Lobster Creek Sediment Abatement Assessment of U.S. Forest Service Road-Stream Crossings

conducted by

The Curry Soil and Water Conservation District:

Aaron Fitch

Erin Minster

and

Swanson Ecological Services, LLC

on behalf of

The Lobster Creek Partnership

funded by

The Rogue-Siskiyou Resource Advisory Committee

October 2011

TABLE OF CONTENTS

	Page
INTRODUCTION	**4**
BACKGROUND: LOBSTER CREEK PARTNERSHIP	**4**
Table 1. Sediment abatement investment on private lands by grantor, 1997-2009	5
ASSESSMENT METHODOLOGY	**6**
Landowner Road Inventory	6
Watershed Analysis Area (WAA) Prioritization	7
Road-Stream Crossing Reconstruction/Modification Cost Estimates	7
FINDINGS	**8**
Sediment Abatement Risks	8
Table 2. Crossing prioritization by Road ID and Watershed	8
WAA Reprioritization	9
Table 3. WAA prioritization based on a multiplication of weighted values…	10
Cost Estimations	10
Fish Passage Sites	11
Table 4. Road-stream crossings with potential fish habitat.	11
General Road Conditions	12
CONCLUSION	**18**
APPENDIX	**20**
Lobster Creek Ownership map	21
Fish Distribution maps	22
Lobster Creek	
Lower Lobster Creek subwatershed	
South Fork subwatershed	
North Fork subwatershed	
2010-11 Road-Stream Crossing Reprioritization maps	27
Upper Lobster Creek overview map	
Lower Lobster Creek detail map	
Middle Lobster Creek detail map	
South Fork detail map	
Boulder Creek detail map	

North Fork detail map

Watershed Analysis Area map 34

Road-Stream Crossing Database Output Summary Reports 37

Road-Stream Crossing Cost Estimation Reports:
Sorted by Sediment Abatement Priority 49
Sorted by Road ID and Milepost 55
Sorted by Culvert Condition 61

Landowner Road Inventory Use Guide 67

INTRODUCTION

In 2006 the Lower Rogue Watershed Council completed a review and update of the Lobster Creek Partnership's *watershed analysis area prioritization* for the Lobster Creek watershed. The results of this review led to the determination that Forest Service roads, particularly those in the South Fork, still constituted a major potential source of anthropogenic sediment loading in the watershed. In response to these findings the Curry Soil and Water Conservation District, on behalf of the Lobster Creek Partnership, submitted a Title II proposal to the Rogue-Siskiyou Resource Advisory Committee (RAC) in 2009 to fund a review and reprioritization of all Forest Service crossings in Lobster Creek. The proposal – #09-DG-11061000-058, "Lobster Creek Sediment Abatement" – was funded, and the work was completed in 2010-11. This report is a summary of the findings.

BACKGROUND: LOBSTER CREEK PARTNERSHIP

Lobster Creek is a 5th field subwatershed (#17100310-07) that confluences with the Rogue River ten miles upstream of the Pacific Ocean, in Curry County, Oregon. The watershed is 44, 253 acres in size (approximately 69 square miles); 64% of the acreage is in Federal ownership, 1% is in state and county ownership; the remaining 35% is in private ownership, primarily industrial timber. The Rogue-Siskiyou National Forest accounts for nearly all of the Federal lands, and Menasha Log Co, LLC currently owns the majority of the private, industrial timber ground (see appendix for map of Lobster Creek Ownership).

Lobster Creek is a vital component of the lower Rogue River fisheries. It supports a healthy run of all four salmonids native to the river: chinook, coho, steelhead, and cutthroat; and has been identified as an important refuge for the long-term preservation of these indigenous salmonid populations. No anadromous barriers exist on the mainstem, and the 5 primary tributaries: the North Fork, South Fork, Lost Valley Creek, Fall Creek, and Deadline Creek; provide significant anadromous habitat (see appendix for Fish Distribution maps).

In 1993 the Pacific Rivers Council (PRC) initiated a discussion with Hancock Timber Resources Group (HTRG), then owner of the private lands in Lobster Creek, about testing an "aquatic ecosystem restoration strategy" in the watershed; the strategy was developed in Knowles Creek (Siuslaw River, OR) by Dr. T. Charles Dewberry. By August 1994 the Oregon Department of Fish and Wildlife (ODFW) joined the discussion, and an assessment of the juvenile salmonid populations was initiated by Dr. Dewberry across the entire stream network. Three stream segments critical to spawning and rearing (*critical fish production reaches*) were identified, and later verified through snorkel surveys and smolt trap data (see appendix for a set of Watershed Analysis Area maps). (Hoobyar 1999)

In response to the juvenile assessment findings interest grew for utilizing Dr. Dewberry's "aquatic ecosystem restoration strategy" as a way to systematically protect the high quality fisheries in Lobster Creek, with an emphasis on the *critical fish production reaches*. By 1997 a partnership had formed known as the Lobster Creek Partnership (the Partnership), which included: HTRG, USFS Gold Beach Ranger District (USFS), ODFW, PRC, the Lower Rogue

Watershed Council (Council), and the Curry Soil and Water Conservation District (Curry SWCD). Given the highly constricted nature of the mainstem and tributary channel morphology, the high energy flood discharge, and the unstable surface geology, the Partnership determined that the primary threats to the *critical fish production reaches* were from upland sites; not from instream conditions such as the absence of large wood. (Hoobyar 1999)

By mid-1997 an initial analysis of the private and Federal road network led to the conclusion that sediment, originating from USFS and private timber roads, constituted the greatest upland threat to the *critical fish production reaches*. The Partnership agreed that a standardized protocol was needed to inventory these roads, to analyze the data, and to prioritize the sediment risks. Cindy Myers, Monitoring Coordinator with the Lower Rogue Watershed Council at the time, and a former geologist with the USFS, developed a protocol entitled "Landowner Road Inventory", which combined attributes of existing protocols used by the Oregon Department of Forestry and the Pacific Watersheds Associates, as well as attributes requested by HTRG for their management purposes. In the spring of 1998 the Council hired and trained a field crew to conduct *Landowner Road Inventory* surveys on the private road network. Between 1998 and 2000 approximately 11 weeks were spent surveying a total of 83 miles of HTRG roads; data was analyzed and sites were prioritized; and the findings were presented to HTRG. Also in 1998 the USFS contracted with Myers to inventory of all their stream crossings in the watershed.

