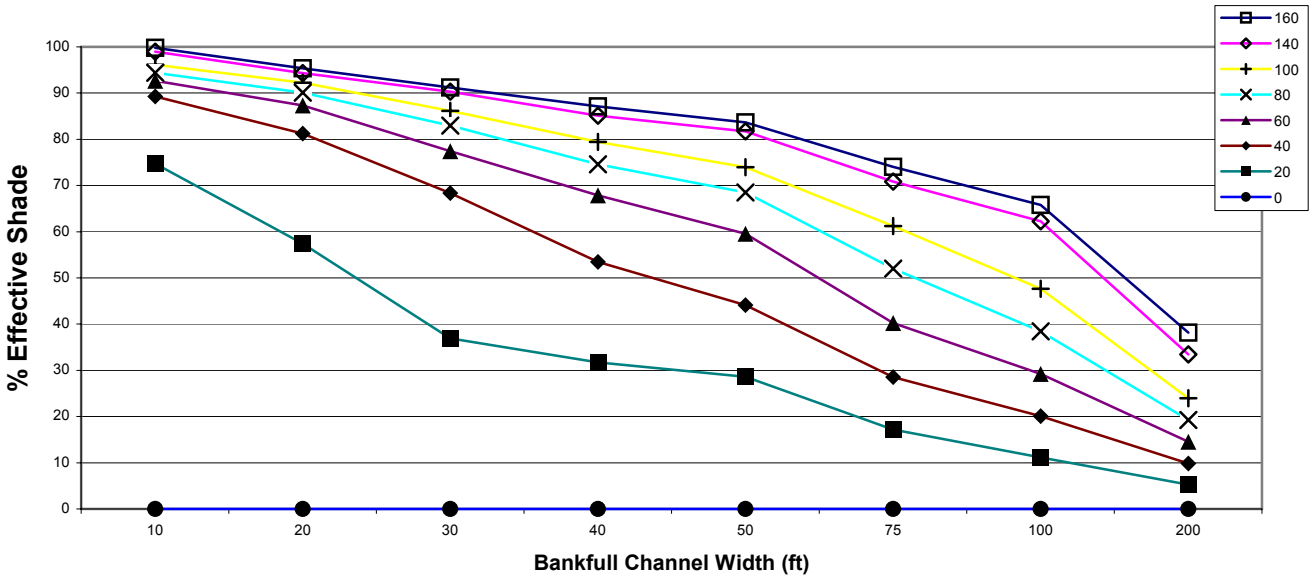
Solar Loading Reduction Predicted = (existing solar loading) – (target solar loading)
= 292 BTU/sq. ft./day - 195 BTU/sq. ft./day
= 97 BTU/sq. ft./day

Appendix C-4 Stream Shade Curves

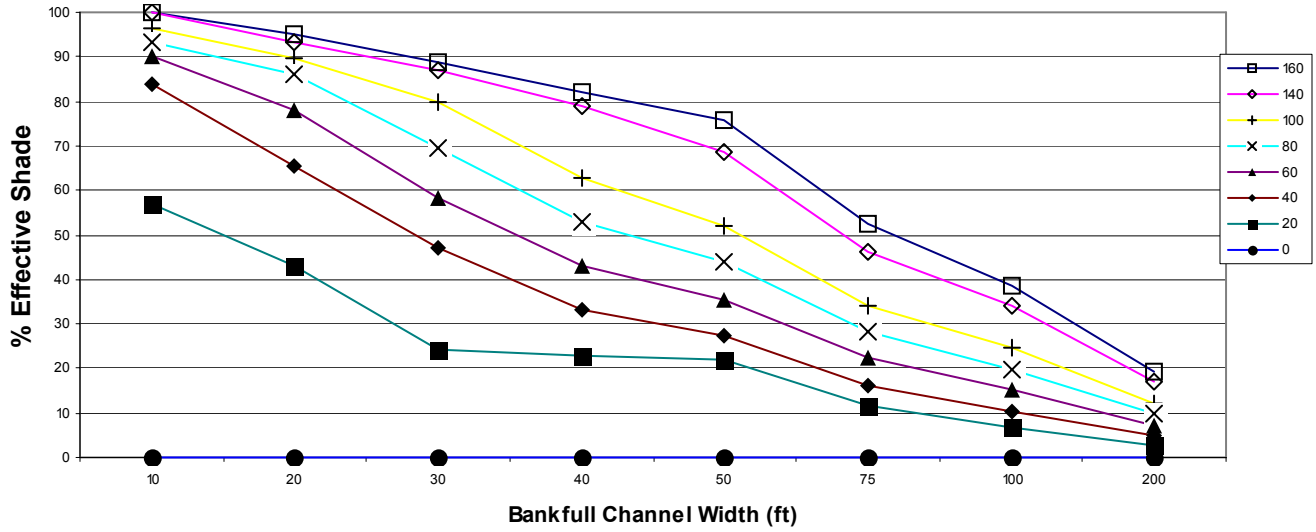
There are three sets of shade curves for the different stream orientations (North-South, East-West, and Diagonal). The three curves assume the following; Shade density: 80%, Terrain Slope 60% Effective Shade by Channel Width for Various Vegetation Heights (three shade curves) Tree-channel distance 5 feet, Overhang varies by channel width. The curves are for tree heights ranging from 0 to 160 feet. Effective Shade by Channel Width for Various Vegetation Heights (three shade curves)



