United States
Department of
Agriculture

Forest
Service

August 2007

AQUATIC RESTORATION PLAN

SUCKER CREEK WATERSHED

Rogue River-Siskiyou National Forest
Wild Rivers Ranger District

Information Contact: **Chris Park**
Phone (541) 471-6761

Approved By:

/s/ Joel T. King ***August 30, 2007***

JOEL KING , Wild Rivers District Ranger

Contributors:

Forest Service Team Members

Ian Reid	Fisheries
Chris Park, Liz Berger Maureen Joplin	Hydrology
Greg Freer	Roads
Frank Betlejewski	Port-Orford-Cedar
Howard Jubas	Mining
Jody Thomas	GIS

External Reviewers

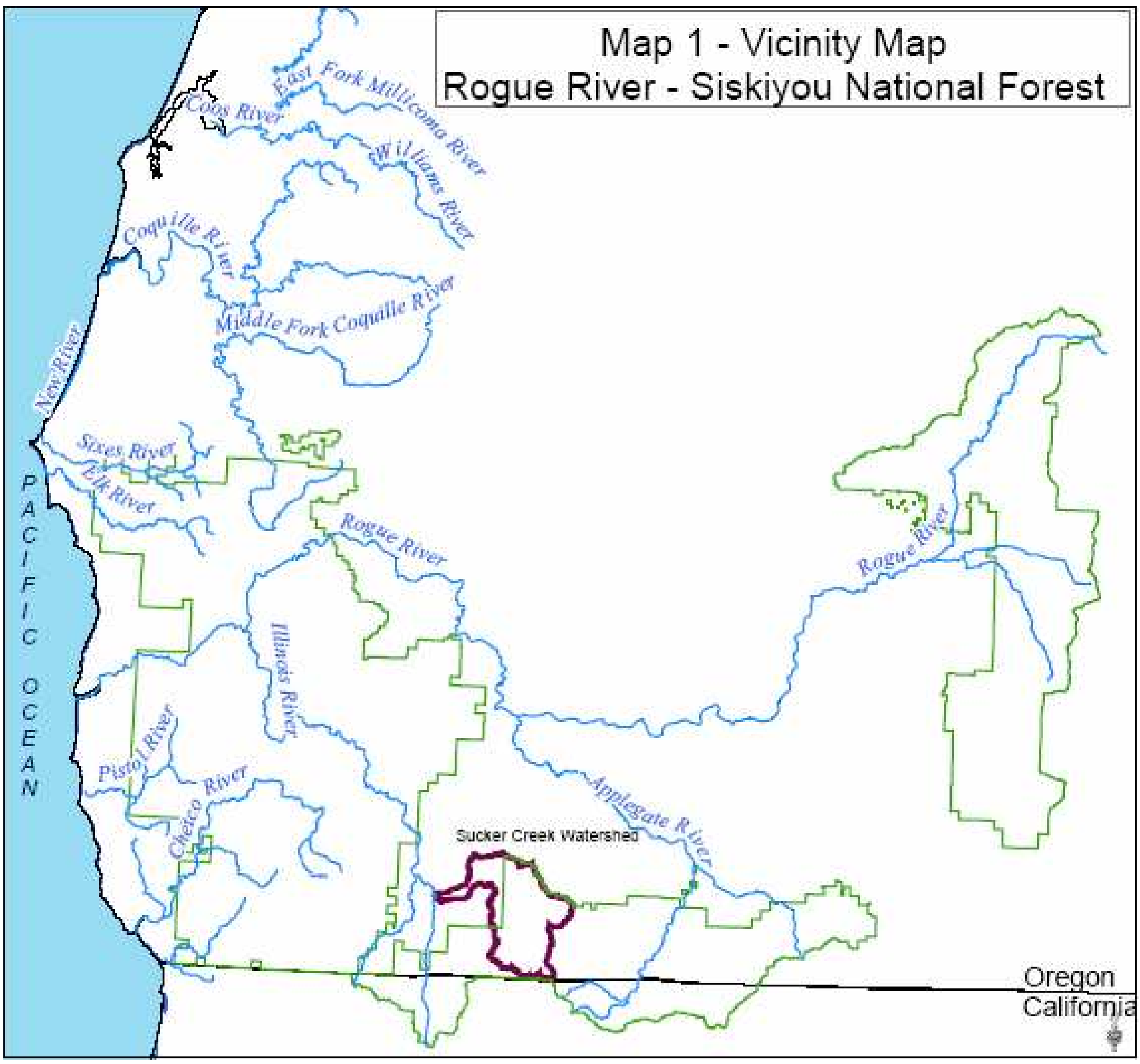
Kevin O'Brien	Illinois Valley Watershed Council Coordinator, Illinois Valley Soil and Water Conservation District Manager
Jay Doino	Fisheries Biologist, Oregon Department of Fish and Wildlife
Jon Raybourn	Fisheries Biologist, Medford District BLM, Grants Pass Resource Area
Pamela Wright	Rogue Basin Coordinator, Oregon Department of Environmental Quality
Leslie Bach, Molly Sullivan	The Nature Conservancy

Table of Contents

EXECUTIVE SUMMARY

This aquatic restoration plan is for the Sucker Creek watershed, located on the Wild Rivers Ranger District, Rogue-Siskiyou National Forest. Sucker Creek is a Northwest Forest Plan Key Watershed and is dominated by the Late-Successional Reserve (LSR) allocation in which old-growth characteristics are to be retained or restored. The watershed contains 62, 540 acres (about 98 square miles); approximately 70% is managed by the Forest Service.

Sucker Creek drains a 5th field hydrologic unit watershed that is located in the Klamath Mountains Province of southwestern Oregon. Sucker Creek flows into the Illinois River and proceeds to the sea via the Rogue River (see Map 1 below). Most of the watershed is within the transient snow zone and covers steep, mountainous terrain.



The Illinois River sub-basin is currently one of the most important sections of the Rogue River for naturally produced coho salmon. Sucker Creek is one of the most important spawning and rearing tributaries for coho in the Illinois River sub-basin. Four anadromous fish species occur in the Sucker Creek watershed (Chinook salmon, Coho salmon, winter steelhead and Pacific lamprey); two native resident salmonids (coastal cutthroat and rainbow trout); and reticulate sculpin. Coho salmon are listed as Threatened under the Endangered Species Act and Chinook salmon and coastal cutthroat trout are USFS Regionally Sensitive.

Aquatic resources have been degraded by timber harvest, road construction, and placer mining operations. Channel modification due to hydraulic mining and other placer operations is especially intense along Sucker Creek. Landslide activity and severe flooding of the watershed in 1964 and 1997 accentuated pre-existing channel damage. Many channels exhibit disturbance responses such as increased width, elevated water temperature, loss of pool habitat due to sedimentation or loss of substrate retention, loss of side channel habitat due to channel straightening, increased channel migration, and loss of channel structure and habitat due to lack of large wood. The road system contributes to habitat degradation in several ways: road-related slope failures generate sediment or aggravate existing landslides and slope failures; road drainage increases peak flow and increases routes for sediment to enter channels; culverts and drainage fills often act as barriers to fish passage.

Regeneration harvest and associated road construction has occurred throughout the watershed. Approximately 30% of the National Forest System lands have been harvested since 1940. Harvest included stream clean-out operations that removed large wood and built a moderately high road density. Harvest rates on the National Forest lands in the Sucker Creek watershed have slowed substantially since 1990, allowing forest canopy to become reestablished in managed stands.

Stream shade provided by tree cover is critical to retaining low stream water temperature. Sucker Creek above the Forest boundary was removed from Oregon's 303(d) list of impaired waters in 2000 due to development of a water quality management plan that demonstrates improvement in water temperature through protection and recovery of riparian forests. Stream temperature is expected to continue dropping until stream shading reaches its maximum effect (ranging from 10 to 60 years depending on location). Recovery of altered channels, especially those severely disrupted by placer mining, may require up to 100 years.

Channels needing large wood may be immediately aided by mechanical placement of large wood; however, reestablishment of large wood recruitment from riparian forests will require thinning and time for managed stands to grow trees of suitable size. For areas with Port-Orford-cedar stands, targeted management is required to contain the spread of disease and establish resistant strains to ensure that this riparian component endures.

Sucker Creek's restoration has been ranked as the Forest's second highest of three priority watersheds (Coquille River is first and Applegate River is third). Aquatic resource specialists evaluated the Forest's watersheds based on the following criteria:

- Key Watershed Designation
- High Erosion Potential
- Stream Crossings and Road Density in High Erosion Areas
- Depositional Reaches and Sensitivity to Disturbance
- Completed Water Quality Restoration Plan
- Miles of Coho Salmon within the Watersheds
- Total Number of Anadromous Species within the Watershed

Restoration projects described by this plan include large wood placement, stream bank stabilization/revegetation, side channel habitat development, riparian planting, riparian thinning, culvert replacement, road crossing stabilization, road decommissioning and subsoiling, slope stabilization, and Port-Orford-cedar disease treatment. Most of the projects described have a recovery timeline of up to 10 years. Projects that address riparian thinning may require 60 years for full recovery to mature forest conditions. Current placer mining operations are generally small in scale. Stream damage from small placer activities is negligible compared with legacy impacts from large historical placer mining.

Proposed projects are grouped based on high, medium, and low priority. High priority projects are currently being implemented and include instream large wood placement, streambank stabilization, channel restoration, culvert replacement, road decommissioning, and road stabilization. Projects are summarized in Table 1 and estimated costs for proposed projects are shown below:

High priority projects	$497,000
Medium priority projects	$275,000
Low priority projects	$250,000
Total Project Cost	$1,022,000

Monitoring for the next ten years $31,500

Partnerships and various funding sources are essential to completing many of the restoration projects proposed. This plan contains a listing of partners accompanied by complimentary sources of agency funding. Our current partners include other federal land management agencies and state regulatory and funding agencies. Local partners include the Illinois Valley Watershed Council, Illinois Valley Soil and Water Conservation District, Oregon Watershed Enhancement Board, Oregon Department of Fish and Wildlife, Oregon Department of Environmental Quality, Middle Rogue Steelheaders, Forestry Action Committee, and The Nature Conservancy. We are also working with individual partners on private lands and with BLM to benefit aquatic resources throughout the watershed.

Table 1. Summary of Proposed Priority Active Restoration Projects.

PRIORITY	LOCATION/ OWNERSHIP	EXISTING CONDITION	PROPOSED RESTORATION	YEARS TO RECOVERY	COST	FUNDING SOURCE	PARTNERS[1]
High Priority Projects							
1	Sucker Creek, Grayback Campground (FS). T39S, R06W, Sec. 30	-Lack of instream large wood -Bank erosion	Instream large wood placement. Bank revegetation. Interpretive signs.	3-5 years	**$75,000** **($15,000 from FS)**	**OWEB KV Soil and Water Fish Partners**	**IVWC ODFW OWEB MRS SCA**
2	Grayback Creek, RM 0 to 3. (FS, Private). T39S, R06W, Sec. 28-30.	Lack of instream large wood	1. Instream large wood placement 2. Plant disease-resistant POC	1. 3-5 years 2. 100 years	**$50,000** **($15,000 from FS)**	**OWEB KV Soil and Water Fish Partners**	**IVWC ODFW OWEB Perpetua MRS SCA**
3	Sucker Creek, Bank Stabilization (FS). T39S, R06W, Sec. 31.	-Eroding streambank -Road failure -Lack of fish habitat	Instream large wood placement. Bank stabilization.	1 to 5 years	**$12,000** **($4,000 from FS)**	**Soil and Water**	**N/A**
4	Sucker Creek, Channel Restoration (FS, private, BLM) T39S, R06W, Sec. 31. T39S, R07W, Sec. 36.	-Lack of instream large wood -Eroding streambanks -High stream temperature -Widened straight channel	Instream large wood placement. Bank stabilization. Off-channel habitat creation.	1 to 60 years (recovery of channel form – up to 30 years. recovery of riparian shade component – 60 years)	**$250,000** **($70,000 from FS)**	**OWEB Soil and Water Fish Partners Joint Venture CCS BLM**	**IVWC ODFW OWEB BLM MRS FAC Private landowners ODEQ**
5	Grayback	Fish passage	Replace culvert	1 to 2 years	**$8,000**	**KV**	**MRS**

[1] See list at end of table for full names of partners.

PRIORITY	LOCATION/ OWNERSHIP	EXISTING CONDITION	PROPOSED RESTORATION	YEARS TO RECOVERY	COST	FUNDING SOURCE	PARTNERS[1]
	Interpretive Trail, unnamed perennial tributary to Grayback Creek (FS). T39S, R06W, Sec. 31	barrier	with footbridge		**($2,000 from FS)**	**Partners**	**SCA**
6	Grayback Thin T40S, R06W, Sec. 21	-Erosion and sediment inputs from logging roads and skid trails -Plugged culvert	Subsoil logging roads and skid trails. Cover with slash. Plant. Replace culvert. Reconnect stream channel.	1 to 2 years	**$22,000 ($7,000 from FS)**	**KV**	**N/A**
7	Tanner Creek, Road Decommissionin g (FS). FS Road 4812-041 and 4812-590. T41S, R06W, Sec. 9, 10.	Erosion and sediment inputs from stream crossings on roads to Tanner and East Tanner Creek and the headwaters of Sucker Creek.	Decommission 1.13 miles of road by removing culverts, installing water bars, and stabilizing the road.	1 to 2 years	**$65,000 ($14,000 from FS)**	**Roads Soil and Water**	**N/A**
8	White Rock Cr. Road Crossing (FS). FS Road 4611910. T39S, R06W, Sec. 21.	-Culvert blown out. -Prone to landslides and debris torrents.	Leave culverts out of stream crossing. Decommission and stabilize road.	Up to 50 years.	**$20,000 ($6,000 from FS)**	**Roads Soil and Water**	**Indian Hill**

PRIORITY	LOCATION/ OWNERSHIP	EXISTING CONDITION	PROPOSED RESTORATION	YEARS TO RECOVERY	COST	FUNDING SOURCE	PARTNERS[1]
9	Sucker Creek Road 4612 (FS). T40S, R06W, Sec. 29	-Plugged culvert -Road washout -Slides -Failed drainage system	Replace culverts. Stabilize road crossings and downstream hillslopes.	1 to 2 years	**$25,000** **($7,000 from FS)**	**Roads**	**N/A**
10	Unnamed perennial tributary to Left Fork Sucker Creek - Road Crossings (FS). T40S, R06W, Sec. 35	-Plugged culverts -Road washout	Replace culverts. Stabilize road crossings and downstream hillslopes.	1 to 3 years	**$25,000** **($7,000 from FS)**	**Roads** **Soil and Water**	**N/A**
Medium Priority Projects							
11	Run Rapid Stream Assessment Model to select managed stands adjacent to streams. (FS)	High stream temperature	Riparian thinnings	Up to 60 years	**$20,000 annually for 5 years** **($20,000 from FS)**	**Soil and Water** **KV** **Timber** **Fuels** **Fish**	**N/A**
12	Bear Creek (private). T39S, R07W, Sec. 21.	Dam is a partial fish passage barrier	Remove barrier.	3 to 5 years	**$20,000** **($5,000 from FS)**	**OWEB** **Fish** **CCS** **Partners**	**ODFW** **IVWC** **Private landowners** **MRS**
13	Lower Cave Creek (private). T39S, R06W,	-Channel straightened -Loss of	Instream large wood placement. Planting of	5 to 10 years	**$100,000** **($15,000**	**OWEB** **Fish** **CCS**	**ODFW** **IVWC** **Private**