Given the delicacy of sharing private property information with a public agency, the Partnership developed a method for presenting their analysis irrespective of ownership. Small sub-watersheds defined as Watershed Analysis Areas (WAA's) were delineated in accordance with standard practices used by the USFS Watershed Analysis methodology (see appendix for map of WAA's). These WAA's were then prioritized as "highest", "high", "medium" and "low", based on their potential to impact fish habitat. (Hoobyar 1999)

Between 1997 and 2009 the Partnership implemented sediment abatement projects on the private road network and the privately owned segment of FSR3310. In total, 82 road-stream crossings were upgraded and 12 were decommissioned; 14 fills were reconstructed to prevent failure; 12 miles of drainage improvements were installed; and 1.2 miles of road were decommissioned. Projects were typically funded on a cost-share basis, with the Council and/or Curry SWCD contributing 60%-75% of the project costs through grant funding, and the landowner contributing the remaining 25%-40% through in-kind (rock, personnel, etc.) and cash donations.

Table 1. Sediment abatement investment on private lands by grantor, 1997-2009

Grantor	Grant Contribution	Landowner	Landowner Contribution
OWEB	$32,112.41	HTRG	$68885.21
DEQ	$68,548.39	Lincoln	$29427.46
NFWF	$6128.00	Menasha	$8901.00
EPA	$1400.00		
Forest Service RAC	$66,667.00		
BLM RAC	$30,510.00		
Other	$1295.00		
Totals	$206,660.80		$107,213.67

During this time period the USFS also made improvements on their road network. One small stream crossing was replaced (FSR3310) and a large crossing was decommissioned (FSR3402230), and most notably the Iron Creek crossing (FSR3310) was reconstructed with an arch culvert; to provide fish passage, and to prevent the delivery of approximately 6,500 cu yds of road fill material. General road maintenance, such as road grading and ditch cleaning, was also conducted on the primary road system, and on some secondary roads. Although these improvements were important, results from the Council's 2006 WAA review and reprioritization highlighted the need to address more of the high and medium priority crossings. In particular, six of the ten highest priority WAA's were on USFS lands in the South Fork drainage.

Review of the USFS' 1998 *Landowner Road Inventory* data revealed that the road-stream crossings had not been "ground-truthed" following prioritization, which is generally recommended to insure that database output is accurate, and that the prioritization methodology captures conditions in the field. In order to develop a sediment abatement road plan for the USFS crossings, the Partnership agreed to revisit and reprioritize the crossings; this decision led to the Title II RAC proposal that funded the work conducted in 2010-11.

ASSESSMENT METHODOLOGY

LANDOWNER ROAD INVENTORY

The original 1998 road-stream crossing surveys were conducted using the Council's *Landowner Road Inventory* protocol, which was developed from the OR Dept. of Forestry's Forest Road Hazard Inventory Protocol, 1997 and the Pacific Watershed Associate's road inventory protocol (1997). Typically *Landowner Road Inventory* surveys are conducted on foot, by a two-person crew; the road is broken into segments based on drainage, failing road fills are assessed, and all road-stream crossings are documented (see appendix for *Landowner Road Inventory Use Guide*). Inventory of the USFS roads in 1998 was abbreviated to account for the quantity of miles that had to be surveyed. This inventory was conducted using a vehicle, and only the road-stream crossings were surveyed. Data was entered into the Council's *Landowner Road Inventory* Approach database, and analyzed to determine which sites were most at risk of failure, and to calculate the quantity of road fill that could potentially be delivered to the stream network. The combination of risk and fill quantity were used to prioritize the crossings based on sediment delivery potential (see appendix for *Landowner Road Inventory Use Guide*).

In preparation for the 2010-11 review the existing USFS road-stream crossings were uploaded into the District's GIS system, so that sites could be displayed spatially, according to their 1998 prioritization. These maps were used to access the crossings, which was done by vehicle, bike, or on foot, depending on road conditions. FSR3310 crossings located between mileposts 0 and 8.25 were not included in the review because these sites had already been re-inventoried in 2006, and prioritized as part of a sediment abatement project implemented in 2009. The remaining 1998 survey data were ground-truthed, and updated as needed, and the original site prioritizations were compared to conditions on the ground to determine if those prioritizations accurately reflected the risk posed by the road-stream crossings. The Council's database was updated with the new data, and the sites were reprioritized according to the *Landowner Road Inventory* Use

Guide. The new prioritizations were cross-referenced with our field notes, and adjusted to reflect conditions observed on the ground. During the 2010-11 field review new crossings were identified that had been overlooked during the 1998 inventory. At these sites a *Landowner Road Inventory* road-stream crossing data sheet was filled out, data were entered into the District's database, and the sites were mapped using GIS. Prioritization of the new sites followed the same procedures as described above for the existing sites.

WATERSHED ANALYSIS AREA (WAA) PRIORITIZATION

Since USFS roads were not surveyed using the full "Landowner Road Inventory" protocol, other road features such as road drainage and fill failures were not included in this assessment; except where a fill failure was occurring at a stream crossing. The overall sedimentation risk posed by Forest Service road-stream crossings was determined for those WAA's containing one or more Forest Service crossings, based on the following methodology:

(1) The "Landowner Road Inventory" prioritization process categorizes sites as Low, Low-Moderate, Moderate, Moderate-High, and High (L, L-M, M, M-H, H) based on their potential to deliver sediment. (see appendix for *Landowner Road Inventory* Use Guide). These ratings were assigned the following weighted values: H = 2.5, M-H = 2.0, M = 1.5, L-M = 1.0. Low priority sites were considered a non-risk, and therefore were not included in the process.