Diagonal Orientation



East-West Orientation



Appendix D

Total Maximum Daily Load

Lobster Creek Watershed

Oregon Department of Environmental Quality
0700 J General NPDES Recreational Mining Permit

GENERAL PERMIT

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

WASTE DISCHARGE PERMIT

Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204
Telephone: (503) 229-5279

Issued pursuant to ORS 468B.050 and the Clean Water Act

ISSUED TO:

SOURCES COVERED BY THIS PERMIT:

This permit covers suction dredges, not to exceed 40 horsepower, used for recovering precious metals or minerals from stream bottom sediments.

Stephanie Hallock, Administrator
Water Quality Division

Date

PERMITTED ACTIVITIES

Until this permit expires or is modified or revoked, the permittee is authorized to operate a suction dredge in public waters in accordance with all the requirements, limitations, and conditions set forth in the attached schedules as follows:

Each other direct and indirect waste discharge to waters of the State is prohibited unless covered by another NPDES or WPCF permit.

SCHEDULE A

Waste Disposal Limitations

1. Dredging is permitted only within the active stream channel where the dredging spoils are relatively clean and will cause minimum turbidity when returned to the stream. This permit does not authorize mining of stream banks (highbanking) or upland areas. Such out-of-stream mining requires a General Permit WPCF 600 or an individual WPCF permit from the Department of Environmental Quality (Department).

2 Dredging shall be done such that in-stream turbidity will be minimized and localized to the general area of the dredging activity. If turbidity is visible 300 feet downstream from one or more working suction dredges, then turbidity exceeds allowable in-stream water quality standard, and dredging must stop. Tailings shall not be discharged into any naturally occurring pool in the work area if it will reduce the volume or depth of the pool.

SCHEDULE D

Special Conditions

OPERATION:

1. Harassment of fish in the stream is prohibited by state law. Dredging is not permitted during the periods that fish eggs could be in the gravel at the dredging site. The attached schedule, Timing of In-Water Work To Protect Fish and Wildlife Resources lists the permitted seasonal work periods for dredging activities. If the Oregon Department of Fish and Wildlife (ODFW) has approved working in a stream during periods other than the listed work periods, then a copy of that written approval must be in the possession of the operator, or readily available, during dredging activities.

2. Care shall be taken by the operator during refueling of the dredge to prevent spillage into surface waters or to groundwater. The suction dredge shall be checked for leaks prior to start of operation. Waste oil or other petroleum products may not be disposed of at the site.

3. Removal or disturbance of rooted or embedded woody plants in the stream including trees and shrubs is prohibited.

4. Suction dredging shall be conducted such that undercutting of stream banks and riparian vegetation does not occur.

5. The permittee shall provide a safe passage of fish around and through the active mining area if the stream supports an anadromous fish population.

6. The suction dredging activity shall be conducted such that it will not result in the formation of a dam within the stream or divert a waterway.