PRIORITY	LOCATION/ OWNERSHIP	EXISTING CONDITION	PROPOSED RESTORATION	YEARS TO RECOVERY	COST	FUNDING SOURCE	PARTNERS[1]
	Sec. 31. T40S, R06W, Sec. 6.	stream channel complexity, lack of large wood	riparian shrubs. Off-channel habitat creation. Channel restoration.		**from FS)**	**Partners**	**landowners MRS**
14	Perennial tributary to Grayback Creek, Grayback Road 4611 (FS and private). T39S, R06W, Sec. 29.	Fish passage barrier (coho and steelhead).	Culvert replacement.	1 year	**$50,000** **($25,000 from FS)**	**KV CCS**	**N/A**
15	Lower Grayback and Lower Cave Creeks. (FS). T39S, R06W, Sec. 30-31.	Lack of quality off-channel habitat	Beaver supplementation	10 years	**$5,000** **($2,000 from FS)**	**Fish, ODFW**	**ODFW TNC**
16	Sucker Creek, Heir Road 4600113 (FS). T39S, R06W, Sec. 31, NW ¼.	Sediment input to stream from road washout	Pull back and stabilize road.	1 year	**$30,000** **($20,000 from FS)**	**Soil and Water CCS Joint Venture**	**N/A**
Low Priority Projects							
17	Lower Bear Cr. (private). T39S, R07W, Sec. 21, 28.	Lack of large wood	Instream large wood placement.	3 to 5 years	**$40,000** **($5,000 from FS)**	**OWEB Fish CCS Partners**	**ODFW IVWC Private landowners MRS**

PRIORITY	LOCATION/ OWNERSHIP	EXISTING CONDITION	PROPOSED RESTORATION	YEARS TO RECOVERY	COST	FUNDING SOURCE	PARTNERS[1]
18	Little Grayback Creek (private). T39S, R07W, Sec. 29.	Lack of large wood	Instream large wood placement.	3 to 5 years	**$60,000** **($8,000 from FS)**	**OWEB Fish CCS Partners**	**ODFW IVWC Private landowners MRS**
19	Sucker Creek push up dams (private). T39S, R07W, Sec. 28-29, 31-32, 36.	Partial fish passage barrier	Improve passage	1 year	**$100,000** **($15,000 from FS)**	**OWEB Fish CCS Partners**	**ODFW IVWC Private landowners MRS**
20[2]	Grayback, Jenny, Lower Cave, Yeager, Elkhorn, and Lower Sucker Creeks (FS). T39S, R06W, Sec. 27-30.	Infested POC	Killing POC along roads and infestation areas. Prescribed burning. Replant areas **not** along roads with resistant POC.	Dependent on the amount of POC in plant community pre-infestation. 10 years.	**$50,000 annually for 15 years. $750,000 total. ($10,000 annually from FS)**	**Special Tech-nology Develop-ment, Forest Health Monitoring, Suppres-sion, Veg. Mgt.**	**BLM Josephine County NMFS ODEQ ODF ODFW OSU USFWS**
				TOTAL COST (All Projects)	**$1,022,000**		

[1]**Partners** – Definitions for Acronyms

- IVWC - Illinois Valley Watershed Council
- BLM - Bureau of Land Management
- ODFW - Oregon Department of Fish and Wildlife
- OWEB – Oregon Watershed Enhancement Board
- MRS – Middle Rogue Steelheaders
- SCA – Student Conservation Association
- KV – Timber Trust Funds
- CCS – Challenge Cost Share funds
- FAC – Forestry Action Committee
- ODEQ - Oregon Department of Environmental Quality
- ODF - Oregon Department of Forestry
- NMFS - National Marine Fisheries Service
- OSU – Oregon State University
- USFWS – U.S. Fish and Wildlife Service
- TNC - The Nature Conservancy

[2] POC treatments would be implemented during higher priority restoration projects where possible.

Sucker Creek Watershed Overview

The Sucker Creek 5th field watershed is approximately 62,500 acres within the Illinois River Subbasin of the Klamath Mountain Physiographic Province of southwestern Oregon (Map 1). The average annual precipitation ranges from 56 inches in the west end of the watershed to 66 inches on the east side. Private lands occupy 19% of the watershed. Public lands are administered by USFS, BLM, State/County, and National Park Service. Approximately 70% of the watershed is managed by the USFS. The Sucker Creek Watershed is a Tier 1 Key Watershed under the Northwest Forest Plan (USDA, USDI 1994) and contains approximately 200 miles of perennial streams on National Forest System land. Ownership and management of the watershed are shown in Table 2.

Table 2. Sucker Creek Watershed Ownership

Ownership	Acres (approximate)
USFS	43,900
BLM	5,800
Private	12,000
State/County	300
Oregon Caves National Monument	500
TOTAL	62,500

Aquatic Restoration Planning for the Sucker Creek Watershed

The condition and restoration needs of the Sucker Creek watershed have been analyzed in several documents as listed below. Much of the resource information in this document is given in greater detail in these documents.

- Upper Sucker Creek Water Quality Management Plan/TMDL
- USDA, Forest Service, Siskiyou National Forest, Illinois Valley Ranger District; 1998. Grayback-Sucker Watershed Analysis, Version 1.1.
- Flood Reports

Forest Watershed Restoration Prioritization Process

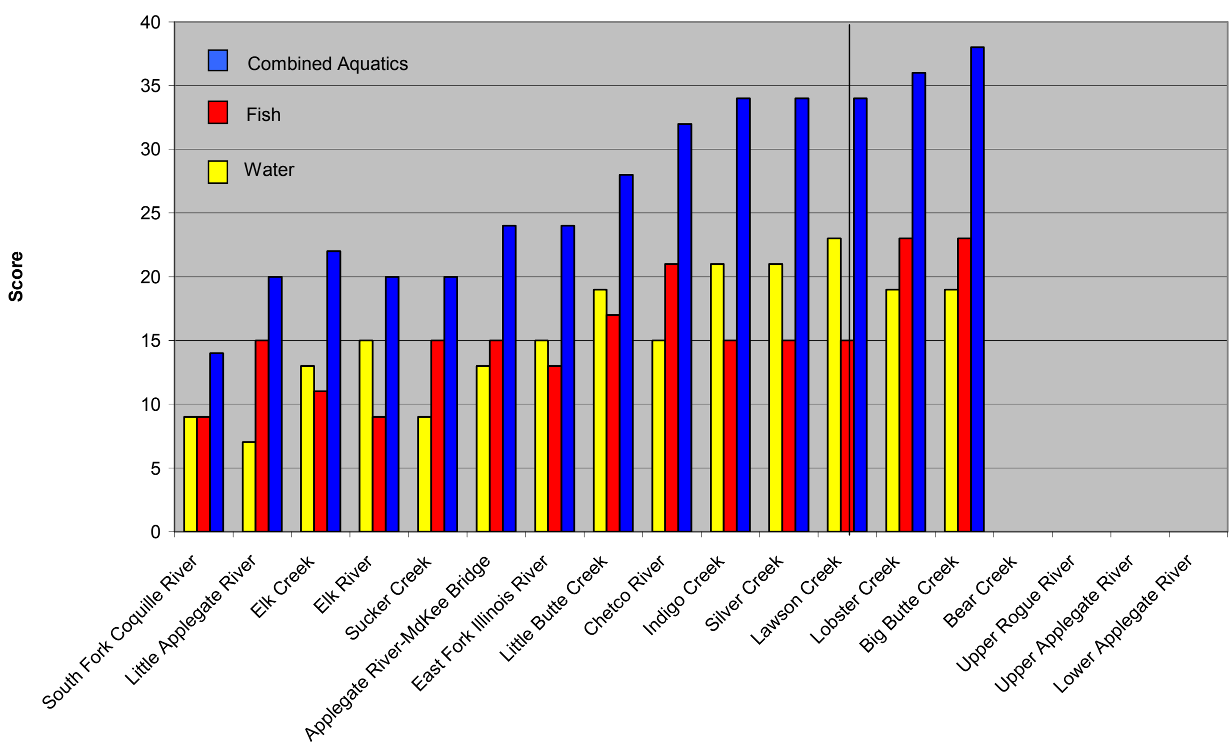
Criteria used to develop priorities for water quality and fish involved seven elements with a numerical rating system and an importance multiplier to weight the value of each individual criterion. While water quality and fish were rated separately, the criteria were jointly developed. Some of the criteria were unique to either water quality or fish while others were common to both. District/Zone and Supervisor's Office personnel were involved in reviewing the criteria and working through Forest watersheds.

Countervailing criteria were used for fisheries ratings, firstly to rate the watersheds by the highest fisheries value (beneficial uses) and secondly by the resource problems within the watershed that required timely restorative actions. An example would be a Key Watershed with high anadromous fisheries values that contained extensive road development in areas with landslide-prone or otherwise erosive soils. This scenario would place a watershed in a high priority category for restorative work. Similarly, a watershed with a completed Water Quality Restoration Plan (WQRP) and with erosional problems as well as sensitive depositional reaches (often equates with the presence of salmon) would cause this watershed to receive a better rating than a watershed without an accepted WQRP.

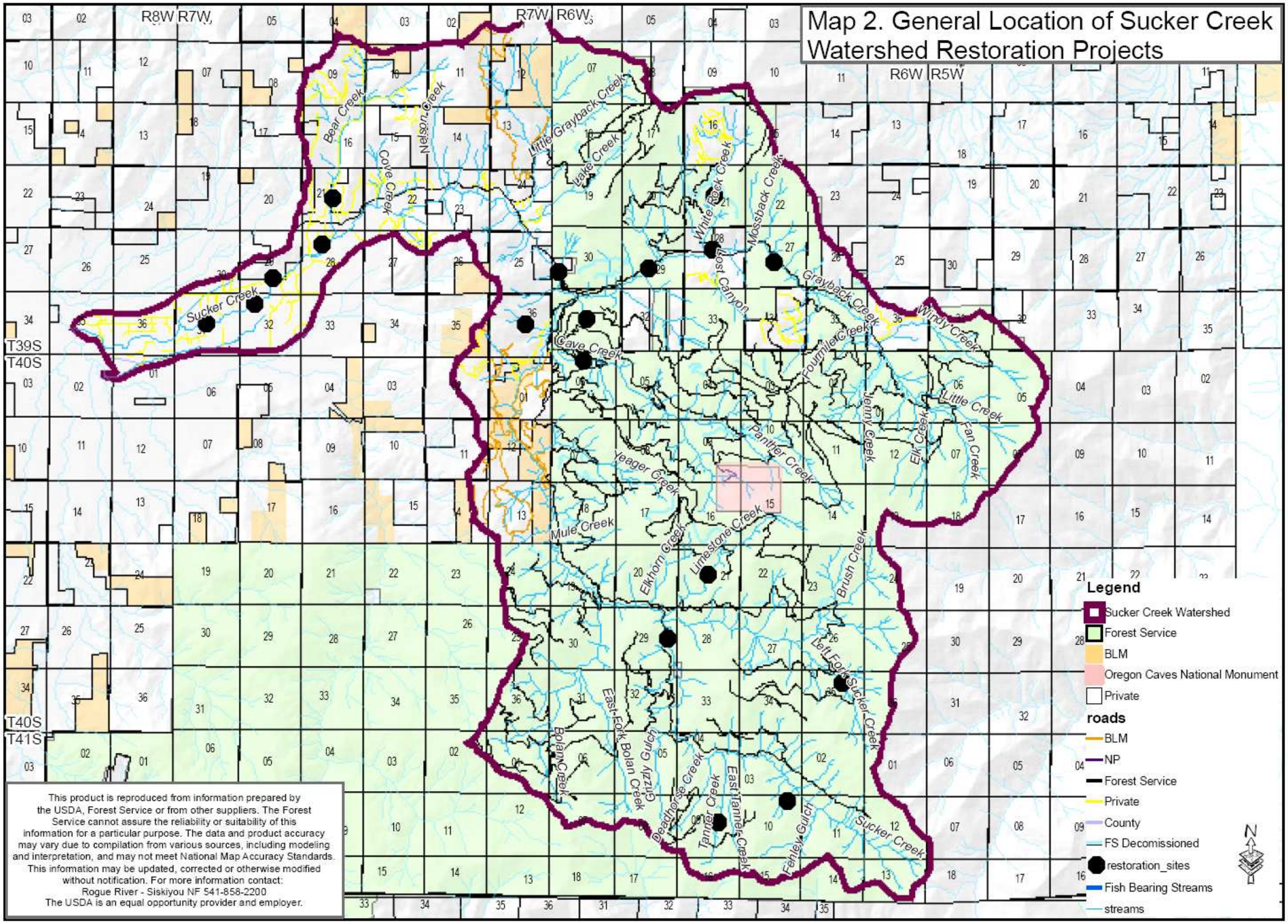
The following criteria were used to generate the Aquatics Ranking graphed below:

1. Key Watersheds - Fish
2. High Erosion Potential – Water Quality/Fish
3. Stream Crossings and Road Density in High Erosion Areas – Water Quality/Fish
4. Depositional Reaches and Sensitivity to Disturbance – Water Quality
5. Completed Water Quality Restoration Plan – Water Quality
6. Miles of Coho Salmon within the Watersheds - Fish
7. Total Number of Anadromous Species within the Watershed – Fish

The final ranking was adjusted by Forest fisheries biologists and hydrologists, and were determined to be 1) South Fork Coquille River, 2) Sucker Creek, and 3) Applegate River-McKee Bridge Watershed.