(2) Three *critical fish production reaches* were identified in the Lobster Creek watershed. The location of the WAA's in relation to these *reaches* was used to assess the WAA's sedimentation risk on the indigenous salmonid populations. *Critical fish production reaches* were dissected into quarters for the purpose of assigning each WAA a value based on the quantity of critical habitat located downstream of the WAA. If a WAA was entirely upstream of one *production reach* it was assigned 5 points; 50% upstream of one *production reach* was assigned 2.5 points; etc.

(3) Points were tallied for each WAA as follows: the weighted value of each crossing within the WAA was multiplied by the weighted value of the *critical fish production reaches*; these values where then added together for all the crossings within a WAA, and the WAA's were prioritized according to the following scoring: 0-19.75 is a Low priority; 20-79.75 is a Moderate priority; and 80-160 is a High priority. The WAA's were also ranked from 1-20 based on their total score; where #1 is the highest priority WAA in the watershed and #20 is the lowest. Note that only WAA's containing Forest Service crossings were included in this analysis.

RD-STREAM CROSSING RECONSTRUCTION/MODIFICATION COST ESTIMATES

Cost estimates were made for the reconstruction and/or modification of the road-stream crossings. Reconstruction costs were calculated based on the excavation volume, replacement culvert diameter and length, and average compaction and rock requirements; given the following assumptions: (1) if the maximum fill height is greater than 20 ft bench construction is required, (2) the excavated trench is twice the width of the new culvert diameter, (3) rate of excavation/reconstruction is 30 cu yds/hr, (4) rate of compaction is 50 cu yds/hr, (5) the first 100 cu yds of excavation can be staged on-site, beyond that it will be stockpiled at a haul rate of 50 cu yds/hr, and (6) twenty percent of the excavation will be reconstructed with new rock.

Spreadsheet formulas were applied evenly to all sites – no individual considerations were made. Hourly rates for heavy equipment, compaction, and rock were based on competitive, private sector contractor pricing for the 2011 field season. Replacement culverts are assumed to be aluminized steel – 16 gauge to 30" diameter, then 14 gauge; prices were based on competitive quotes made between 2007-2011.

Generic costs were developed for the following alternative prescriptions (modifications): construct rock headwall ($570 – 2 machine hrs + 1 load rock); tar culvert invert ($250/culvert); fix existing culvert inlet or outlet ($135 – 1 machine hr); rock inlet and outlet ($435 – 1 machine hr + 1 load rock); trash rack ($500 – steel and fabrication); add ditch culvert ($2000 – 18" diameter, 80 ft - incl. downspout, 4 machine hrs + 1 load rock + labor).

Equipment mobilization costs were not factored into the estimates. See appendix for cost estimation spreadsheet tables.

FINDINGS

SEDIMENT ABATEMENT RISKS

Of the original 121 road-stream crossings identified in the RAC proposal, 86 were reviewed in the field; 32 were not included because they had already been reprioritized as part of the 2009 FSR3310 sediment abatement project; 2 sites, which posed relatively low risk, were omitted because poor access generated time constraints; and 1 site, which is located on an access road to a miner's cabin, was omitted because of trespass concerns; 12 new sites were also added to the inventory. Of the 86 sites that were reviewed, 47 were reprioritized based on the field review. Typically sites were downgraded because (1) the streams were small and if the site fails the rate of failure rate will be slow, (2) the existing culvert size and condition, coupled with a low plug potential, minimized the risk of failure or diversion, or (3) the site had already been upgraded or decommissioned. In the first scenario we recommend that these sites be revisited in 10 years to check on their status; in the case of the second scenario, we are recommending that rock headwalls be installed to increase culvert capacity rather than undertaking the expense of replacing the crossings. Where site prioritization was increased, high plug potential and/or poor culvert conditions led to the higher ratings. Table 2. lists site prioritization by road, for all 133 USFS crossings; see also the appendix for 2010-11 crossing prioritization maps.

Table 2. Sediment abatement crossing prioritization by Road ID and Watershed

Road ID	Watershed	Low	Low-Moderate	Moderate	Moderate-High	High
FSR3237	South Fork		1	2	1	
FSR3237121	South Fork	1				
FSR3237132	North Fork	3			1	
FSR3310	Mainstem	24		6		2
FSR3310	South Fork	12	7	7	2	9
FSR3310390	South Fork	1		1		
FSR3310435	South Fork	1				
FSR3340	South Fork	2	1			
FSR3340110	South Fork	2				
FSR3340140	South Fork	4	3	4	2	2
FSR3340150	South Fork					1

Road ID	Watershed	Low	Low-Moderate	Moderate	Moderate-High	High
FSR3340156	South Fork	4				
FSR3340190	South Fork			1		
FSR3340196	South Fork	2	3	1		
FSR3340260	South Fork	1				
FSR3402	Mainstem*	3		2		
FSR3402190	Mainstem*	1				
FSR3402230	Mainstem*	1				
FSR5325	South Fork	1				
FSR5502220	Mainstem*			1		1
FSR5502220	North Fork	2		1	2	
FSR5502260	North Fork	1		1		
FSR5502320	North Fork	1				
FSR5502321	North Fork			1		

* Lost Valley Creek is considered part of the Mainstem for analysis purposes

Road-Stream Crossing Summary reports are included in the appendix. These reports include the primary data used to prioritize sites, as well as the prioritization and prescription made for each crossing; an explanation for how to read these reports is included in the *Landowner Road Inventory* Use Guide.