APPLICATION AND FEES

1. To receive this permit, an application must be made on a form provided by the Department.

2. A permit filing fee of $50 is required for dredges equipped with a suction hose having an inside diameter greater than four (4) inches, regardless of the nozzle size. No fee of any kind is required for suction dredges equipped with a suction hose having an inside diameter of four (4) inches or less.

3. Persons covered by this general permit must have a copy of the permit in their possession, or readily available during dredging activities.

OREGON SCENIC WATERWAYS and ESSENTIAL SALMON HABITAT STREAMS and WATER QUALITY LIMITED STREAMS:

1. Dredging in Oregon Scenic Waterways and Essential Salmon Habitat Streams is restricted to recreational placer mining. Recreational placer mining as defined in Oregon Revised Statutes (ORS) 390.835(17)(b) includes the use of a motorized surface dredge having an intake of four (4) inches or less and a motor no larger than ten (10) horsepower. A map and list of Oregon Scenic Waterways is attached. Maps and a list of essential salmon habitat streams can be obtained from the following Division of State Lands (Division) offices:

   a. Division of State Lands
   Salem Office
   775 Summer St. NE
   Salem, OR 97310
   Telephone: (503) 378-3805

   b. Division of State Lands
   Bend Office
   20300 Empire Avenue
   Bend, OR 97701
   Telephone: (541) 388-6112

2. Dredging in Oregon Scenic Waterways and Essential Salmon Habitat Streams requires a separate permit from the Division.

3. Dredging in Oregon Scenic Waterways and Essential Salmon Habitat Streams must follow the regulations and requirements of the Oregon Parks and Recreation Department, the Division of State Lands and the Oregon Water Resources Department.

4. No placer mining shall be conducted in federal lands located within the Oregon Scenic Waterways except as allowed by the agencies of the federal government.

5. Dredging activity covered by this general permit is allowed in streams which are water quality limited for sediments but not for toxic substances. A list of Oregon water quality limited streams is attached.

OTHER REGULATIONS AND REQUIREMENTS

1. A Removal-Fill Permit is required by the Division for any placer mining operation which involves an alteration, removal, or filling of more than fifty (50) cubic yards of material per year in any waterway. Furthermore, a Removal-Fill permit may be required by the Division. The permittee must contact the Division for additional information.

2. Persons who are otherwise eligible for coverage under this general permit but who want an individual NPDES permit, may apply to the Department in accordance with the NPDES permit procedures set forth in OAR 340-45-030.

SCHEDULE F

General Conditions

STANDARD CONDITIONS

1. The dredge owner/operator must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of ORS 468B.025 and is grounds for enforcement action, for permit termination, suspension, or modification; or for denial of a permit renewal application.

2. Dredge operations that result in complaints from downstream users or impairment of other beneficial stream uses may be in violation of the terms and conditions of this permit and the Department may take enforcement action as described in Condition 1.

3. The permittee shall allow the Director, or an authorized representative, upon presentation of credentials to:

    a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted;

    b. Inspect at reasonable times any facilities, equipment, practices or operations regulated or required under this permit; and

    c. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by state law, any substances or parameters at any location.

4. If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for permit renewal. The application shall be submitted at least 180 days before the expiration date of this permit. The Director may grant permission to submit an application less than 180 days in advance but no later than permit expiration date.

5. This permit may be modified, suspended, revoked and reissued, or terminated for cause including, but not limited to, the following:

    a. Violation of any term, condition, or requirement of this permit, a rule, or a statute;

    b. Obtaining this permit by misrepresentation or failure to disclose fully all material facts; or

    c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

The filing of a request by the permittee for a permit modification or notification of planned changes or anticipated noncompliance, does not stay any permit condition.

6. Except for effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants and standards for use or disposal of sewage sludge established under Section 405(d) of the Clean Water Act, all rules and statutes referred to in this permit are those in effect on the date this permit is issued.

PROPERTY RIGHTS AND TRESPASS

1. The issuance of this permit does not convey any property rights of any sort, or any exclusive privilege.

2. This permit does not authorize trespass on private property or mining claims.

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