Graph 1: Watershed Ranking – The lower the score the higher the priority


Map 2. General Location of Sucker Creek Watershed Restoration Projects
R8W R7W
R7W R6W
R6W R5W
T39S
T40S
T41S
Sucker Creek
Bear Creek
Cove Creek
Nelson Creek
Little Grayback Creek
Lake Creek
White Rock Creek
Mossback Creek
Lost Canyon
Grayback Creek
Windy Creek
Fourmile Creek
Cave Creek
Jenny Creek
Elk Creek
Little Creek
Fan Creek
Panther Creek
Yeager Creek
Mule Creek
Limestone Creek
Elkhorn Creek
Brush Creek
Left Fork Sucker Creek
East Fork Bolan Creek
Bolan Creek
Grizzly Gulch
Deadhorse Creek
Tanner Creek
East Tanner Creek
Fehley Gulch
Legend
Sucker Creek Watershed
Forest Service
BLM
Oregon Caves National Monument
Private
roads
BLM
NP
Forest Service
Private
County
FS Decomissioned
restoration_sites
Fish Bearing Streams
streams
N
This product is reproduced from information prepared by the USDA, Forest Service or from other suppliers. The Forest Service cannot assure the reliability or suitability of this information for a particular purpose. The data and product accuracy may vary due to compilation from various sources, including modeling and interpretation, and may not meet National Map Accuracy Standards. This information may be updated, corrected or otherwise modified without notification. For more information contact:
Rogue River - Siskiyou NF 541-858-2200
The USDA is an equal opportunity provider and employer.

Proposed Active Restoration Projects by Priority

<u>**High Priority:**</u>

1. **Sucker Creek large wood placement at Grayback Campground (T39S, R6W, Sec 30):** place large hazard trees with rootwads in 0.5 miles of Sucker Creek, which has low quality fish habitat at this site. Also stabilize and revegetate banks and construct interpretive signs for pre-existing interpretive trail. NEPA complete. Estimated cost $75,000, OWEB grant partially funded.
2. **Grayback Creek large wood placement (T39S, R6W, Sec 28, 29, 30):** place large wood (felled hazard trees and whole Port-Orford-Cedar snags) in the unconfined floodplain area in Grayback Creek downstream of the White Rock Creek confluence on Forest Service and Perpetua timberland. This area is a low-gradient, broad floodplain important to salmon. Also plant disease-resistant Port-Orford-Cedar. NEPA complete. Estimated cost $50,000, OWEB grant partially funded.
3. **Sucker Creek bank stabilization (T39S, R6W, Sec 31):** place large wood structures and stabilize roadbed of 4600112. Currently the road is eroding into Sucker Creek. NEPA complete. Estimated cost $12,000.
4. **Sucker Creek channel restoration (T39S, R6W, Sec 31 and T39S, R7W, Sec 36):** place large wood structures and stabilize eroding streambanks. Multiple partner project with BLM, private, and watershed council. No NEPA in place. Estimated cost $250,000.
5. **Grayback interpretive trail culvert replacement (T39S, R6W, Sec 31):** replace trail culvert that currently blocks access of over 0.5 miles of low-gradient habitat in a perennial tributary to Grayback Creek from coho salmon and other native fishes. NEPA complete. Estimated cost $8,000.
6. **Grayback Thin rehabilitation and restoration (T40S, R6W, Sec 21):** Subsoil logging roads and skid trails to reduce compaction and erosion. Spread slash, plant, and seed to cover bare ground. Replace culvert. Reconnect stream channel. NEPA complete. Estimated cost $22,000.
7. **Tanner Creek road decommissioning (T41S, R6W, Sec 9, 10):** reduce sediment from plugged culverts and drivable fords by decommissioning over 1 mile of road in the upper Sucker Creek sub-watershed. NEPA complete. Estimated cost $15,000.
8. **White Rock road crossing stabilization/road decommissioning (T39S, R6W, Sec 21):** Keep culverts removed and stabilize fill slopes on road 4611910 and 4611917. Keep culverts onsite in case road needs to be used to access private timberland inholding on Forest Service land. No NEPA in place. Estimated cost $15,000.
9. **Sucker Creek Road stabilization/culvert replacement (T40S, R6W, Sec. 29):** Replace culverts, stabilize road crossings, and downstream hillslopes to improve drainage system and reduce sediment inputs. Estimated cost $25,000. No NEPA in place.
10. **Left Fork Sucker Creek road stabilization/culvert replacement (T40S, R6W, Sec 35):** No NEPA in place. Estimated cost $25,000.

Total cost of all high-priority projects: $497,000

Medium Priority:

11. **Riparian thinning (T39S, R6W, Sec 31):** Thinning of overstocked riparian areas near streams could improve water quality for fish in the long term. Thinning would reduce susceptibility of stand replacement wildfire in riparian areas. In addition, the large wood recruitment rate would increase and the time needed for trees to provide stream shade would decrease. Locating areas that are deficient in stream shade (e.g. Figures 1 and 2) could be an efficient way to prioritize areas for riparian thinning. NEPA is complete on some stands through plantation thin and East Illinois Valley Managed Stands EA. Some riparian thinning has already occurred in the Grayback and upper Sucker Creek sub-watersheds. Estimated cost $75,000.

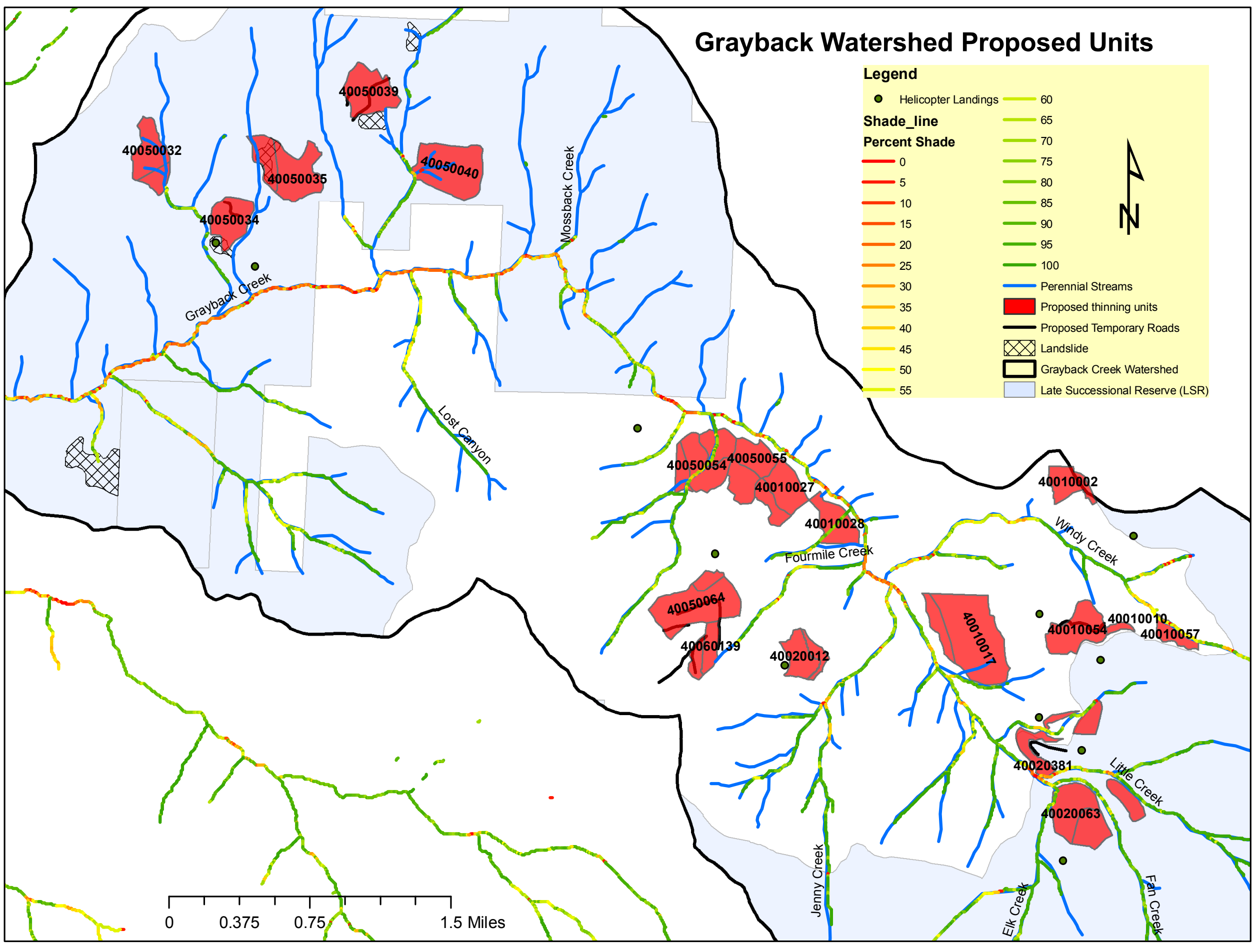


Figure 1. Shade model of the Grayback Creek sub-watershed. Red, yellow, and orange lines are streams with less than 50% canopy cover and potential areas for riparian thinning or planting.

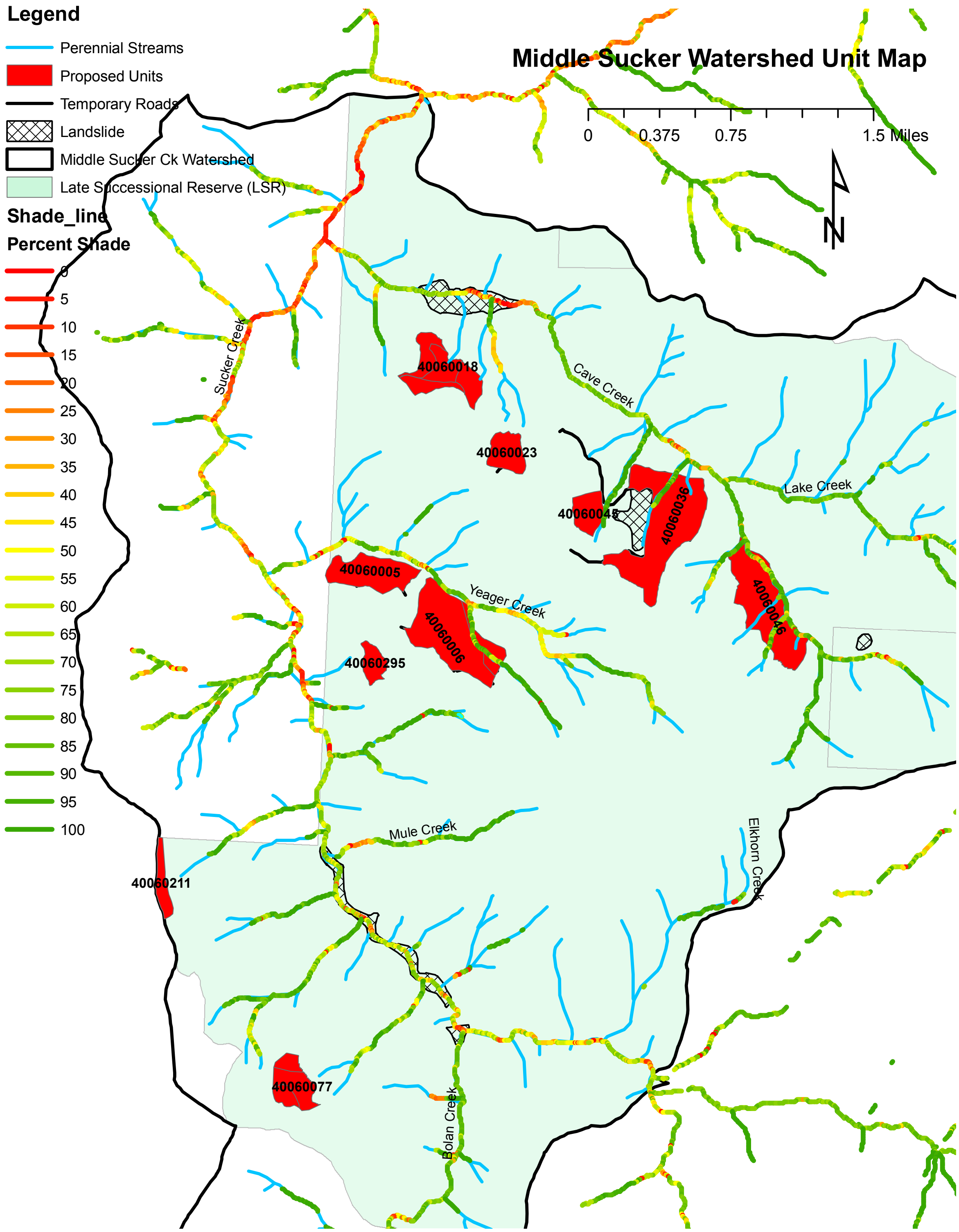


Figure 2. Shade model of the middle Sucker Creek sub-watershed. Red, yellow, and orange lines are streams with less than 50% canopy cover and potential areas for riparian thinning or planting.

12. **Bear Creek diversion dam (T39S, R7W, Sec 21):** Improve fish passage on a dam on private land in Bear Creek. Estimated cost $15,000. No NEPA in place but might not be needed.
13. **Lower Cave Creek channel restoration (T39S, R6W, Sec 31 and T40S, R6W, Sec 6):** Potential to conduct channel restoration in lower Cave Creek to improve coho habitat on low-gradient private lands including meander construction and off-channel rearing ponds and side channels. Need willing landowners. Estimated cost $100,000. No NEPA in place but might not be needed.
14. **Grayback Creek tributary culvert replacement (T39S, R6W, Sec 29):** Replace a culvert on a perennial tributary to Grayback Creek that is a total barrier to coho and steelhead. The amount of habitat above the culvert is low. Estimated cost $50,000. No NEPA in place.
15. **Sucker Creek Heir road stabilization (T39S, R6W, Sec 31):** Pull back currently washed-out 4600113 road and stabilize. Keep road decommissioned. Contributing sediment to Sucker Creek and actively eroding. Estimated cost $30,000. No NEPA in place.
16. **Beaver supplementation (T39S, R6W, Sec 30, 31):** Transplant beaver into low gradient areas in Grayback, Cave, and Sucker creeks to create and improve off-channel habitats and rearing ponds. No NEPA needed (existing MOU with ODFW). A contact from the Nature Conservancy helps live trap problem beavers on private lands and looks for suitable relocation sites on public lands. Estimated cost $5,000.

Total cost of all medium-priority projects: $275,000

Low Priority:

17. **Lower Bear Creek large wood placement (T39S, R7W, Sec 21, 28):** Place large wood in lower Bear Creek on private land within the range of coho salmon. Project would need private landowner approval, coordination with the watershed council, and documentation that large wood is limited in Bear Creek. Estimated cost $40,000. No NEPA in place.
18. **Little Grayback Creek large wood placement (T39S, R7W, Sec 29):** Place large wood in lower Little Grayback Creek on private land within the range of coho salmon. Project would need private landowner approval, coordination with the watershed council, and documentation that large wood is limited in Little Grayback Creek. Estimated cost $60,000. No NEPA in place.
19. **Sucker Creek mainstem push-up dams (T39S, R7W, Sec 28, 29, 31, 32, 36):** Work to improve fish passage if needed on gravel push-up dams in lower Sucker Creek. Project would need private landowner approval and close coordination with the watershed council. Estimated cost $100,000. No NEPA in place.
20. **Port-Orford-cedar treatment (T39S, R6W, Sec 27, 28, 29, 30):** Sanitize Port-Orford-cedar along roadways and streams (Grayback Creek, Jenny Creek -PL not mapped in this drainage but is present, Lower Cave Creek, Yeager Creek, Elkhorn Creek, and Lower Sucker Creek) to slow the spread of *Phytophora lateralis.* Treatment would include killing (but not necessarily removing) of all POC along roads and within infestation areas, followed by prescribed burning.