WAA REPRIORITIZATION

For this report only WAA's containing one or more Forest Service crossings were reprioritized to reflect the threat posed by those crossings on the *critical fish production reaches*. This is a deviation from the 2006 prioritization, in which all the crossings in the watershed (private and public) were taken into account. Our 2011 reprioritization also deviated from the 2006 assessment in that total scoring in 2011 was based on a multiplication of the weighted value of the sediment risk per crossing by the weighted value of *critical fish production reach* habitat (CFPR habitat); in 2006 the total value from the crossings was added to the CFPR habitat weighting. This change in the total scoring was undertaken to better represent the actual risk each crossing has on the *critical fish production reaches*.

Narrowing the focus to only Forest Service crossings, coupled with the use of the 2011 scoring methodology, led to a moderate reshuffling of the overall ranking and prioritization of the WAA's, and to the elimination of 5 WAA's from the analysis (those that contained no Forest Service crossings). Not surprisingly the ranking of lower mainstem WAA's was reduced substantially because crossings on the private road system were not included, and because sediment abatement work implemented on FSR3310 in 2009 eliminated a number of High priority sites. Based on our 2011 assessment the highest priority Forest Service WAA's remain in the South Fork where the majority of Moderate to High risk crossings exist, and because failure of those crossings will impact one or more of the *critical fish production reaches*; slight variations between the 2006 and 2011 overall ranking of the South Fork WAA's is primarily a reflection of the updated road-stream crossing prioritizations. Table 3. summarizes the 2011 WAA reprioritization.

Table 3. WAA prioritization based on a multiplication of weighted values per crossing and CFPR habitat

WAA	Prioritized Stream Crossings				Total Weighted Value of Crossing Priorities	Quantity of CFPR Habitat	Total Weighting of CFPR Habitat	Total Score *	Overall Ranking (highest-lowest priority)	WAA Prioritiz-ation
	H	M-H	M	L-M						
20S05W	3	1	3	4	18	1.75	8.75	157.50	1	H
20S04W	1	2	2	4	13.5	1.5	7.5	101.25	2	H
20S07W	2	2	1	0	10.5	1.75	8.75	91.88	3	H
20S01F	2	0	3	1	10.5	1.25	6.25	65.63	4	M
20S08W	0	0	1	4	5.5	1.75	8.75	48.13	5	M
20L09F	2	0	3	0	9.5	1	5	47.50	6	M
20S06W	0	0	2	2	5	1.75	8.75	43.75	7	M
20S02W	2	1	1	0	8.5	1	5	42.50	8	M
20L010W	1	0	3	1	8	1	5	40.00	9	M
20N01F	0	2	0	0	4	1.5	7.5	30.00	10	M
20S09F	1	0	0	0	2.5	1.75	8.75	21.88	11	M
20N05W	0	1	0	0	2	2	10	20.00	12	M
20N03W	0	0	1	0	1.5	2	10	15.00	13	L
20N04W	0	0	1	0	1.5	2	10	15.00	13	L
20N02W	0	0	1	0	1.5	1.5	7.5	11.25	15	L
20S03W	0	0	1	0	1.5	1.25	6.25	9.38	16	L
20L06W	1	0	0	0	2.5	0.5	2.5	6.25	17	L
20L01F	1	0	2	0	5.5	0	0	0.00	18	L
20L03F	0	0	2	0	3	0	0	0.00	18	L
20L05F	0	0	0	0	0	0.75	3.75	0.00	18	L
* Note: Total Scores 0-19.75 are Low Priority; 20-79.75 are Medium Priority; 80-160 are High Priority										
Lower Mainstem WAA's in White.										
South Fork WAA's in Blue.										
North Fork WAA's in Green.										

COST ESTIMATIONS

Excluding potential fish passage sites, whose design and cost are beyond the scope of this project, there is approximately $336,000 in culvert replacement expenses (contracting and materials) to address all Moderate, Mod-High, and High priority Forest Service crossings. If alternative prescriptions are implemented, such as constructing a rock headwall or re-lining the culvert invert with tar, rather than replacing the crossing, the cost drops to $243,000. As mentioned above, these estimates do not include mobilization costs, which will vary depending on the implementation timeline and sequence, nor do they include administrative, engineering, contracting, or project management costs; these additional costs will likely range from 25%-35% of the estimated replacement costs.

In the appendix cost estimation data is sorted three ways: by Sediment Abatement Prioritization; by Road ID & Milepost; and by Culvert Condition. These different data sorts are intended to aide management decision making. For example, if a harvest activity occurs that will generate funding for road improvements along a haul route, the *Road ID & Milepost* sort can easily provide information for all the crossings along that route; conversely, application of general maintenance funds could use the *Culvert Condition* sort to identify where culverts are worn out and likely to impact access into and within the Forest. The *Sediment Abatement Prioritization* sort highlights where road-stream crossings are most likely to impact salmonid productivity and water quality, which could be used to develop one or more "sediment abatement" grant proposals.

It is important to remember that these costs are based on a coarse evaluation of the fill profile, and rely on generic assumptions about compaction, staging capacity, and the volume of rock required to reconstruct the site. Although potentially sufficient for seeking grant or agency funding, these costs should be refined with additional on-site determinations before projects are put out for bids.

FISH PASSAGE SITES

Seven road-stream crossings warrant further assessment to determine whether they impact salmonid movement; of these, only Deadline Creek has substantial habitat upstream of the crossing. Based on existing GIS layers five of these sites are within known fish distribution, and within projected "steelhead recovery" habitat. Determining fish usage was beyond the scope of this project, aside from making visual observations in the field. Forest Service data may already confirm presence/absence; if not, we recommend electro-shocking the streams as a first step. Table 4. lists the potential fish passage sites.

