**FINAL Meeting Notes**
**Lewis River License Implementation**
**Aquatic Coordination Committee (ACC) Meeting**
**February 12, 2009**
**Ariel, WA**

## ACC Participants Present (22)

Eli Asher, LCFRB
Michelle Day, NMFS
Jeremiah Doyle, PacifiCorp Energy
Pat Frazier, WDFW
Bernadette Graham Hudson, LCFRB
Adam Haspiel, USDA Forest Service
Tom Hickey, PacifiCorp Energy
Gardner Johnston, Inter Fluve
George Lee, Yakama Nation
Erik Lesko, PacifiCorp Energy
Jim Malinowski, Fish First
Steve Manlow, WDFW
Kimberly McCune, PacifiCorp Energy
Tony Meyer, Lower Columbia Fish Enhancement Group
Todd Olson, PacifiCorp Energy
Nathan Reynolds, Cowlitz Indian Tribe
Rudy Salakory, Cowlitz Indian Tribe
Frank Shrier, PacifiCorp Energy
Ruth Tracy, USDA Forest Service
Neil Turner, WDFW
Steve Vigg, WDFW
Shannon Wills, Cowlitz Indian Tribe

## Calendar:

| | | |
|---|---|---|
| March 11, 2009 | TCC Meeting | Merwin Hydro |
| March 12, 2009 | ACC Meeting | Merwin Hydro |

| **Assignments from February 12, 2009 Meeting:** | **Status:** |
|---|---|
| Vigg: Provide formal comment to PacifiCorp regarding the Lewis River Spawning Gravel Evaluation - Final Report, December 2008 | **Complete – 3/4/09** |
| McCune: Add Bernadette Graham-Hudson to the H&S Plan Subgroup email distribution list. | **Complete – 2/13/09** |
| McCune: Check availability of Woodland City Hall council chambers and the conference room at the Merwin Hydro Control Center and advise the H&S Plan Subgroup attendees. | **Complete – 2/13/09** |
| Doyle/McCune: Provide a copy of the Baseline Monitoring Subgroup 2/4/09 meeting notes and distribute to the ACC. | **Complete – 2/20/09** |
| McCune: Proceed with securing contract extensions with US Forest Service relating to the 2007 aquatic fund projects. | **Complete – 2/20/09** |

| | |
|---|---|
| McCune: Contact the appropriate individuals and request a closeout project report for 2008 aquatic fund projects. | **Complete – 2/19/09** |

| **Assignments from January 8, 2009 Meeting:** | **Status:** |
|---|---|
| Doyle/Bryne: Schedule Baseline Monitoring Subgroup meeting on February 4, 2009 (10:00am – 2:00pm) at WDFW, Vancouver office | **Complete – 1/8/09** |

**Opening, Review of Agenda and Meeting Notes**

Frank Shrier (PacifiCorp Energy) called the meeting to order at 9:05am. Shrier requested a roundtable introduction for the benefit of guests. He also reviewed the agenda for the day and requested any changes/additions. Jim Malinowski (Fish First) requested we conduct some of the aquatic fund presentations before noon if possible.

Shrier requested comments and/or changes to the ACC Draft 1/8/09 meeting notes. No changes were requested. The meeting notes were approved with the above-referenced changes at 9:10am

**License Update**

Todd Olson (PacifiCorp Energy) informed the ACC that the Utilities are working on the 2008 ACC/TCC Annual Report and will include information required per Settlement Agreement and other license requirements such as the Washington Department of Ecology 401 certificate.

**Michelle Day joined**

**High Flow Event Update**

Olson communicated to the ACC that there was a significant number of landslides around the Merwin area and that Merwin dam flows reached 40,000 cfs. Communication was lost at Swift No. 2 plant then shortly thereafter at Swift No. 1 plant also. Swift No. 2 shutdown as water entered the power house and impacted the controls. The landslide at Swift No. 1 damaged part of the powerhouse. Debris and rock shut down Unit 13. Over the past month PacifiCorp crews have dedicated 24/7 to stabilizing the slope and are working to get unit 13 back on line. In addition, there was a sizeable log jam in Canyon Creek (a 23 acre slide), thus affecting recreational use of the creek (kayakers). A separate slide also impacted the Speelyai Hatchery diversion. Thanks to the WDFW hatchery crew and their quick response, no fish were lost.