Replanting with resistant POC after the pathogen has been removed from infested sites would occur, except along roads. Timing to recovery is estimated to be within 10 years of initial POC mortality. Large (greater than 20 inch diameter) POC would be used within the watershed for in-channel structures. The first 100 trees of this size or larger are dedicated to placement within streams in the watershed. Estimated cost $50,000. No NEPA in place.

Total cost of all low-priority projects: $250,000

Total cost of ALL projects: $1,022,000

Passive Restoration and Timing to Recovery

Northwest Forest Plan standards for Riparian Reserves, and Tier 1 Key Watershed status should allow many of the federally-managed portions of the Sucker Creek watershed to recover passively within the next 100 years as vegetation grows back and stabilizes banks and unstable areas and large wood is recruited into streams (Gallo et al. 2005). Passive restoration of stream shade would take approximately 60 years where riparian vegetation is the limiting factor and up to 100 years where channel form is the major limiting factor. Passive restoration would allow riparian vegetation to grow to site potential heights for riparian shade in areas where channel form is not a factor, while recovery of channel form would allow for natural channel evolution to continue. Small setbacks due to permitted mineral extraction under the 1872 Mining Law are expected as a result of prospecting and extraction at current levels along the main stem of Sucker Creek.

Few, if any, major new roads will likely be constructed on federal lands in the watershed. However, privately-owned sections of Sucker Creek will continue to be at risk of development and disruption of natural hydrological and geomorphologic processes. Land acquisitions from willing sellers, or conservation easements and preservation of riparian gallery forests could be ways to passively restore portions of the lower Sucker Creek watershed.

Passive restoration of POC would aid in reducing the spread of disease by minimizing transmission through sites along roads. This type of restoration would include road closures or removal of roads that access currently un-infested or infested areas. Surfacing of any roads without seasonal closures would also aid in passive restoration of POC.

Potential Partners

Illinois Valley Watershed Council/Soil and Water Conservation District (IVWC), Oregon Department of Fish and Wildlife, Oregon Department of Environmental Quality, and The Nature Conservancy are interested in partnering in the restoration of stream processes within the Sucker Creek watershed. Medford District BLM has implemented some aquatic restoration projects in the Sucker Creek watershed and is planning future restoration on Sucker Creek with the FS and the IVWC.

The Forestry Action Committee has performed several restoration projects in the watershed, including extensive riparian tree planting endeavors. Perpetua Forests Company and Indian Hill LLC (formerly Rough and Ready Lumber Company) have some private timberland holdings within the watershed and have expressed interest in aquatic restoration or fish habitat enhancement projects. The Middle Rogue Steelheaders, Youth Conservation Corps, and Josephine County Community Justice are sources for obtaining work crews and labor. The Oregon Watershed Enhancement Board has funded several projects in the Sucker Creek watershed and could be a source of future funding, as could the Forest Service Challenge Cost Share and Joint Venture pools.

Monitoring for Restoration Activities

The parameters that would be monitored to determine the effectiveness of restoration activities and to assess long term trend in the watershed include: fish habitat and smolt production; physical stream characteristics/channel morphology; water quality; and riparian vegetation.

Fish Habitat

Changes in fish habitat can be monitored with stream habitat surveys (e.g. Hankin and Reeves). Localized and more precise channel surveys and some local cross-sections can be established to test effectiveness of where wood is placed or other instream work is performed. Some of the Sucker Creek watershed will be soon mapped using LIDAR through DOGAMI and this technology could prove useful in channel restoration projects.

Spawning ground surveys for coho and Chinook salmon and winter steelhead are important to gauge long term trends in fish population dynamics. A rotary screw trapping project designed to monitor smolt production and responses to habitat enhancement in Grayback Creek should be continued (Figure 3).

Figure 3. A rotary screw trap in lower Grayback Creek has documented changes in fish production from disturbances such as debris torrents.

Channel Morphology

Changes in physical stream characteristics would be monitored with Rosgen Level 2 surveys, including cross sections, longitudinal profiles, and Wolman pebble counts (Rosgen, 1996). Some of the stream characteristics that would be monitored include: cross sectional area, location and depth of the thalweg, shape of the streambanks, slope, bed and water surface features, and substrate composition over time. Information on physical stream characteristics is also an important component of assessing fish habitat suitability. In addition photo points would be installed to document visual changes to project sites and stream reaches over time.

Water Quality

Water quality parameters that would be monitored include water temperature and sediment. Water temperature would be monitored directly with Water Temp Pros deployed annually during the summer months. The riparian shade component would be monitored with a Solar Pathfinder and future aerial photographs. The channel form component would be monitored with channel cross sections, longitudinal profiles, and pebble counts.

Sediment inputs to streams would be monitored indirectly with review of road treatments and culvert replacements. Assessing the reduction in sediment delivery would occur through storm patrols to determine how stabilized roads and replaced culverts respond to winter storms.

Effectiveness monitoring after sub-soiling treatments would occur to determine if soil subsidence has caused a plow pan or dense layer. This monitoring would be completed by the soil scientist who designed the sub-soiler.

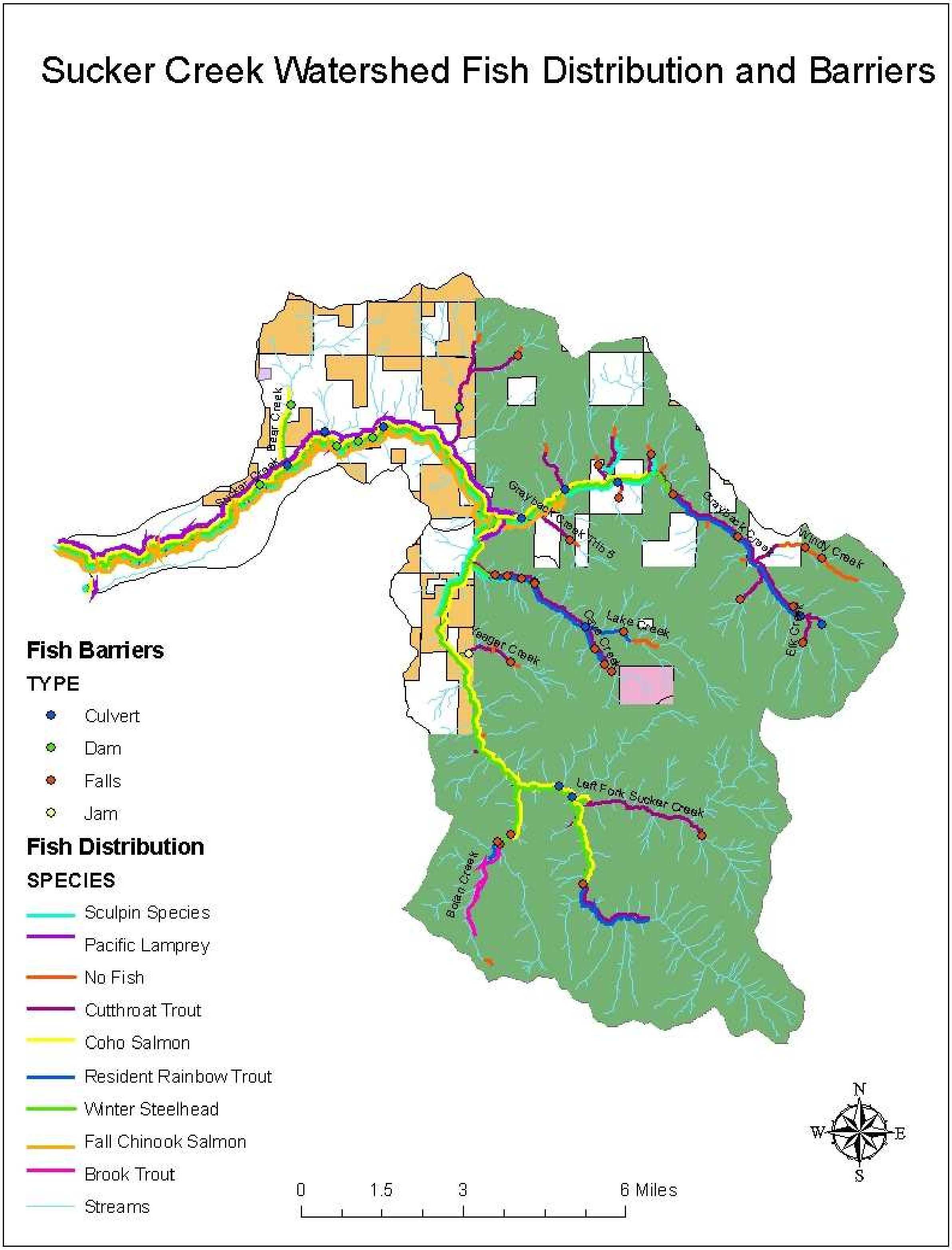
Riparian Vegetation

Effects on vegetation from riparian thinning would be monitored with stand exams and photo points. Stand exams would provide information on the overall condition of the site for trees, saplings, shrubs, and forbs. Photo points would also be established to monitor visual changes in riparian vegetation over time. Monitoring of POC would occur through survey and assessment of seedling survival and condition.

Resource Conditions Relevant to Proposed Restoration

Fish Habitat

The Sucker Creek watershed provides spawning or rearing habitats for native Chinook and coho salmon, winter steelhead, Pacific lamprey, coastal cutthroat and rainbow trout, and reticulate sculpin (Map 3). Coho salmon in Sucker Creek are federally-threatened with designated critical habitat; Chinook salmon and coastal cutthroat trout are Forest Service regionally sensitive (Table 3).



Map 3. Map of land ownership, known[1] fish distribution, and barriers in the Sucker Creek watershed as of May 2007. Orange areas represent BLM land, white are private, green are Forest Service, purple are state, and pink are National Park Service. GIS analysis by Patrick Jarrett. Fish distribution in Bear Creek is estimated from StreamNet database.

Important anadromous fish-bearing streams in the watershed are Bear Creek, Grayback Creek, Sucker Creek, Left Fork Sucker Creek, Bolan Creek, and lower Cave Creek (Table 4). The most important sub-watershed for anadromous fish use (based on miles occupied) is lower Sucker Creek; the least is upper Sucker Creek (Table 5).

Fall Chinook salmon is the most abundant salmonid in the Rogue River basin with recent estimates ranging from 150,000 to 291,000 wild adults (Jacobs 2003). No Forest Service abundance estimates of Chinook salmon production or accurate estimates of their distribution in the Sucker Creek watershed exist. Chinook salmon is thought to occur in Sucker Creek several miles above the Grayback Creek confluence. Recently, Chinook salmon redds were detected about one mile up Grayback Creek in an area where they were not previously thought to occur (unpub. USFS data), which suggests they might be more well-distributed in the Sucker Creek watershed than previously thought. Chinook salmon surveying is problematic, because even though the adults are large, the juveniles do not spend long in freshwater and have usually emigrated by the time summer snorkel surveys occur. Chinook salmon produced in the Sucker Creek watershed contribute to consumptive recreational and commercial fisheries in the Rogue River and Pacific Ocean.

The Illinois River sub-basin is currently one of the most important sections of the Rogue River for natural coho salmon production (Jacobs et al. 2002; ODFW 2004). Sucker Creek is one of the most important spawning and rearing tributaries for coho in the Illinois River sub-basin. Peak counts of over 60 coho salmon spawners per mile have been observed recently in Grayback Creek (Map 3, Figures 4,5), and coho salmon spawn almost up to the Mossback Creek confluence (ODFW 2005b). If Sucker Creek escapement estimates are similar to those in Grayback Creek, it could provide habitat for several hundred spawners; a substantial portion of the Rogue River basin's wild coho salmon run. In the mainstem of Sucker Creek coho salmon appear to be extending their distribution into Left Fork Sucker Creek about one half mile. Upstream of Left Fork Sucker Creek, coho salmon redds have been observed upstream to near Layman Gulch (unpub. USFS data). Coho salmon produced in the Sucker Creek watershed contribute to non-consumptive recreational fisheries in the Rogue River.

Table 3. Special status fish species in the Sucker Creek watershed (14 May 2007).

Species Common (Scientific)	Evolutionarily Significant Unit	Special Status
Coastal cutthroat trout (*Oncorhynchus clarki clarki*)	Southern Oregon California Coasts (SOCC)	ESA Not Warranted, R-6 Sensitive
Steelhead trout (*Oncorhynchus mykiss irideus*)	Klamath Mountains Province (KMP)	ESA Not Warranted
Chinook salmon (*Oncorhynchus tshawytscha*)	Southern Oregon and Northern California Coastal (SONCC)	ESA Not Warranted, R-6 Sensitive, Essential Fish Habitat
Coho salmon (*Oncorhynchus kisutch*)	Southern Oregon Northern California Coasts (SONCC)	ESA Threatened, Essential Fish Habitat and Critical Habitat
Pacific lamprey (*Entosphenus tridentatus*)	Region-wide	ESA Not Warranted, ODFW sensitive,

Table 4. Miles of estimated fish use by species in the Sucker Creek Watershed.

Mainstem stream	Miles of fish use				
	Chinook salmon	**Coho salmon**	**Winter steelhead**	**Pacific lamprey**	**Resident trout**
Sucker Creek	11.6	20.7	20.7	11.7	1.9
Left Fork Sucker Creek	0.0	0.3	0.3	0.0	0.0
Grayback Creek	1.5	3.3	4.0	0.3	3.6
Bear Creek[1]	0.0	1.7	1.3	0.0	0.0
Cave Creek	0.0	0.6	0.6	0.0	3.0
Bolan Creek	0.0	1.0	1.3	0.0	0.4
Other streams in Sucker watershed[1]	0.0	1.4	0.3	0.0	1.0
Total	13.1	29.0	28.5	12.0	9.9

[1]Estimated from the StreamNet database.

Table 5. Miles of estimated[1] fish use by sub-watershed in Sucker Creek watershed.