Table 4. Road-stream crossings with potential fish habitat.

Road ID	Milepost	Drainage	Fish Observed	Comments
FSR3237120	N/A	Boulder Cr & Tributary	No	No passage concerns, but large wood should be added to both streams for habitat
FSR3310	5.49	Deadline Cr	Yes	Slight to moderate impediment for adults, barrier to juveniles. Substantial salmon and trout habitat upstream
FSR3310	21.100	Boulder Cr Trib.	No	ACW 3-5 ft & slope 4-6%; assessed for 100 ft up & downstream; perennial flow; within reach of mapped fish distribution
FSR3310390	0.230	South Fork Trib.	No	ACW 9-11 ft & slope 4-8%; assessed for 300 ft up & downstream; perennial flow; within mapped fish distribution
FSR3310390	0.390	South Fork Trib.	No	ACW 10-12 ft & slope 6-12%; less than 200 ft of habitat upstream; intermittent flow; within reach of mapped fish distribution
FSR3340140	3.870	South Fork Trib.	No	Perennial flow; no measurements taken
FSR3340156	1.560	South Fork Trib.	No	Perennial flow; no measurements taken
FSR5502321	0.180	North Fork Trib.	Yes – in pond	Pond may be stocked; mapped fish distribution extends to the downstream confluence

GENERAL ROAD CONDITIONS

During the 2010/11 field review general observations were made for each road; the following is a brief discussion of those observations, along with narrative to augment the road-stream crossing summary reports.

FSR3237: From the intersection with FSR3310 to the Boulder Creek Bridge, the road is in relatively good condition, and is easily drivable, though brushy. The crossing at mp 0.12 is stable; between the crossing and the bridge there is a moderately active slump with cracks. Beyond the Boulder Creek Bridge the road begins to rut and brush encroachment has nearly closed the road up to mp 1.80, which is where we ended our assessment; removal of the brush will require an excavator (too large and dense for a mower). There are three crossings within this segment; none are actively failing – mp 0.97 (mod-high), which is susceptible to plugging and diversion, could be retrofitted with a headwall.

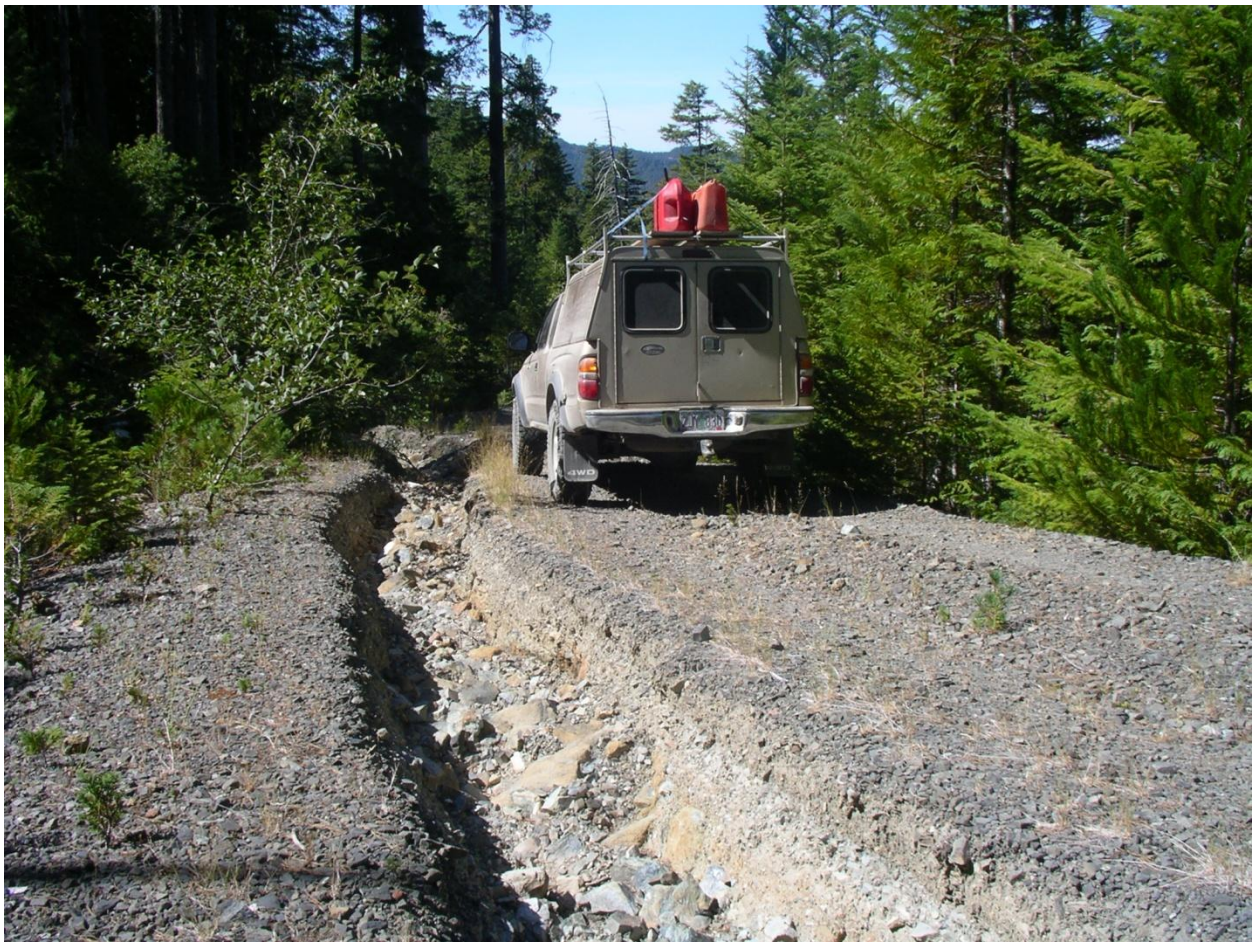
FSR3237120: The road leads into Bonanza Basin – it is tank trapped near mp 0, and rutting and slides within the first 0.2 miles also block vehicle access; ATV's are actively using the road. The road descends alongside a large tributary of Boulder Creek, which it crosses multiple times at low water fords, without problems. The east side of the tributary was harvested in the last 20 years (approximate). As a result of the harvest, which extended to within 20 ft of the tributary, the proximity of FSR3237120 to the tributary channel, and the introduction of Phytophthora lateralis; reduced riparian function is a greater concern than sedimentation from the road. Our recommendation is to pull the remaining ditch culverts and install waterbars, and to interplant resistant Port Orford Cedar, particularly within the riparian area. Other considerations include wood placements in both Boulder Creek and its tributary, which are within mapped fish distribution, and fuels reduction within the managed units.