**Shannon Wills and George Lee joined**

Olson provided photos of the Swift 1 powerhouse damage, the landslide, the Speelyai intake diversion and Canyon Creek log jam for ACC attendees.

**SA 7.2 - Spawning Gravel Study and Gravel Monitoring and Augmentation Plan, 30-day review and comment period discussion**

Shrier reminded the ACC attendees that comments were due on or before January 23, 2009. Please see Attachment A for comments received by the ACC to date. Steve Vigg (WDFW) expressed concern in regards to the mapping technique, threshold flow, one test plot that was at least partially covered by gravel movement, discrepancies in map polygons. Day shared Vigg's concerns. Vigg will submit written comments to PacifiCorp in the next couple of days.

**Hatchery & Supplementation Plan Subgroup Update**

Erik Lesko (PacifiCorp Energy) informed the ACC attendees that the H&S Plan Subgroup met on February 6, 2009. The intent of the meeting was to review the draft annual operations plan for wild winter steelhead (WWSTH). Of primary concern is the method and level of genetic assignments, and the type of genetic baseline to use for assignment in order to ensure a broodstock that is relatively free of hatchery influence for the 50,000 smolts which will be released each year. A conclusion has not been made but the Subgroup wants to include as many stocks in the genetic baseline as possible.

Shrier expressed that of the eight fish two assigned as hatchery fish and four strongly assigned to Lewis River wild, while the remaining two assigned as wild strays from someplace else.

Lesko mentioned that, at the HSS meeting WDFW presented a discussion paper, which included the following main points:

- Suspension or termination of the wild winter steelhead program, unless a plan can be completed
- ESA concerns in holding WWSTH at hatchery
- How is the program to be implemented effectively?

Shannon Wills (Cowlitz Indian Tribe) stated that what is the best for the fish should be the priority.

Vigg communicated that March 1, 2009 is when the program should begin in accordance with the collection curve. Pat Frazier (WDFW) expressed that WDFW is committed to starting the program this year if at all possible.

Olson requested a letter in writing from NMFS indicating permission relating to ESA coverage due to conflicting mandates since the HGMP's are not yet approved. Michelle Day (NMFS) expressed that a letter cannot be written outside of the HGMP process.

The H&S subgroup is currently working on revising the HGMP and H&S plan relative to wild winter steelhead. Once these revisions are complete, NMFS (a member of the H&S subgroup) will review and approve the plans for implementation.

George Lee (Yakama Nation) expressed that the idea is to reintroduce fish throughout the basin, but now the ACC seems to be focusing on the lower basin and not the entire basin. Lee expressed his disapproval that the collected fish had already been released. His opinion is that WDFW has overrun this entire process; and questioned whether WDFW was developing a program for the fish or for full time employment.

Frazier responded to Lee that the WDFW was not trying to add to their staff and that they shared the same concerns for fish over personnel.

Currently the program is suspended and another H&S Plan Subgroup meeting needs to be scheduled in order to meet the March 1, 2009 deadline. The next meeting will be February 17, 2009 with a location to be determined. Kimberly McCune (PacifiCorp Energy) will check availability of Woodland City Hall council chambers and the conference room at the Merwin Hydro Control Center and advise the H&S Plan Subgroup attendees.

<Break 10:15am>
<Reconvene 10:30am>

**Aquatic Funding Proposals – PowerPoint Presentations**

*Plas Newydd RM 0.5 Bar Plantings and LWD Structures – Nathan Reynolds (Cowlitz Indian Tribe):* Reynolds informed the ACC that until all assessment are complete the property owner does not want to continue with this project due to an additional grant process that was in progress, thus this project has been formally withdrawn for further consideration from the 2008/2009 aquatic funding cycle but may be resubmitted later.

*Plas Newydd RM 2.0 Off-Channel Habitat Enhancement – Nathan Reynolds (Cowlitz Indian Tribe*) Reynolds provided a PowerPoint presentation (Attachment B) as an overview for the ACC prior to rending a decision next month.

Reynolds communicated that the lower mainstem Lewis River contains only scarce amounts of off-channel habitat, which is essential for:

- Chinook salmon, Lower Columbia River ESU, listed as *Threatened*
- Chum salmon, Columbia River ESU, listed as *Threatened*
- Coho salmon, Lower Columbia River ESU, listed as *Threatened*
- Steelhead trout, Lower Columbia River DPS, listed as *Threatened*

The opportunities were also discussed to include the following:

- The enhancement of off-channel habitat described in this project proposal will benefit fish recovery throughout the North Fork Lewis River, with priority for ESA-listed species.
- In the short term, this project will increase the abundance of functional habitat in the lower river, an area of great need.
- The habitat will benefit and be utilized by both returning adults and out-migrating juveniles.
- Ultimately this project will allow the Lewis River to support larger populations of anadromous fish.