Sub-watershed (6^{th} field HUC)	Miles of fish use				
	Chinook salmon	Coho salmon	Winter steelhead	Pacific lamprey	Resident trout
Lower Sucker Creek	11.2	12.9	12.4	11.2	0.0
Middle Sucker Creek	0.3	10.4	9.7	0.7	4.4
Upper Sucker Creek	0.0	0.0	2.2	0.0	1.9
Grayback Creek	1.5	3.3	4.0	0.3	3.6
Total	13.0	26.6	28.3	12.2	9.8

[1]All miles are confirmed except for Bear Creek, which was estimated from the StreamNet database. Trout and Chinook salmon mileages may be underestimates.

Figure 4. Coho salmon carcass in Grayback Creek after debris torrent, January 2006.

In addition to salmon, Sucker Creek is also an important spawning and rearing tributary for winter steelhead in the Illinois River sub-basin. In 2005, surveyors counted about 5.5 steelhead redds per mile in middle Sucker Creek (ODFW 2005a). This abundance estimate is very comparable to the average 5.6 redds per mile observed in 22 miles of Sucker Creek in 2000 (SRG 2000). Steelhead also use Grayback Creek up to an impassable falls at river mile 4, Left Fork Sucker Creek, Bear Creek, and possibly other streams in the Sucker Creek watershed. Steelhead produced in the Sucker Creek watershed contribute to non-consumptive recreational fisheries in the Illinois River and consumptive recreational fisheries in the Rogue River.

Pacific lamprey distribution and abundance are poorly understood in the Sucker Creek watershed as they are across most of the species' range (Close et al. 2001). Lamprey redds were observed above the Grayback Creek confluence during 2000 steelhead spawning surveys (SRG 2000) and one juvenile was collected in a rotary screw trap in lower Grayback Creek in 2006 (Reid et al. 2007).

Resident rainbow and cutthroat trout are present above many passage barriers in the Sucker Creek watershed and there are likely more stream miles of resident trout in the watershed than currently estimated, as some tributary streams have not been surveyed. Sucker and Grayback creeks were annually stocked with several thousand rainbow trout between 1928 and 1977 (Cramer 1992) and anglers historically fished for trout in both streams. Streams in the Sucker Creek watershed are currently closed to angling, as are most tributaries in the Rogue River basin.

Figure 5. Sucker Creek above Grayback Creek. Note the lack of instream wood and hardwood riparian area.

Limiting Factors to Native Fish Production

Invasive Species

Invasive species are not currently a major threat to native fishes in the Sucker Creek watershed. Exotic brook trout are present in Tannen and Bolan lakes and the outflows downstream of the lakes, but do not seem to have become well-established throughout the Sucker Creek system. There is some evidence suggesting current brook trout stocking densities in Tannen Lakes are limiting native aquatic ecosystem diversity (Reid 2002, 2005), however, these lakes encompass only a small portion of the Sucker Creek watershed. Exotic Umpqua pikeminnow and redside shiner have not become established on Sucker Creek on Forest Service lands, although it is possible they are expanding their range in lower Sucker Creek. Current surveys do not exist for these species on private lands in the Sucker Creek watershed. Other invasive aquatic and riparian species such as New Zealand mudsnails, Japanese knotweed, and purple loosestrife have not currently invaded Sucker Creek.

Fish Passage

There are about 40 known fish barriers in the Sucker Creek watershed (Map 3), with most of the barriers occurring in tributary streams (Table 6). While some of these are total passage barriers, others are only barriers for certain species or life stages, or at certain flows or seasons. Dams are the most common types of barriers located on private lands (Table 7). The most common types of fish barriers on National Forests are natural waterfalls and culverts. Some culverts on Forest Service land are total fish barriers although the amount of fish habitat above them is generally insignificant as the streams are steep and small.

Table 6. Number and type of fish passage barriers by stream.

Main Stem Stream	Number of Barriers				
	Culvert	Dam	Debris Jam	Falls	Total
Sucker Creek		4		1	5
Left Fork Sucker Creek				1	1
Grayback Creek	1			2	3
Bear Creek	1	1			2
Cave Creek				8	8
Bolan Creek				2	2
Other streams	7	1	1	10	19
Total	9	6	1	24	40

Table 7. Number and type of fish passage barriers by land owner.

Ownership in Sucker Creek Watershed	Number of Barriers				
	Culvert	Dam	Debris Jam	Falls	Total
Private	3	5		2	10
BLM	2	1	1		4
Forest Service	4			22	28
State					0
Other					0
Total	9	6	1	24	40

Habitat Quality

Grayback and Sucker creeks have a history of management activities that affected fish habitat quality and native fish production. These activities included extensive road development and timber harvest (Figure 6). Sucker Creek was placer mined extensively, through hydraulic and other methods, from Grayback Creek upstream beginning in the 19th century. The Grayback Creek sub-watershed is mostly decomposed granite and was not heavily mined. Erosion in uplands and headwaters has contributed to sedimentation and major channel migration, aggradation, and channel avulsion in lower Sucker Creek on private lands, especially in relation to winter floods (Figure 7).

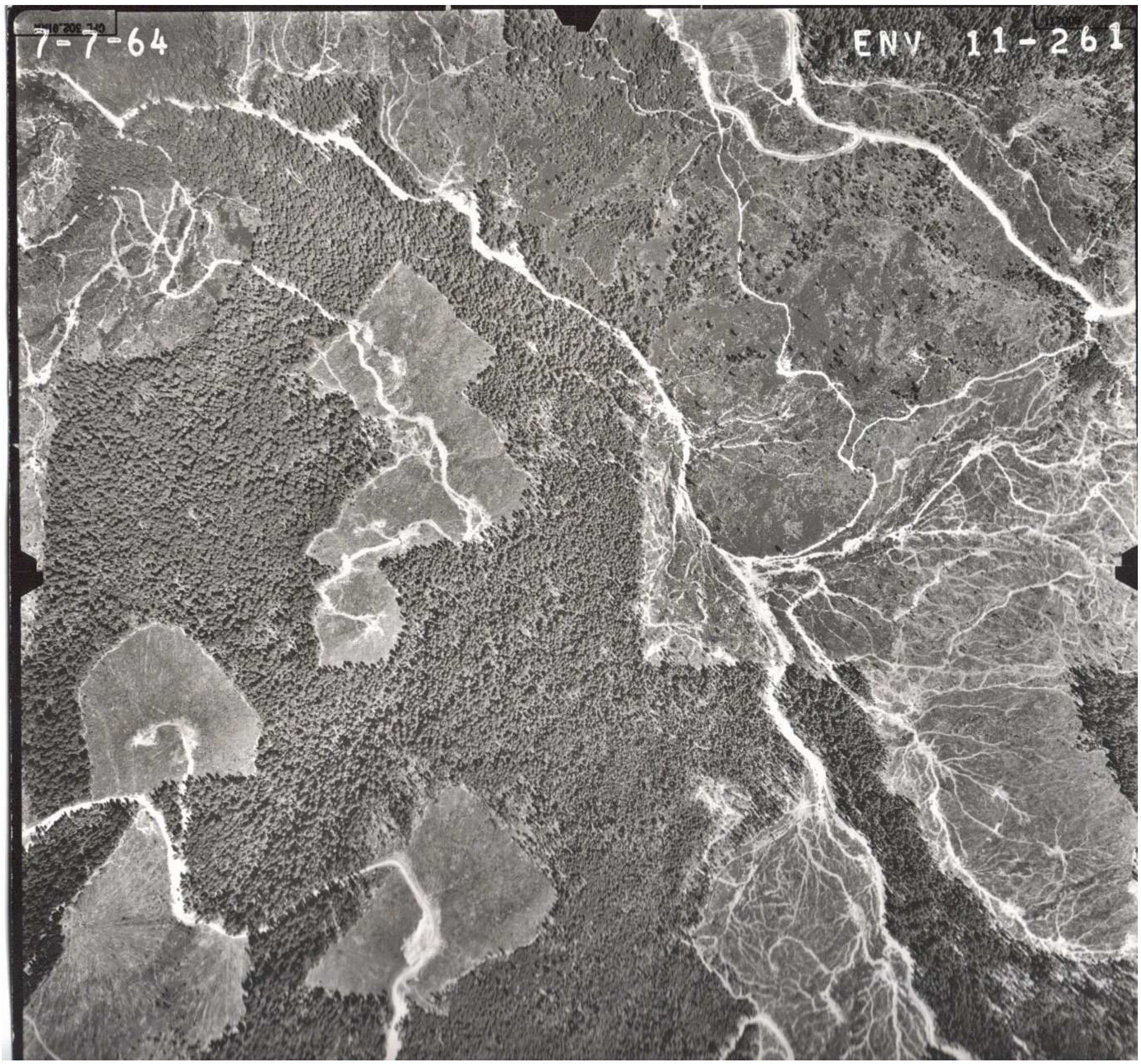


Figure 6. Timber harvest and associated road building and tractor logging scars in the Grayback Creek sub-watershed on Forest Service land in the 1960s.

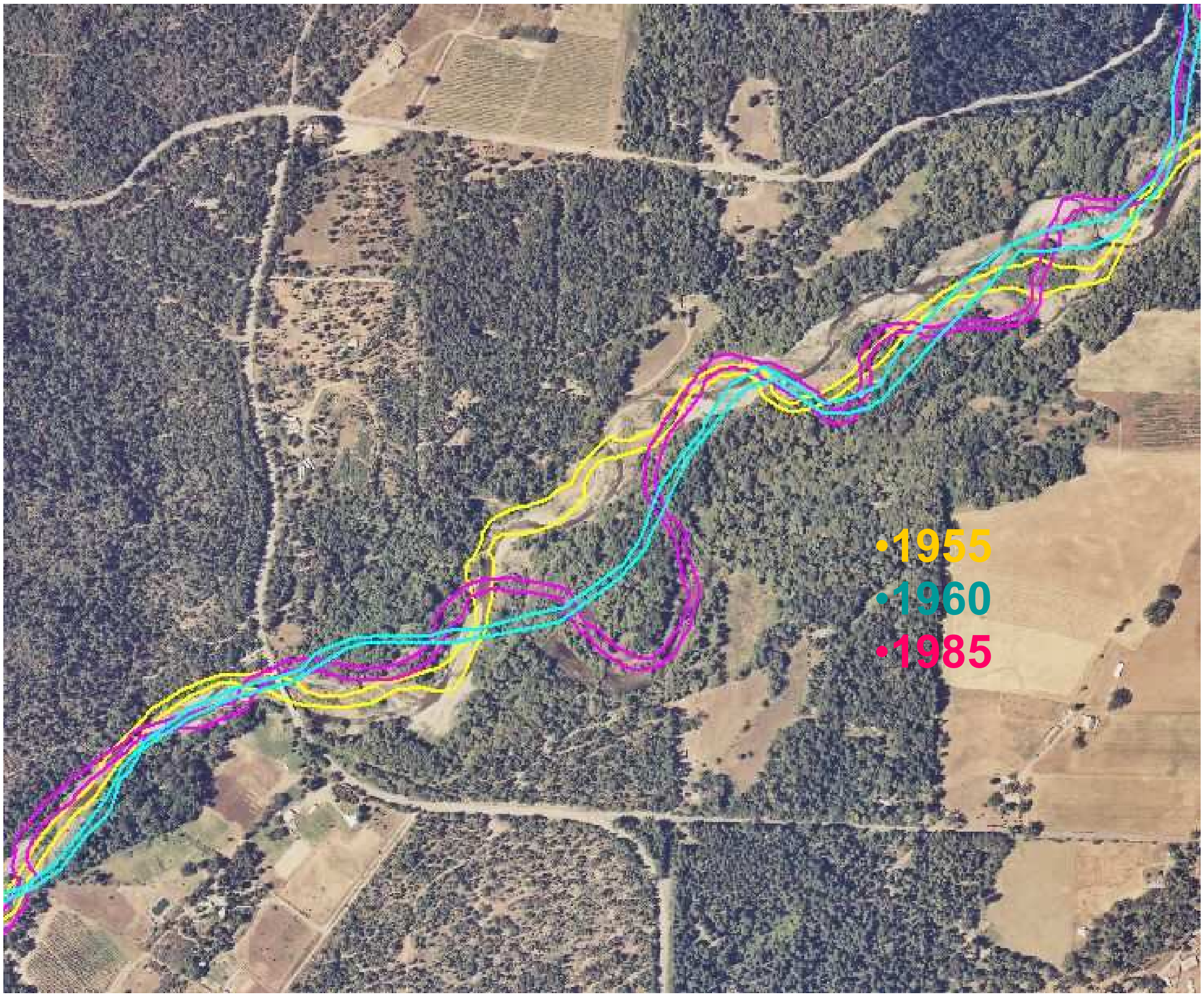


Figure 7. Channel migration in lower Sucker Creek between 1955 and 1985. Data interpretation courtesy of Pamela Wright, Oregon Department of Environmental Quality.

Large wood has been extensively removed from entire stream channels by mining practices, stream cleanout activities after large floods, and riparian timber harvest. Instream large wood frequencies are below benchmark levels of 80 pieces per mile (USFS and BLM 1995, but see Fox and Bolton 2007) in Sucker and Grayback creeks (Table 8, Map 4). Some large wood was placed in Grayback Creek by helicopter in 1998, and large wood restoration projects are currently ongoing in Sucker and Grayback creeks (Figure 8).

Figure 8. Large wood is below benchmark levels in Sucker and Grayback creeks. Sucker Creek at Grayback Campground where a large tree naturally fell across the stream. Photo taken in winter 2006. Suitable spawning gravels have accumulated upstream of the tree and off-channel habitats were created.