FSR3237130: The road was reassessed up to the intersection with FSR3237132. **The initial 0.5 miles are deeply rutted because the ditches are no longer functioning: the road should be graded with a dozer, waterbars installed, and the ditches cleaned.**

FSR3237132: The road is slightly rutted, the ditches are full, and brush encroachment has nearly closed access. The road-stream crossings are all adequately sized and in moderately good shape (Life Rating 2-3); mp 0.65 is rated Moderate-High because of concerns about the stability of the fill. The road leads to a harvest unit with pre-commercial reprod, where it ends at an old growth boundary. Phytophthora lateralis is present, presumably brought in during the road construction and harvest. We recommend decommissioning the road following the first commercial thinning because the culverts will be near or at the end of their useful life.

FSR3310: Where the road crosses the privately owned lands between mileposts 0.00 – 11.69 routine maintenance is being done on an on-going basis as part of Menasha's harvest operations; multiple sediment abatement projects have also been implemented by the Partnership over the last 15 years, which have addressed most of the road-stream crossings at risk of failure. Road drainage is a concern within this segment because groundwater is persistent at or near the surface, because earthflow activity is prevalent, and because road failure has great potential to runout to the Lobster Creek mainstem, as was the case in 2009 when an apparent failing ditch culvert saturated the road fill and caused a catastrophic slide that delivered directly to Lobster

Creek. Deadline Creek (mp 5.490) is the only fish passage site within this reach. The existing culvert, which is 108 inches in diameter, was retrofitted with concrete baffles by the Forest Service in the 1980's; the Lower Rogue Watershed Council and ODFW installed jump pool weirs downstream of the crossing in 1995 (reconstructed in 1997) that reduced the jump height from 5 ft to 2.5 ft. Spawning surveys conducted by the Council over the last 10 years suggest that adult salmonids (chinook and coho) are able to pass through the culvert given the right flows; in some years the culvert appeared to impede adult salmon migration during the peak of the run, in other years it seemed to have little if any effect. A cluster of Moderate-High priority crossings located in the South Fork drainage between mileposts 10.00 – 11.110 were identified for funding in 2010, and are scheduled for implementation in 2012.



FSR3237130: Lack of routine maintenance such as ditch cleaning and road grading may prevent water from leaving the road prism, which can result in gullies and/or slides that contribute sediment to the stream network and increase costs.

Between Menasha ownership and the bridge over South Fork Lobster Creek (mileposts 11.10 - 14.37) FSR3310 is near the base of a predominately north facing slope. Groundwater is persistent in the cutbanks, which contributes to fill instability and saturation of the subgrade (potholes). Road-stream crossings are concentrated within this segment, including Iron Creek; two High priority sites are actively failing – mp 13.24 and mp 14.17. An existing quarry is located near mp 14.0 that may serve as a source for rip rap and fill slope rock.

Between the South Fork bridge and the intersection with FSR3237 ruts had developed because the road surface no longer sheds runoff – at the time of the review the ruts were being filled in with a dozer, but the road shape still lacked a sufficient crown. Multiple slumps affect the road bed within this segment, but all are passable; presumably they are associated with large scale movement, but none were investigated. Two road-stream crossings culverts – mp 15.24 and mp 15.45 – are rusted through; they will compromise the stability of the road fill in the near future.

Between the intersection with FSR3237 and FSR3310390 the road is ready to be brushed and graded, but in general it is in good condition with the exception of a series of slumps and slides near mp 18.68 (one slide, which had closed the road, was recently repaired). Four road-stream crossings between mp 18.29 and mp 18.68 are undersized with high plug potential; the culverts are in moderately good condition, though, so we recommend retrofitting these sites with rock headwalls to increase culvert capacity.

Between the intersection with FSR3310390 and FSR3340110 the road is in moderately good condition. The road-stream crossing at mp 21.100 has potential fish habitat upstream of the crossing, but there's no indication that fish are present within this part of the Boulder Creek drainage. The crossing at mp 21.550 diverts at higher flows through two overflow culverts; all three culverts have generated slides on the outlet fill slope. The original road-stream crossing culvert is buried in 250-300 cu yds of perched sediment, but is still functioning at low flows because a standpipe was installed. **This site is at risk of catastrophic failure, and should be addressed immediately**.

FSR331090: The road was in relatively good condition and drivable out to the road-stream crossing at mp 0.39, where our assessment ended. There are two crossings: mp 0.23 is within mapped fish distribution, and is significantly undersized – it likely acts as a fish passage impediment or barrier; mp 0.39 has potential habitat, but it ends approximately 500 ft upstream of the road. No fish were observed during our visit.

FSR331435: Neither the road nor the road-stream crossing at mp 0.010 were assessed because the road leads to a miner's cabin, for which we did not have permission to trespass. The culvert was observed from below when the crossing at FSR3310 mp 21.100 was reassessed; the culvert appeared to be in good condition, and there were no obvious concerns downslope (no fresh deposition, etc.).