**Ruth Tracy joined**
**Tom Hickey joined via conference call**

Reynolds identified the plantings that will be used for the project to include site-appropriate species that are able to survive inundation and the goals of the plantings to include enhanced habitat quality and function of the off-channel area for ESA-listed salmonids through reduced water temperatures, increased water quality and increased organic inputs to the system.

Carcasses will be planted in the system in late fall or early winter of 2009; stakes and Vexar will be removed in early spring of 2010. In addition, the carcasses provide localized pulse of nutrients in readily accessible format and they promote a pulsed increase in the abundance of macroinvertebrates. **Funding Request is: $50,000**

**Nathan Reynolds and Rudy Salakory departed**

**Preliminary Design of Barrier Net in front of Yale Spillway**

Tom Hickey (PacifiCorp Energy) provided a PowerPoint Presentation titled, *Barrier Nets for Bull Trout Entrainment Reduction - Yale Hydro Project,* dated January 8, 2009 (Attachment C) to address the following:

- Reduce entrainment of bull trout at the Yale intakes, in accordance with Settlement Agreement 4.9.3
- Improve fish survival over the spillway during spill events in accordance with Settlement Agreement 5.1

Hickey informed the ACC that the barrier net spanning the intakes is a fixed net which will be in place year round. The net is 1/2" mesh to full depth. He provided a sample of the net for ACC viewing, which has a life expectancy of no more than five years. The net will be installed behind the existing log boom.

The contract was awarded on February 10, 2009 to McMillan Engineering.

- Design submittal due February 20, 2009
- Permit applications February 25, 2009
- Construction period is 30 days after permits and regulatory approvals are received

Hickey further communicated that the alternative approach is to protect bull trout by reducing entrainment in the spill flow and there is an additional fish protection benefit of reducing the need to trap and haul bull trout from Merwin back to Yale.

He also queued up the Yale spillway project and informed the ACC that PacifiCorp is considering a similar net structure for the spillway rather than excavating a slot through the rock. Day noted that there may be additional passage benefits of a spillway modification at flows higher than what the modification is designed for. Only using nets will not allow this potential added benefit at the higher flows when the nets cannot be used. This should be discussed further. More on that project later as it is not due until Dec. 2012.

**Tom Hickey departed**

**Baseline Monitoring Plan Subgroup Update**

Jeremiah Doyle (PacifiCorp Energy) informed the ACC that the Baseline Monitoring Subgroup met on February 4, 2009. They reviewed the draft plan and the subgroup agreed that the methodologies are acceptable. The final plan will be submitted to the Subgroup the week of February 16, 2009, followed by a copy of the final plan to the ACC for their records. Doyle will provide a copy of the Baseline Monitoring Subgroup meeting notes and distribute to the ACC.

In addition, Vigg provided a copy of WDFW's comments dated February 11, 2009 which have been included in these meeting notes as Attachment D.

**<Lunch 11:45am>**
**<Reconvene 12:05pm>**

*Clear Creek Instream Habitat Restoration, Pepper Creek Instream Habitat Restoration, Pine Creek Instream Nutrient Enhancement – Adam Haspiel (USDA Forest Service)*

Haspiel provided a PowerPoint presentation (Attachment E) as an overview for the ACC prior to rending a decision next month.

*Clear Creek* - Haspiel communicated that the lower 1.3 miles of the Clear Creek project lacks large woody material (LWD) and provides minimal structure for fish habitat. The addition, 900 pieces of LWD would be added to the lower 1.3 miles to create pool habitat and provide complex structure to the stream. This would create and improve rearing opportunities for chinook, coho salmon and steelhead trout. In addition, it would improve spawning opportunities for reintroduced adult chinook and coho salmon and steelhead trout. Most of the woody material will be placed downstream of the 93 road bridge to avoid potential problems with both the bridge and the proposed acclimation pond.

Haspiel informed the ACC attendees that the wood for the project would be transported by log truck to Clear Creek from a nearby timber sale thinning unit, which is part of the Wildcat Stewardship Timber Sale. A skidder or front end loader would transport trees to project sites in Clear Creek. An excavator would place trees into clusters along streambanks and bury the ends as needed to anchor the structures. Pictures were provided of the present condition illustrating the lack of large wood and pool habitat in many areas and areas of bank failure.