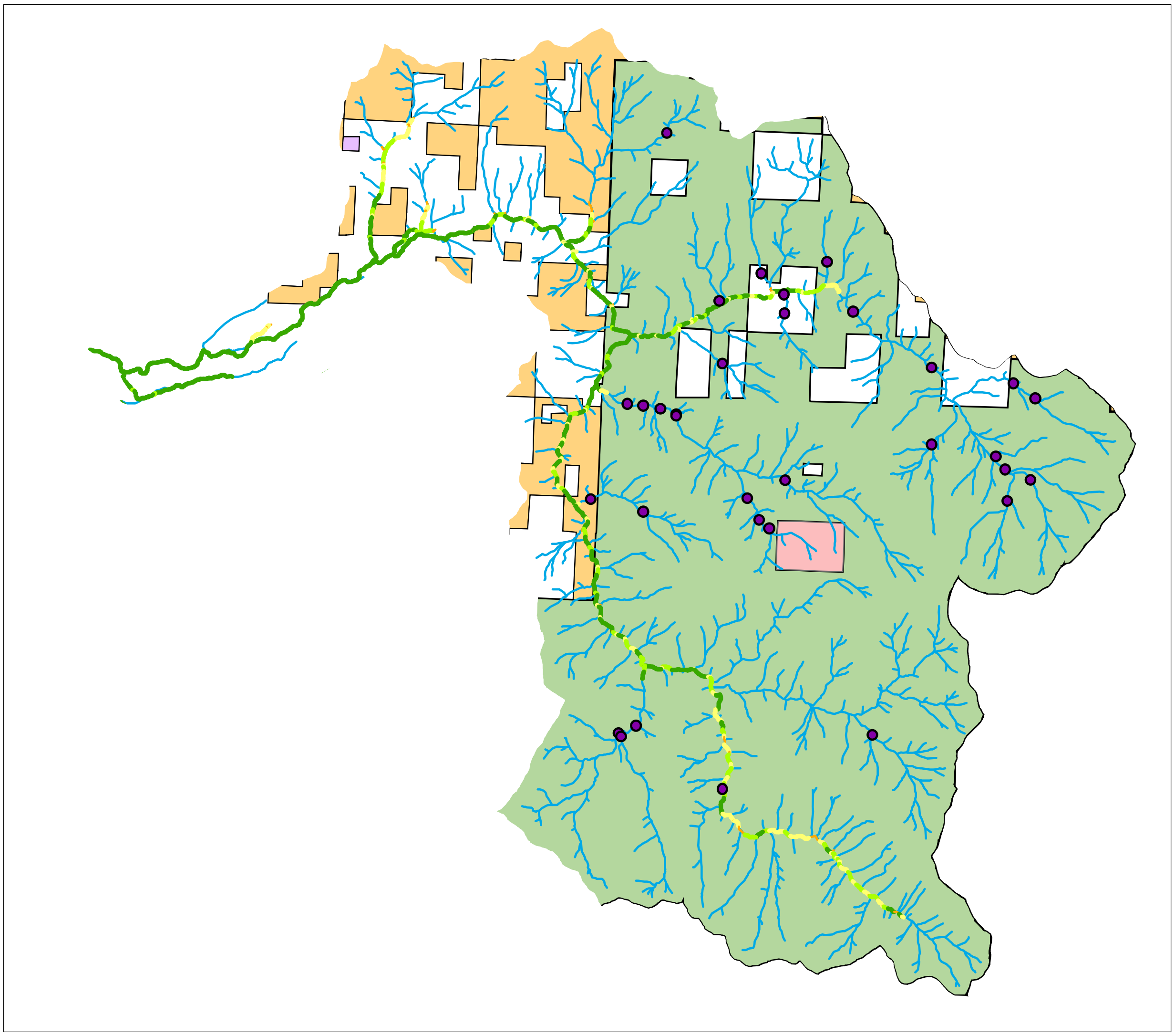
Table 8. Large wood frequency in Sucker and Grayback creeks on Forest Service lands from 1997 stream habitat surveys.

Stream	Reach #	% Gradient	Bankfull width (ft)	Rosgen stream type	Large wood per mile	All countable wood per mile
Grayback Creek	1	3	39.4	B	0.8	26.5
	2	6	31.2	B	2.7	25.4
	3	9	19.2	A	0.6	16.2
Sucker Creek	1	1	63.0	F	0.4	7.4
	2	3	46.7	B	0.0	9.1
	3	5	31.3	B	2.0	37.1

Chronic erosion and sedimentation, particularly in the granitic sub-watersheds, compromise fish production in Sucker Creek. The ditch capture of Windy Creek, when the 4611 road crossing culvert plugged in the 1997 New Year's Day flood, delivered approximately 80,000 cubic yards of decomposed granite soil into the stream channel of Grayback Creek immediately downstream of Windy Creek. Also, several tens of thousands of yards of granitic sand were delivered to lower Grayback Creek in December 2005 due to a slope failure, culvert and road fill washout, and associated debris torrent in the White Rock Creek drainage (Figures 4, 9).

Coho salmon redds were destroyed by this debris torrent and smolt production the following year was extremely limited (Reid et al. 2007). Bank erosion is prevalent on lower Sucker Creek along private lands and in some areas of BLM and Forest Service land in the middle Sucker Creek sub-watershed. Beaver populations are likely reduced from historic levels and could greatly reduce the production potential of coho salmon through the loss of high-value overwintering habitat (Pollock et al. 2004).

Based on an habitat intrinsic potential model (Agrawal et al. 2005) the lower Sucker Creek watershed has the highest potential for coho salmon rearing (40 miles of high and very high potential) and the upper Sucker Creek watershed has the least (less than 5 miles, Reid and Davis 2007). While over 70% of the low-gradient high and very high potential coho salmon habitat is found on private lands in the Sucker Creek watershed some is found on Forest Service lands in Grayback and Sucker creeks (Reid and Davis 2007, Map 4).



Map 4. Coho salmon intrinsic habitat potential in the Sucker Creek watershed (Agrawal et al. 2005). Dark green areas are the highest potential followed by light green areas. Data analysis courtesy of Graham Davis.

Figure 9. Side channel of Grayback Creek used for coho salmon spawning and rearing filled with sand after December 2005 debris torrents from slope failure and plugged culverts in the White Rock Creek drainage.

Water Quality – Temperature

The Oregon Department of Environmental Quality placed the Sucker Creek watershed on the 1994/1996 303(d) list for stream temperature, habitat and flow modification. Stream temperatures exceeded the standard on Sucker Creek between June and September from the mouth upstream to the confluence with Grayback for the five years of record (1993-1997; Table 9).

Completion of the TMDLs for Sucker Creek resulted in delisting of the drainage for year round (non spawning) summer temperatures. Private lands in Lower Sucker Creek and portions of Upper Sucker Creek are listed as “water quality limited” for temperature for salmon and steelhead spawning (Oct. 15 to May 15), flow modification, and habitat modification (2004/2006 Section 303(d) List).

In 1999, the Upper Sucker Creek WQMP/TMDL was completed for stream temperature within the Forest Boundary. The area covered by the upper Sucker Creek plan includes land managed primarily by the U.S. Forest Service and BLM. It covers from the headwaters down to just below the confluence of Sucker-Grayback Creek at approximately River Mile 10.4 of Sucker Creek.

This portion of Sucker-Grayback Creek is a Key Watershed as defined by the Northwest Forest Plan (1995, USDA, USDI). There are no point source discharges within the Sucker Creek watershed. The TMDL addresses the question regarding whether lands under Federal management are providing the coolest water possible to downstream uses. Lower Sucker Creek is defined as the area that includes all BLM managed lands below the USFS boundary at mile 10.4 on Sucker Creek, and all private and county managed lands in the watershed – both above and below mile 10.4.

**Table 9. Grayback/Sucker Temperature Summary.
Summer water temperatures only – June to September.**

Water Quality Station	Years of Record	Average 7-Day High, All Years	Average 7-Day High, 1994-1997
Sucker Ck. @ mouth Elevation 1360’	1993-1997	71.9°F	72.3 °F
Sucker Ck. Blw. Little Grayback Ck	1993-1997	66.9 °F	65.7 °F
Sucker Ck. @ Bolan Ck.	1994-1997	59.9 °F	59.9 °F
Sucker Ck. @ Tannen Ck.	1994-1997	58.3 °F	58.3 °F
Grayback Ck. @ Mouth Elevation 1840’	1991-1997	61.9 °F	61.6 °F
Grayback Ck. Below Mossback Ck.	1994-1995	59.5 °F	NA
Cave Ck. near Mouth	1977, 1980, 1994	62.9 °F	NA
Bolan Ck. @ Mouth	1978-81, 94-97	57.9 °F	57.2 °F
L.F. Sucker Ck. @ Mouth	1992-1997	58.9 °F	59.0 °F

Increased stream shading is the primary mechanism for improving water temperatures in Sucker Creek. Stream shade condition and recovery were assessed in support of the Upper Sucker Creek TMDL/WQMP. Table 10 displays the existing and target shade values for the mainstem Sucker Creek and its tributaries. Specific project work would be developed based on results from RAPID Stream Assessment modeling and current vegetation condition information.

On the main stem of Sucker Creek, mining is responsible for the greatest reduction of stream shade. Mining operations include placer mining within the channel and floodplain of Sucker Creek. For the tributaries of Sucker Creek, the greatest loss of shade from management is due to harvest of trees in the riparian area. Considering both percent flow contribution and shade loss, the Left Fork Sucker, Cohen Creek and Cave Creek are highest priority to reach target shade values. Loss of shade from human disturbance has had a small-to-moderate effect on increasing stream temperature on Sucker Creek above its confluence with Grayback.

Table 10. Sucker Creek and its tributaries – current shade conditions and potential recovery.

Location[2]	% Flow of Main stem[1]	% Existing Shade	% Target Shade	Shade Loss	Type of Disturbance	Years to Full Site Potential Recovery
SUCKER CREEK AND ITS TRIBUTARIES						
Main Stem		52 52	65 53	-13 -1	Mining Harvest	100 60
Tannen Ck	30	86	89	-3	Harvest	10
Deadhorse Ck	15	77	86	-9	Harvest	45
Grizzly Ck	17	82	89	-7	Harvest	35
LF Sucker	30	69	85	-16	Harvest	50
Limestone	6	68	89	-21	Harvest	50
Bolan Ck	20	76	81	-5	Harvest	35
Cohen Ck	5	40	88	-48	Harvest	50
Yeager Ck	7	73	89	-16	Harvest	35
Cave Ck	20	73	85	-12	Harvest	50
GRAYBACK CREEK AND ITS TRIBUTARIES						
MAIN STEM		44	57	-13	HARVEST	45
Fan Ck	20	41	86	-45	Harvest	45
Little Ck	30	30	86	-56	Harvest	45
Jenny Ck	30	53	79	-26	Harvest	50
Windy Ck	25	65	78	-13	Harvest	50
Four Mile Ck	27	27	58[3]	-31	Harvest	45
White Rock	15	63	86	-23	Harvest	50
Lost Canyon Ck	5	54	69[4]	-15	Harvest	50

Larger font and underline indicates areas of highest priority for recovery.

[1] "% Flow of Main Stem" is at the point of confluence between the tributary and Main Stem. This represents how much influence the tributary has on main stem temperatures.

[2] Tributaries are listed in order starting from the headwaters down.

[3] The lower weighted target shade value for Four Mile Creek reflects damage to riparian areas from the December 1996 flood. USFS harvest units located on Four Mile Ck have a target shade value of 86%.

[4] The lower weighted target shade value for Lost Canyon Creek is due to harvest on private land. USFS harvest units located on Lost Canyon Creek have a target shade value of 86%.

For Grayback Creek, the greatest loss of shade from management is due to harvest of trees in the riparian area which caused a 22% increase in solar exposure. Grayback contributes 36% of the stream flow at the confluence of Sucker Creek. Considering flow and the amount of shade loss, Grayback does contribute to increases in stream temperature on Sucker Creek.

For the tributaries of Grayback Creek, the highest priority for reaching target shade values are Fan Creek, Little Creek, Jenny Creek, Four Mile Creek and White Rock Creek. Shade recovery on these tributaries will reduce summer temperature on the lower main stem of Grayback Creek.

For Sucker Creek, including Grayback at the Forest boundary, management activities have increased solar exposure 14% by the removal of shade trees. The highest priorities for shade recovery are four tributaries of Grayback Creek: Fan Creek, Little Creek, Four Mile Creek and White Rock Creek.

There has been considerable channel widening on Sucker Creek in the mining areas upstream of Grayback Creek to Yeager Creek (Figure 10). A meandering pool/riffle stream with connectivity to adjacent floodplains is characterized as a Rosgen “C” channel and is the expected channel form of this stream segment. The dominant existing channel type is a “F4”. F4 channels are entrenched, meandering riffle/pool. An “F4” channel is extremely sensitive to disturbance and has a poor recovery potential (Rosgen, 1994). Changes in the channel probably occurred from natural disturbance, mining, and sediment sources in this stream segment. No other areas on Sucker Creek (on NFS lands) appear to have a channel width greater than expected. The additional width has increased solar radiation in the “F4” stream section by 15% (Upper Sucker Creek TMDL/WQMP, 2000).

On Grayback Creek there are two areas where channel widening may have occurred. In the upper reach from river mile 4.7 to 7.1, the channel is an “A3” steep, cascading step pool. In this area the w/d ratio exceeds expected by 3 units. The width-depth ratio values can vary by +- 2 units without showing a different morphology (Rosgen, 1994). During the storm of 1996, large amounts of sediment were introduced into the stream from natural and harvest-related landslides as well as road failures. Some widening may have occurred. The vegetation is of sufficient height in this area such that a small increase in stream width will not result in increases in solar radiation.

On Grayback Creek, from the confluence with Sucker Creek to river mile 0.75, stream widening is contributing to increases of solar radiation to the stream. The channel has increased in width approximately 10 feet from increases in flow and sediment. A “B4” channel is moderately sensitive to disturbance, and has an excellent recovery potential (Rosgen, 1994). The additional width has increased solar radiation to the lower 0.75 miles of stream by 7 percent.