FSR3340: This is a primary Forest Service access road that is routinely maintained. It is primarily located on the ridge that separates Lobster Creek from Rogue River tributaries that enter the river near Agness. Three road-stream crossings in the headwaters of the South Fork were surveyed during the 1998 inventory, but only two were relocated during the 2010-11 reassessment; both culverts were in good condition – mp 10.960 should be retrofitted with a rock headwall, and a ditch culvert should be installed to a drain nearby spring.

FSR3340110: From the road intersection with FSR3310 to Devil's Half Acre the FSR3340110 road is in poor condition: the ditch no longer functions, the drivable surface is rutting, the cutbanks have slid in multiple locations, and brush is quickly encroaching. **Given the potential for headwall failures with long runout potential, maintenance of the road is a High priority.**

Beyond Devil's Half Acre the road is in better condition; it is travelled more often, and appears to be maintained intermittently. There are two road-stream crossings – mp 1.200 and mp 1.700 – both are adequately sized, and are rated as Low priority.

FSR3340140: Road fills displaying cracks, scarps, and/or horsetails are at risk of failure. In Lobster Creek these failures have potential to "run-out", which destroys forest and timber resources and may contribute sediment to the stream network. Reconstruction often requires realignment, which can be a significant, if not prohibitive, expense.

FSR3340140: Between mp 0.00 and the intersection with FSR3340150 the road is susceptible to both large scale movement and failure of the road fill. Near mp 0.90 a large fill failure occurred within the last few years that narrowed the drivable surface to less than 10 ft in width. The slide was likely triggered by runoff; it ran out for approximately 500 ft, consuming 3-4 acres of reprod. Within this segment of road there are four road-stream crossings that are Moderate-High priorities. These culverts are at or near the end of their useful life, and most of the sites are prone to plugging. Failure rates may be slow at a few sites, but they should be addressed given their potential to initiate slides. Between the intersection with FSR3340150 and mp 1.870 the road is in relatively good condition, but brush is beginning to encroach on the drivable surface. The road-stream crossings within this segment are relatively stable and in good condition, but headwalls could be constructed at one or more of the sites to reduce the risk of diversion. Beyond mp 1.870 there are a few slumps that are still drivable, and the need for minor drainage improvements. Two road-stream crossings near the end of the road should be addressed. Mp

3.790 could be retrofitted with a headwall to increase capacity. Mp 3.870 may be a fish passage site; further investigation is needed. In addition, there is a larger railroad iron trash rack at mp 3.870 that has prevented the site from plugging, but it is getting buried and is at risk of plugging. Beyond mp 3.87 the road ends in a stand of old growth; if no future management is planned for this area, the crossing at mp 3.87 could be a candidate for decommissioning.

FSR3340140 mp 3.870: "Trash Racks" constructed with I-beam or railroad track were installed at many of the larger crossings to prevent culverts from plugging. In general these structures have performed well, but overtime 100's – 1000's of cubic yards of sediment have deposited upstream, which can "starve" the downstream channels of needed bedload, and increase reconstruction costs. These structures also create or contribute to fish passage impediments and barriers.

FSR3340150: Between the intersections with the FSR3340140 and FSR3340156 the road surface is in good shape, but brush is beginning to encroach. The road-stream crossing at mp 0.96 is a High priority because of its potential to plug and divert; a headwall may be installed to increase capacity, or the culvert could be replaced. Phytophthora lateralis is present in this area.

FSR3340156: The road surface is in good condition, but brush is starting to encroach. Minor slumps and cracks are present throughout, and one fill edge slide has occurred between mp 0.38 and mp 0.67. The road-stream crossings are adequately sized and culverts are in good condition. The crossing at mp 1.560 may be a fish passage site – further investigation is needed; the culvert

is also prone to plugging, but an I-beam trash rack is keeping it open. Phytophthora lateralis is present.

FSR3340190: The road is overgrown but drivable to approximately mp 0.6; the road surface is in good condition to the intersection with FSR3340196, with only two short stretches that are rutting. The survey ended at the intersection with FSR3340196 because of time constraints; subsequently the road-stream crossing at mp 3.070 was not reassessed, but based on the 1998 data we feel confident that the Moderate rating accurately reflects the level of risk.

FSR3340196: The road is too overgrown to drive (or bike), but in general the surface is in good condition, and there are only minor fill edge cracks, which appear to be stable. There are six road-stream crossings – the culverts are all in moderate to good condition, and only the site at mp 0.480 is at risk of plugging and diverting; a headwall could be constructed to reduce costs.

FSR3340260: The road is overgrown but drivable; the ditches are full but there is little scour on the road surface. The road-stream crossing at mp 0.490 could not be located, but a 24 inch diameter ditch culvert with springflow was observed, which may have been inventoried as a crossing in 1998; it was in good condition.

FSR3402: This is a primary Forest Service access road that is routinely maintained, which is located at or near the ridge that separates Lobster Creek from Euchre Creek. Five road-stream crossings were reassessed on the segment of FSR3402 that drains into Lobster Creek. With the exception of a new culvert installed at mp 9.050, the pipes are at or near the end of their useful life; considering the importance of this road, these sites should be addressed from an access management objective. From a sediment abatement perspective, mp 9.051 is the only crossing at risk of significant delivery. At this site multiple sources of groundwater and surface water converge to form a definable stream channel downslope. The new installation at mp 9.050 was positioned to drain a small stream and spring; unfortunately the new culvert was placed over the existing culvert at mp 9.051, which is rusted through and starting to fail. In addition, groundwater adjacent to 9.051 is perched in the ditch and causing the fill to saturate – a ditch culvert should be installed (18”x30’ with 40’ of downspout). If these sites are addressed, rip rap should also be placed on the outlet fill slope where the two crossings converge, to prevent further erosion.