Haspiel concluded the presentation on Clear Creek with a visual of the project location and a list of project partners to date. **Funding Request is: $106,000**

Haspiel provided a PowerPoint presentation (Attachment E) as an overview for the ACC prior to rending a decision next month.

*Pepper Creek* – Haspiel communicated to the ACC attendees that the lower 0.5 miles of Pepper Creek lacks large woody material and provides minimal structure for fish habitat. Approximately 150 pieces of Large Wood Material (LWD) would be added to the lower 0.5 miles to create pool habitat and provide complex structure to the stream. This would create and improve rearing opportunities for, coho salmon and steelhead trout. In addition, it would improve spawning opportunities for reintroduced adult coho salmon and steelhead trout. LWD for this project would come from USFS lands and from Swift Reservoir cleaning operations.

LWD for the project would be transported by log truck to Pepper Creek from a nearby timber sale thinning unit, which is part of the Wildcat Stewardship Timber Sale and flown into the creek using a mobile yarder set up at strategic locations along the road. An all terrain excavator (Spyder) would walk up the creek placing the wood into clusters and logjams to create rearing pools and spawning opportunities for fish.

Haspiel concluded the presentation on Pepper Creek with a visual of the project location and a list of project partners to date. **Funding Request is: $46,000**

Haspiel provided a PowerPoint presentation (Attachment E) as an overview for the ACC prior to rending a decision next month.

*Pine Creek 2009* – Haspiel communicated to the ACC attendees that because of the lahar flows of 1980, the 1996 floods, and the blockage of anadromous fish by Merwin Dam, Pine Creek is nutrient deficient. This results in reduced primary and secondary production, creating poor fish habitat, and a poor food base. The Pine Creek Nutrient Enhancement project will utilize coho salmon carcasses to add nutrients to Pine Creek. The US Forest Service plans to add up to 4,000 carcasses to the system over a six mile reach using mostly helicopter support to distribute fish because of poor access. A second method we could use would be carcass analogs produced by Skretting fish food company. They are made from a pacific whitefish and have the same nutritional value as a salmon carcass analog. Using analogs would allow us to target fry emergence in early spring. ACC members quickly passed the sample of analogs provided by Haspiel along due to the strong odor.

Haspiel provided photos illustrating loading of the helicopter bucket for deployment and the method of which the carcasses are spread out over a long stretch of the creek. In addition, Haspiel reviewed the benefits of the project include:

- Increased stream biota
- Increased food base for fish
- Increased riparian vegetation growth
- Long-term source of large woody debris for Pine Creek

Haspiel concluded the presentation on Pine Creek with a visual of the project location and a list of project partners to date. **Funding Request is: $41,000**

Ruth Tracy (USDA Forest Service) provided a PowerPoint presentation (Attachment E) as an overview for the ACC prior to rending a decision next month.

*Spencer Peak Road Decommission* – Tracy communicated to the ACC attendees that road decommission project includes remove of all culverts along the last 2.6 miles of Forest Road 9300150 and spur roads, to reconstruct the channel at each stream crossing (1 perennial and 2 intermittent) and re-vegetate disturbed areas with native vegetation. She discussed the benefits of the project to include:

- Reduced erosion
- Reduced sediment delivery to Clear Creek
- Removal of risk of culvert failure- total sediment risk is 2235 cu yards for the perennial culvert and 2,000 cu yards for the intermittent culverts

Tracy concluded the presentation on Spencer Peak Road Decommission project with a visual of the project location and a list of project partners to date. **Funding Request is: $33,000**

Shrier reminded the ACC attendees that in terms of the LWD program, the ACC needs to let PacifiCorp know the number of logs needed each year and PacifiCorp will place them on a list.

Day questioned whether the intent in the SA was to have PacifiCorp to retain logs from year to year rather than only stockpile one year's supply.

*North Fork Lewis River RM 13.5 Habitat Enhancement – Tony Meyer (Lower Columbia Fish Enhancement Group) and Gardner Johnston (Inter Fluve)*

Meyer and Johnston provided a PowerPoint presentation (Attachment F) as an overview for the ACC prior to rending a decision next month.