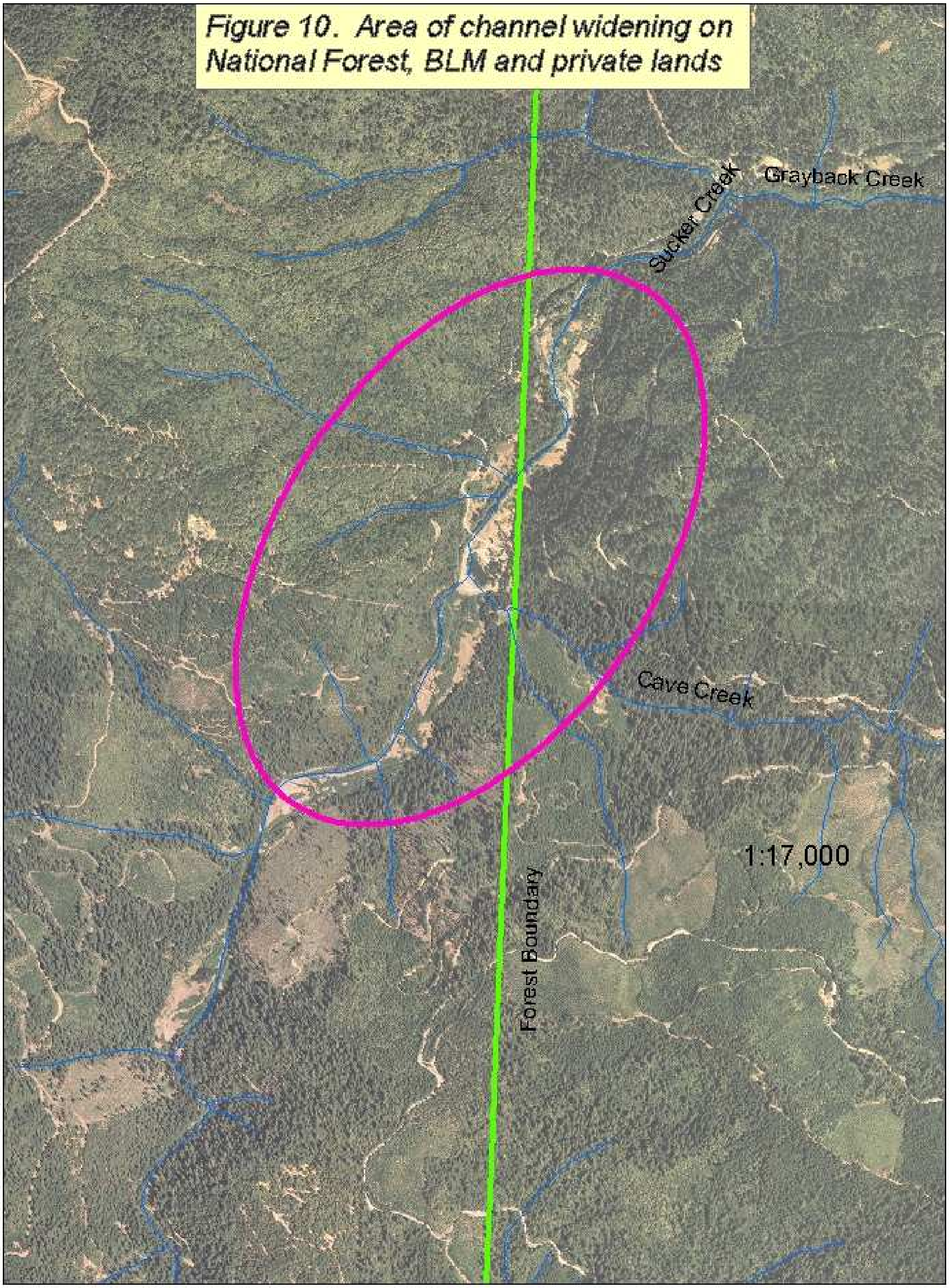


Figure 10. Area of channel widening on National Forest, BLM and private lands
Grayback Creek
Sucker Creek
Cave Creek
1:17,000
Forest Boundary

Water Quality – Sediment Sources

There are both natural and management related sources of sediment; these occurrences are episodic. In Sucker and Grayback creeks, sediment supplied during the January 1, 1997 storm has two primary sources: slope failures and road failures. The 1998 Forest Flood Assessment Report found that sediment supply from roads is greatest when culverts plug, and the flow is diverted outside of the original stream channel (Figure 11). This is clearly demonstrated by the 63,000 cubic yards supplied to Grayback Creek as a result of the road diversion at Windy Creek.

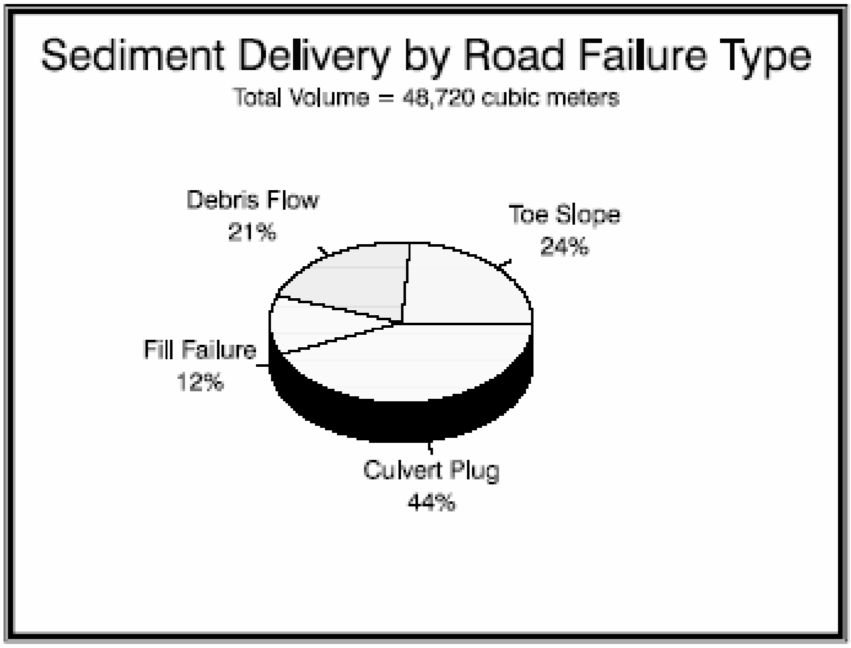


Figure 11. Road related sediment.

Secondly, large hillslope failures can contribute high amounts of sediment. Slope failures are observed to occur in both natural and created openings, sites which often lack large wood (USFS, IVRD, 1998). The effects of sediment delivery are less if large wood is simultaneously delivered to the channel. The principal processes that deliver sediment have been identified as slope failures, road failures, and streambank failures as the result of placer mining.

Volumes of sediment delivered during major storms provide an order of magnitude estimate. Review of air photos indicates that sediment pulses are linked to the 100-year recurrence interval: 1964 storm (280,000 cy) and the 25-year recurrence interval 1997 storm (214,000 cy). The relationship between large pulses of bedload sediment and channel widening are well documented (Hagans and Weaver, 1987; Lisle, 1981; Kelsey, 1980).

In an attempt to understand the relationship between changes in sediment supply, sediment transport, and storage, changes in length of unvegetated bars adjacent to the channel were measured. In Sucker Creek above its confluence with Grayback, there has been a three-fold increase in the length over the photo period (1940 to 1997). Additionally, measured changes in sinuosity have declined from 1.22 to 1.08.

In this same reach, there has been a decrease in riparian cover, especially conifers. An increase in unvegetated bars and loss of sinuosity supports the argument that there has been more sediment in the stream in recent decades. The reduction of sediment supplied by management sources is critical for channel recovery on Grayback Creek, and can only help recovery on Sucker Creek. While linear recovery of channel form is possible, it is more likely to occur in association with channel changing storms whose recurrence interval is 25 years or more. Existing channel conditions will affect recovery rates.

Channel recovery on Sucker Creek near Cave Creek where mining is occurring will not begin until current mining practices are changed or stopped. Even then, channel recovery in an unstable “F4” channel type could begin or be set back in a storm event. Considering the poor recovery potential of the channel and the need for mature conifers to provide shade in this wide section, channel recovery could take over 100 years. On lower Grayback Creek, there is good potential for recovery in the “B” and “C” channel types. With a reduction of management related sediment input, recovery could reasonably be expected over a 25- to 50-year time period.

Roads as Sediment Sources

There are approximately 200 miles of road on National Forest System land within the Sucker Creek watershed. There are 184 miles of existing road and sixteen miles of decommissioned road. Approximately 9% of all roads are within 100 feet of perennial streams, while 5% of all roads are within 100 feet of perennial fish bearing streams. In addition, there are 261 road crossings on perennial streams, and 26 road crossings on perennial fish bearing streams (USFS GIS analysis). Many of the road crossings have high erosion potential due to undersized culverts, lack of maintenance, and unstable substrate material. The average road density (total road length for a given area) in the watershed is 3.4 miles per square mile which is generally considered to be moderate (Sucker Creek Watershed Analysis and (USFS GIS analysis).

In the Sucker Creek watershed, there have been a number of trends identified. Some roads are contributing higher than natural rates of sediment to streams. In addition, some roads have stream crossings where plugged culverts cause erosion as water is diverted across the road during storms. In some areas road fill is not stable and may fail during storms (Figure 12). Further, some roads cross streams, expanding the length of the stream network by road ditches (Grayback/Sucker Pilot Watershed Analysis, 1995).

Areas with high road densities and large numbers of drainage crossings, such as Cave Creek, are most at risk of road failure from large storms. Roads deliver sediment when water is forced across a road by a failed drainage system (Figure 13). Plugged culverts are responsible for many of these failed drainage systems. According to the Siskiyou National Forest Flood Report, culverts plugging is the single largest source of sediment delivered to streams (1998).

Figure 12. Fill failure below culvert outlet.

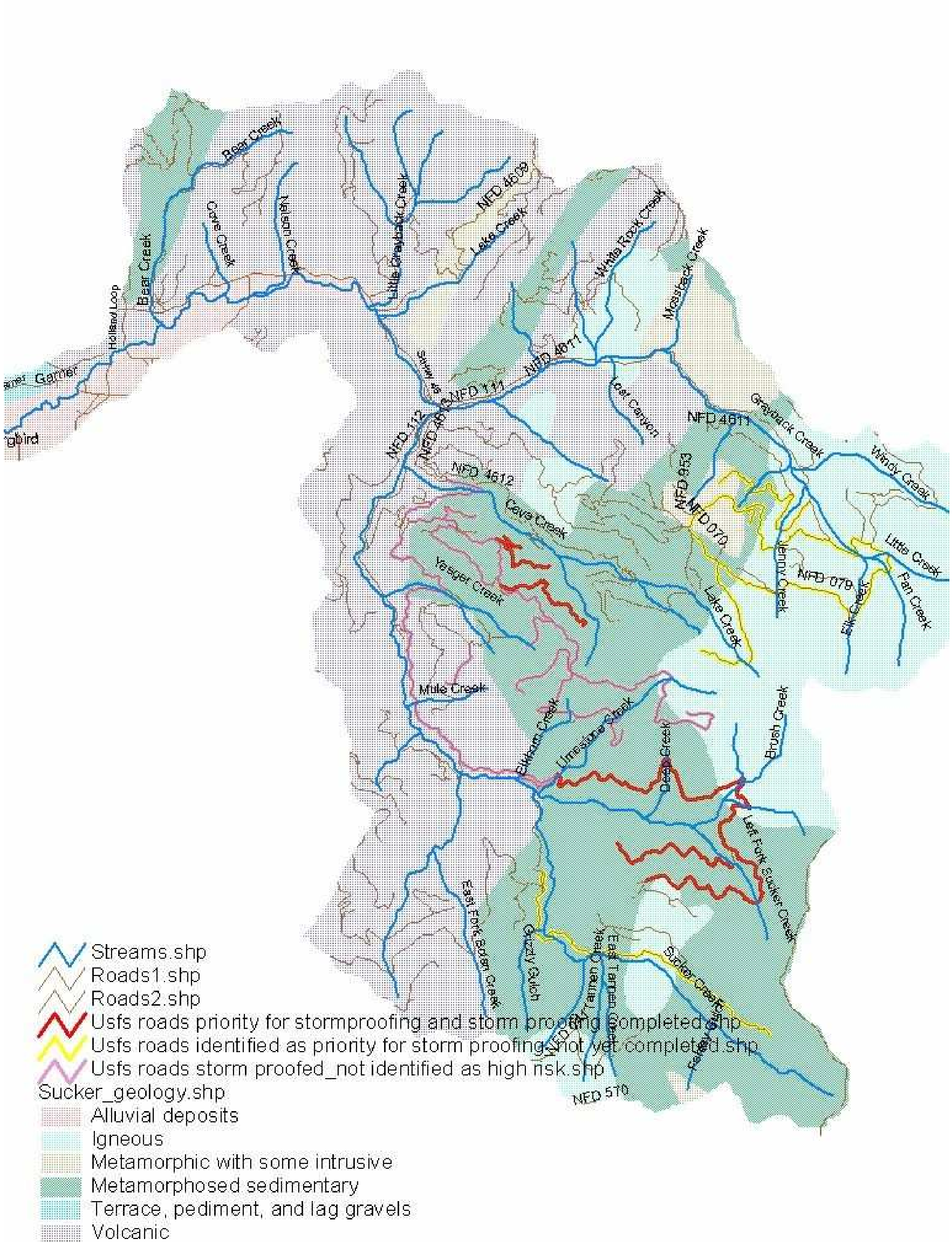
For example, the storms of 1997 caused the culvert on Windy Creek to plug. This accounted for 65,000 cubic yards of sediment or 66% of the total sediment in the stream to be from roads. More recently, during the five-year storm event of 2005 a culvert on White Rock Creek plugged. A slide approximately ¼ mile upstream caused the culvert to plug and fail, resulting in a loss of approximately 500 cubic yards of fill. The effects of the failed culvert were observed at the mouth of Grayback Creek, over three miles downstream of the confluence with White Rock Creek. In Grayback Creek, sediment had deposited in pools and side channels, and in some areas deposits were approximately two feet deep.

Figure 13. Drainage failure on a road in Sucker Creek.

Other roads where plugged culverts have caused road washouts and sediment delivery to streams include the Tanner Creek Road, the Sucker Creek Road, and the road crossings of a tributary to Left Fork Sucker Creek.

Another source of sediment delivery to streams from roads includes road washouts, where roads are located adjacent and parallel to the stream channel. As the stream channel migrates, the lack of streambank and floodplain causes erosion of the road fill. Without proper stabilization, the road begins to washout and sediment is delivered to the stream. Examples of this type of road washout include the FS Road 4600112 and Heir Road along Sucker Creek.

On the Siskiyou portion of the Rogue River-Siskiyou National Forest, more road funds have been spent to upgrade the road drainage system in the Sucker Creek watershed than in any other watershed since 1997 (Map 5). Nonetheless, additional work is needed. Not only are there areas that have not been improved since the 1997 storms, but also high potential for road related sediment issues due to the erosive granitic soils and the susceptibility of the area to rain-on-snow events. Thus, improving the road drainage system in the watershed remains a priority.



Map 5. Storm-proofing on USFS Roads in the Sucker Creek Watershed.

Port-Orford-Cedar

Current inventory data for the Sucker Creek watershed shows approximately 4,391 acres containing Port-Orford-cedar (POC). About 584 acres (13.3%) are infested with *Phytophthora lateralis* (PL), the pathogen that causes POC root disease (Table 11). POC is present on most of the major streams in the watershed. Most of Grayback Creek is infested, as is lower Caves Creek and lower Sucker Creek. Map 6 shows locations of POC and PL in the watershed.

The Sucker Creek watershed is located in the Siskiyou Risk Region for POC. This risk region includes the Coastal Siskiyous, Siskiyou Mountains, and Gasquet Mountain ultramafics located in Oregon and California. The entire Siskiyou portion of the Rogue River-Siskiyou National Forest, except the Powers Ranger District, is located within this risk region. The 13.3% infestation rate for the Sucker Creek watershed is slightly higher than the 11% infestation rate seen for the Siskiyou Risk Region as a whole.

Without active management, estimates for the Siskiyou Risk Region indicate an increase in infested acres to 36% of the risk region as a whole in 100 years. Further, 89% of high risk sites (defined below) will be infested (USDA USDI, 2004). Under proposed management (POC FSEIS) estimates for the Siskiyou Risk Region show an increase in infested acres to 24% of the risk region as a whole in 100 years. In addition, 51% of high risk sites will be infested (USDA USDI, 2004).

Figure 14. Loss of POC from PL along a high-risk site (a stream).