FSR3402190: The road is in good condition but impassable due to brush; the road-stream crossing at mp 0.540 is adequately sized and in moderate-good condition.

FSR3402230: The road was recently maintained in conjunction with forest management activities, and the road-stream crossing at mp 0.52 was decommissioned within the last 5 years. In general the decommissioning looks good, but approximately 30% of the fill was left as over-steepened sideslopes, of which approximately 30% have already experienced minor slides; the remaining sideslopes are re-vegetating with alder and Douglas fir, which will add stability; minor rill development also occurred.

FSR5325: This is a primary Forest Service access road that is routinely maintained, which is near or at the ridge that separates Lobster Creek from Elk River. One road-stream crossing was

reassessed on the segment of FSR5325 that drains to Lobster Creek; the culvert is adequately sized and in good condition. FSR5325 should be graded to clean the ditches and to prevent runoff from concentrating on the road surface.

FSR5502220: The road was reassessed from the intersection with FSR5502 down to the road-stream crossing at mp 5.140. Within this segment the surface is in good condition but the road is overgrown, the ditches are full, and a cutbank slide near mp 4.4 is impassable. There are seven road-stream crossings. The culverts are in poor-moderate condition, and all but one are undersized and prone to plugging; two are presently plugged but not diverting. **The crossings should be addressed as soon as possible**; to lower costs, a number of crossings could be retrofitted with headwalls and/or risers.

FSR5502260: The road was reassessed down to the road-stream crossing at mp 0.480. Within this segment the ditches are full, the road surface is beginning to scour, brush is encroaching, and a cutbank slide near mp 0.2 took part of the road fill so that the drivable surface is barely passable. The two road-stream crossings – mp 0.410 and mp 0.480 – are in good condition, but both are undersized and prone to plugging – headwalls could be constructed to increase capacity; the stream at 0.480 is active – rip rap should be added to the channel upstream of the crossing and below the outlet.

FSR5502320: The road was recently brushed up to the intersection with FSR5502321 as part of a commercial thinning operation; beyond the intersection the road is too overgrown for a vehicle or bike, subsequently the road-stream crossing at mp 1.790 was not reassessed because of time constraints. Based on the data collected in 1998 we are confident that the Low priority rating accurately reflects the risk.

FSR5502321: The road surface is starting to develop ruts – it should be graded and shaped, waterbars installed, and ditchouts cut through the road berms within the through-cut. The road-stream crossing at mp 0.18 drains an artificial pond that is stocked with salmonids (presumably cutthroat?). The culvert is in moderately good condition, and though it is undersized, there is no diversion potential and less than 50 cubic yards of fill at risk of failure. Downstream of the crossing the channel was filled for approximately 100 ft before reaching a confluence with a larger stream. The channel is headcutting through this fill, albeit at a slow rate; the nickpoint is 4-6 ft in height. Rip rap should be placed in the channel to prevent further downcutting; if fish are present below in the larger stream, a series of weirs could be constructed to provide passage into the pond (would require approximately 60 cu yds).

CONCLUSION

Through this re-assessment important improvements were made to the data set and to our analysis and prioritization:

- We downgraded our risk assessment at dozens of crossings for the reasons discussed in the findings, which in turn better stratified the site prioritizations; making it easier to identify the crossings most-at-risk of failure and delivery.

- We prescribed retrofitting sites with inexpensive fixes, such as rock headwalls to increase capacity and trash racks to reduce plugging, where culvert condition was moderate or better and risk of catastrophic failure was low. These "alternative" prescriptions have the potential to yield considerable savings over culvert replacements.
- We identified potential fish passage crossings based on immediate habitat conditions and existing fish distribution maps.
- We developed cost estimates for culvert replacements and "alternative" prescriptions.
- We reprioritized the WAA's to determine where treatment of Forest Service crossings will have the greatest benefit to salmonid productivity.
- And we were able to provide a coarse assessment of general road conditions, which highlights critical and immediate needs, and may be useful in scheduling the type and timing of upcoming maintenance.

We also made a few observations that, although commonplace, warrant reiteration because of their importance:

1.) Lack of routine maintenance poses a significant sediment threat and most likely increases the cumulative cost of road upkeep. Without ditch cleaning and surface grading roads trap water. This typically concentrates flow, which in turn leads to a whole host of problems: ruts, gullies, slides, debris flows, etc. Furthermore, without maintenance the Forest lacks the "eyes on the ground", which creates the potential for a situation, such as a diverted stream crossing or a failing road fill, to go unnoticed for years, and turn into a catastrophic failure.
2.) Lack of routine brushing greatly reduces access throughout the Forest, increases fire risks, and creates situations where future brushing must be done with an excavator, rather than a mower; this increases costs and disturbance.
3.) Road decommissioning may be a viable management option for spur roads that traverse plantations and terminate in old-growth stands; once commercial thinnings are conducted within the plantations. Decommissioning may be most appropriate where the road-stream crossings are in poor condition and/or pose a significant sediment risk, and where Phytophthora lateralis is absent or manageable. Decommissioning can be done in such a way as to facilitate road reconstruction at a future date if the plantation is selectively harvested or clear cut again. To leave these roads in place after they've served their management objectives only generates maintenance expense and increases the risk of failure.

In closing, the risk of sediment delivery from Forest Service crossings in the Lobster Creek watershed is a real concern to the health of the *critical fish production reaches*, but at present conditions are generally not critical and can be addressed over the long-term if the Lobster Creek Partnership continues to pursue sediment abatement grant funding and/or if the Forest Service's harvest activities and/or operating budget increases. With that said there is one crossing on FSR3310 in need of immediate attention – milepost 21.550; the crossings on FSR5502220 should also be addressed as soon as possible, and FSR3340110 and 3237130 need to be graded, the ditches need cleaning, and waterbars should be installed.

APPENDIX