High and low risk sites for POC describe site characteristics that affect the level of risk for infestation by PL. High risk sites are identified as low-lying wet areas (infested or not) that are located downslope from already infested areas, or below likely sites for future introductions, especially roads (Figure 14). High-risk sites include streams, drainage ditches, gullies, swamps, seeps, ponds, lakes, and concave low lying areas where water collects during rainy weather (USDA USDI 2004). Data collected after the Biscuit Fire (2005) provides information on high risk sites for POC. The number of plots with POC and with POC in the canopy, by Plant Association Group (PAG) was determined (Table 12). Similar mortality would be expected on high-risk sites in the Sucker Creek watershed.

High risk sites occur in all Plant Association Groups (PAGs). In the drier PAGs (Douglas-fir-Dry, Douglas-fir–Moist, Jeffrey pine, Tanoak – Dry, Tanoak –Moist, and White Fir – Dry), POC will primarily be located on high-risk sites. Streams, seeps, and other moist micro-sites are the principal locations where POC can successfully compete with other vegetation in these PAGs. However, these same sites also have a high probability for occurrences of new PL infection. If a new infection occurs, the presence of POC in these PAGS can be dramatically reduced, particularly for large live overstory trees. Loss of this canopy component can hinder achieving late-successional objectives in these PAGs.

A low-risk site is identified as a site with characteristics unfavorable for spread and infection by a particular pathogen (USDA USDI 2004). Low risk sites are generally found in moist PAGs (Port-Orford-cedar, Shasta Red Fir- White Fir, and White Fir – Moist). POC can still be found near water, but in these PAGs the moisture gradient is less steep and POC occurs on upland sites, and is not restricted to areas in proximity to water. While the potential for new infection still exists on high risk sites in these PAGs, the distribution of POC across the landscape puts the species at low risk overall as the potential for new infection away from water is low. POC can occur on low risk sites in the drier PAGs; for example above roads at the top of drainages.

Loss of live POC from high risk sites due to PL caused mortality can result in a reduction of 8 to 20% canopy cover within a relatively brief time, perhaps as little as five years, followed by the associated effects from increased sunlight. In addition, if the pathogen is left unchecked, it is likely that currently un-infested, high risk sites will become infested and additional loss of large live POC will occur on these sites with subsequent loss of shade.

Additional un-infested acres of POC may need to be treated. For example, POC within 25 feet of a road on the uphill side and 50 feet of a road on the downhill side may be removed to deny the pathogen a host. Distance to the nearest POC has been shown to be a factor in reducing PL occurrence (Jimerson 1999 and Jules et al 2002). The Grayback/Sucker Pilot Watershed Analysis Results recommends removing POC along roads and isolating infection centers among other treatments (USDA 1997).

Map 6. POC on FS land in the Sucker Creek Watershed.

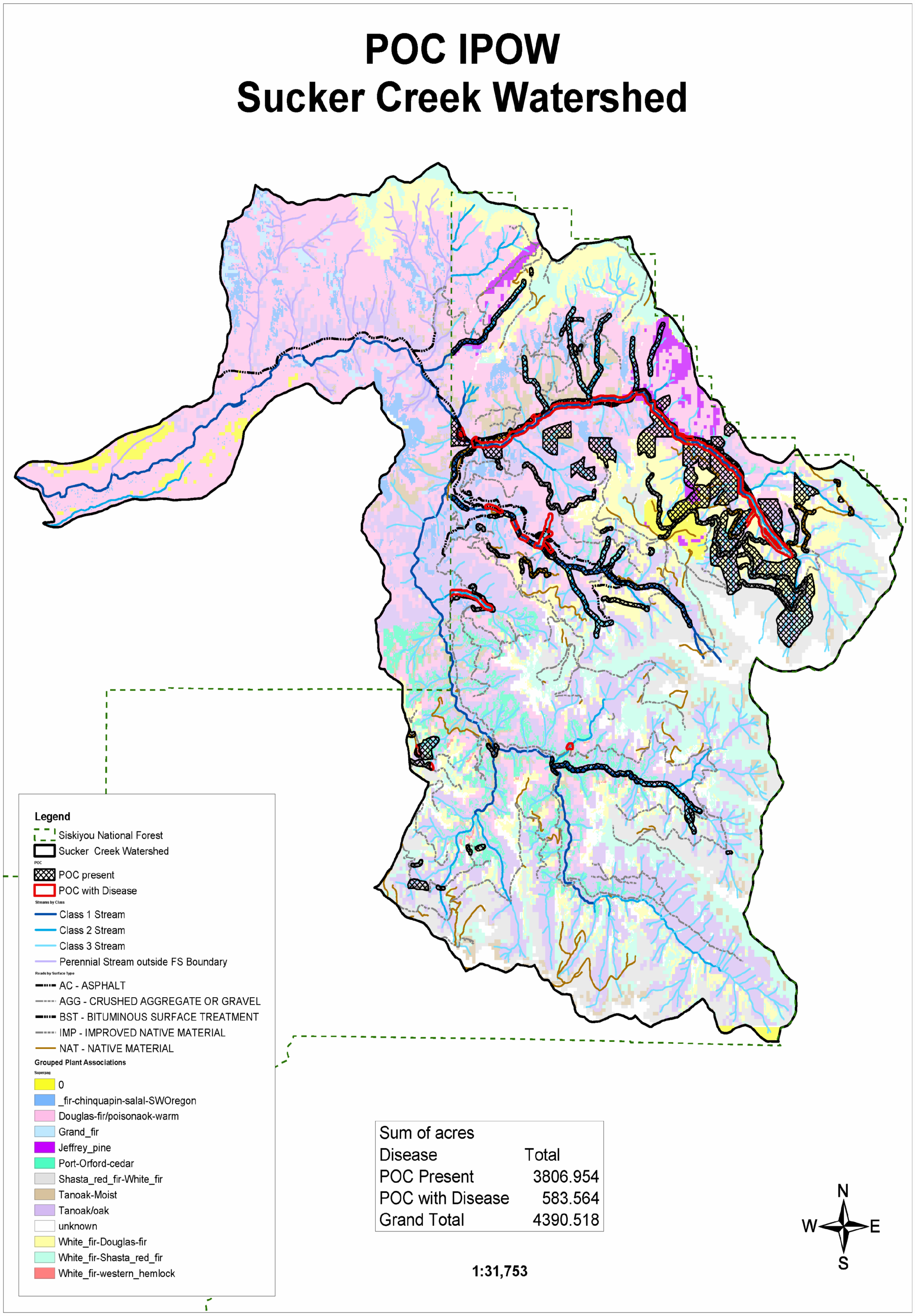


Table 11. POC Treatment Acres by Plant Association Groups in the Sucker Creek Watershed.

Grouped Plant Associations	Risk	Un-infested Acres	Estimated Overstory Infested Acres to Treat	Estimated Understory Infested Acres to Treat	Total (Overstory and Understory) Infested Acres to Treat
Douglas-fir-Chinquapin-salal/ SW OR and Douglas-fir- poison oak/warm	High	594	15	35	50
Grand Fir	unknown	12	0	0	0
Jeffrey Pine	High	121	23	8	31
Port-Orford-cedar	Low	50	2	0	<2
Shasta Red Fir/White Fir	Low	168	2	0	<2
Tanoak Moist	High	171	20	16	36
Tanoak/Oak	High	1,524	112	261	373
Unknown/Other	--	230	14	0	14
White fir-Douglas-fir	High	815	44	34	78
White Fir/Shasta Red Fir	Low	121	1	0	<1
Total		3,806*	233	355	588*

*Does not add up to 3,807 and 584 due to rounding of numbers.

Grouped Plant Associations	Biscuit PAG	Risk	Total PAG Plots	# Eco-plots with POC	# Eco-plots with POC in Canopy	POC Canopy Cover %	% of PAG Plots with POC*
Douglas-fir-Chinquapin-salal/ SW OR and Douglas-fir-poison oak/warm	Douglas fir-dry	High	726	7	2	16%	1.0%
Grand Fir	NA	unknown	NA	NA	NA	NA	NA
Jeffrey Pine	Jeffrey pine	High	102	37	27	20%	36.3%
Port-Orford-cedar	Port-Orford-Cedar	Low	155	154	129	27%	99.4%
Shasta Red Fir/ White Fir	Shasta red fir-White fir	Low	47	2	2	9%	4.3%
Tanoak Moist	Tanoak Moist	High	624	83	45	15%	13.3%
Tanoak/Oak	Tanaok Dry	High	268	20	6	17%	7.5%
Unknown/Other	NA	--	--	--	--	--	--
White fir-Douglas-fir	White Fir Dry	High	1,113	23	13	8%	2.1%
White Fir/Shasta Red Fir	White fir - Moist	Low	666	18	8	7%	2.7%

Table 12. Risk for POC by Plant Association Group (Biscuit Fire Data, 2005).
*Includes all POC, understory and overstory.

References

Agrawal, A., R. S. Schick, E. P. Bjorkstedt, R. G. Szerlong, M. N. Goslin, B. C. Spence, T. H. Williams, and K. M. Burnett. 2005. Predicting the potential for historical coho, Chinook, and steelhead habitat in northern California. NOAA Fisheries Technical Memorandum NOAA-TM-NMFS-SWFSC-379.

Beechie, T. J., G. Pess, P. Kennard, R. E. Bilby, and S. Bolton. 2000. Modeling recovery rates and pathways for woody debris recruitment in northwestern Washington streams North American Journal of Fisheries Management 20:436–452.

Brown, G.W., 1972. An Improved Temperature Model for Small Streams, Water Resources Research Institute Report 16, Oregon State University, Corvallis, OR.

Close, D. A., M. S. Fitzpatrick, and H. W. Li. 2002. The ecological and cultural importance of a species at risk of extinction: Pacific lamprey. Fisheries 27:19-25.

Cramer, S. P. 1992. Status of the Illinois River winter steelhead. Prepared for Illinois Valley Water Rights Association. S. P. Cramer and Associates, Gresham, Oregon.

Fox, M. and S. Bolton. 2007. A regional and geomorphic reference for quantities and volumes of instream wood in unmanaged forested basins of Washington state. North American Journal of Fisheries Management 27:342-359.

Gallo, K, S. Lanigan, P. Eldred, S. N. Gordon, and C. Moyer. 2005. Northwest Forest Plan—the first 10 years (1994–2003): preliminary assessment of the condition of watersheds. Gen. Tech. Rep. PNW-GTR-647. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 133 p.

Jacobs, S. J. 2003. Prediction of the 2003 ocean abundance of Rogue River fall Chinook salmon. Available on the internet at: http://oregonstate.edu/Dept/ODFW/spawn/pdf%20files/reports/rogue%20chf%20prediction%20report%202003.pdf

Jacobs S., J. Firman, G. Susac, D. Stewart and J. Weybright. 2002. Status of Oregon coastal stocks of anadromous salmonids, 2000-2001 and 2001-2002; Monitoring Program Report Number OPSW-ODFW-2002-3, Oregon Department of Fish and Wildlife, Portland, Oregon.

Jimerson, T.M. 1999. A Conservation Strategy for Port-Orford-cedar. Unpublished paper. On file with: Rogue River – Siskiyou National Forest, 333West 8th St. Medford OR 97501.

Jules, E.S.; Kauffman, M.J., Ritts, W.D.; [and others]. 2002. Spread of an Invasive Pathogen Over a Variable Landscape: a Nonnative Root Rot on Port-Orford-cedar. Ecology(83)11:3167-3181.

[ODFW] Oregon Department of Fish and Wildlife. 2004b. Random coho coastal spawning fish summary. Available on the internet at: http://oregonstate.edu/Dept/ODFW/spawn/pdf%20files/coho/PopEst2003.pdf

[ODFW] Oregon Department of Fish and Wildlife. 2005a. Coastal Salmonid Inventory Project 2005 provisional steelhead spawning data. Available from ODFW research laboratory, Corvallis, OR.

[ODFW] Oregon Department of Fish and Wildlife. 2005b. Coastal Salmonid Inventory Project Random coho coastal spawning fish survey summary. 2004-2005 spawning season. Available from ODFW research laboratory, Corvallis, OR.

Oregon Department of Geology and Mineral Industries [DOGAMI]. Mineral Land Regulation and Reclamation Program, Permitting Process. (http://www.oregongeology.com/sub/mlr/newmlrrpermitting.htm). May 21, 2007.

Pollock, M. M., G. R. Pess, T. J. Beechie, and D. R. Montgomery. 2004. The importance of beaver ponds to coho salmon production in the Stillaguamish River basin, Washington, USA. North American Journal of Fisheries Management 24:749-760.

Reid, I. S. 2002. Potential ecological effects to native amphibian, macroinvertebrate, and zooplankton communities from stocking exotic fish in lakes of the Siskiyou Mountains, California and Oregon. M.S. Thesis, Southern Oregon University, Ashland, 78 p.

Reid, I. S. 2005. Amphibian, fish stocking, and habitat relationships in Siskiyou Mountain wilderness lakes, California and Oregon. Northwestern Naturalist 86:25-33.

Reid, I. S. and G. Davis. 2007. Analysis of Illinois Valley coho salmon habitat potential. Poster. Jefferson Fish Society Quarterly Meeting, 12 April 2007, Roseburg, OR.

Reid, I. S, P. Jarrett, and J. Kilgo. 2007. 2006 Grayback Creek smolt trapping report. Available from Wild Rivers Ranger District, Cave Junction, OR.

Rosgen, Dave. Applied River Morphology. Colorado: Wildland Hydrology, 1996.

[SRG] Siskiyou Research Group. 2000. Winter steelhead spawning surveys. Available from Illinois Valley Ranger District, Cave Junction, OR.

USDA Forest Service – USDI, Bureau of Land Management, Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. April 1994.

USDA - U.S. Forest Service and BLM (Bureau of Land Management). 1995. Interim strategies for managing anadromous fish-producing watersheds in eastern Oregon and Washington, Idaho, and portions of California (PACFISH). Habitat Conservation Division, Idaho State Habitat Office, Boise.

USDA-FS. 1997. Draft Grayback/Sucker Pilot Watershed Analysis Results. Illinois Valley Ranger District, Rogue River – Siskiyou National Forest, 26568 Redwood Highway, Cave Junction OR 97523. 28 p.

USDA-FS. 1998. Siskiyou National Forest, Preliminary Assessment Report, Storms of November and December 1996. 39p.

USDA-FS and Oregon Department of Environmental Quality. 1999. Rogue River – Siskiyou National Forest, 333 West 8th St. Medford OR 97501. 52p.

USDA-FS; USDI-BLM. 2004. Final Supplemental Environmental Impact Statement – Management of Port-Orford-Cedar in Southwest Oregon. Portland OR 97208. 485 p.

USDI-BLM. 2007. Sucker Creek Watershed Analysis. Grants Pass Interagency Office, 2164 NE Spalding Ave., Grants Pass, Oregon 97526. 157 p.