Johnston communicated to the ACC attendees that the subject site consists of a lack of structure and refuge habitat in the channel and on streambanks, which is impacted by hydrosystem (e.g. interruption of LWD transport), it is impacted by past LWD removal and gravel mining which in turn causes adverse impact to riparian and floodplain forest vegetation.

Johnston reviewed the project objectives to include:

- Increase channel complexity and velocity refuge along channel margins to benefit adult holding and juvenile rearing
- Promote development of high quality scour pool habitat with wood cover
- Increase wood quantities
- Restore the native riparian plant community

Johnston concluded the presentation on the North Fork Lewis River RM 13.5 Habitat Enhancement project with a visual of the project location and an illustration of LWD log ballast and anchoring requirements based on engineering analysis. **Funding Request is: $190,000**

**Tony Meyer and Gardner Johnston departed**

Haspiel provided an update on the following 2007 aquatic projects approved for funding:

**Pine Creek Instream Structures 2007 – Originally funded $25,000 on April 30, 2007**
The US Forest Service experienced liability issues with ORM and the use of a helicopter on their lands. The Forest Service will submit the return the funds to PacifiCorp for deposit back into the aquatics fund.

**Rush Creek Gravel Restoration 2007 - Originally funded $20,000 on July 31, 2007**
The US Forest Service decided not to move forward with this project due to unexpected differences/challenges with the USFWS regarding project approach. The project was pulled in 2008; all remaining funds (approximately $19,100) will be returned to PacifiCorp for deposit back into the aquatics fund.

**Pine Creek Nutrient Enhancement 2007**
The US Forest Service requested an extension to the existing contract to 12/31/2010 for additional monitoring needs.

**Dispersed Camping & Day Use Road Restoration – 2007**
The US Forest Service requested an extension to the existing contract to 12/31/2011 for ????? (Adam please advise here)

**Fish Passage Culvert Replacement - 2007**
The US Forest Service requested an extension to the existing contract to 12/31/2011 due to inclement weather and inaccessible with large equipment.

**The ACC attendees agreed to each contract extension**. McCune will proceed with working with the US Forest Service in securing extensions for each contract referenced above.

Olson reminded the ACC that photo documentation (project close-out report) of completed aquatic fund projects is a NMFS Biological Opinion requirement, which he would like to include in the Lewis River Aquatic Fund Annual Report. McCune will contact the appropriate individuals and request a closeout project report for 2008 aquatic fund projects.

**Study Updates**

Lesko and Shrier provided the following study updates:

*Swift Constructed Channel Concept Design and Swift Upper Release Design* – PacifiCorp is finalizing the bid package for the constructed channel work from the designs provided by Northwest Hydraulic Consultants (NHC). Current design calls for approximately 140 pieces of large woody debris including root wads. The upper release project is currently out for bid and is expected to start in March 2009.

*Hatchery Upgrades*
*Lewis River Pond 15* – Contract awarded and project will be completed in early September 2009 to complete the project.

*Acclimation Pond Plan* – Contract pending; no additional updates.

*Water Quality Management Plan* – Draft of plan was submitted to the Washington Department of Ecology (WDOE), which they have review and provided comments. PacifiCorp is currently reviewing WDOE comments.

*Monitoring and Evaluation Plan (ACC Review Draft)* – The consultant has been asked to review ACC comments. The Draft Plan is due to the ACC within one year of license issuance (6/26/2009) at which time PacifiCorp will provide a draft and a 90-day review and comment period. The final version is due to the FERC on or before 6/26/2010.

**Public Comment**
None

**Agenda items for February 12, 2009**

- Review February 12, 2009 Meeting Notes
- WDOE Presentation
- Aquatic Funding Proposals Selection – ACC Decision Required
- Revisit H & S (Steelhead) Plan; update from H&S Plan Subgroup
- Study/Work Product Updates

**Next Scheduled Meetings**

| | |
|---|---|
| March 12, 2009 | April 9, 2009 |
| Merwin Hydro Control Center | Merwin Hydro Control Center |
| Ariel, WA | Ariel, WA |
| 9:00am – 3:00pm | 9:00am – 3:00pm |

**Meeting Adjourned at 2:20 p.m.**

**Handouts**

- Final Agenda
- Draft ACC Meeting Notes 1/8/09
- Attachment A – Lewis River Spawning Gravel Evaluation – Final Report, dated December 2008 (with ACC comments)
- Attachment B - Cowlitz Indian Tribe PowerPoint Presentation, Plas Newydd RM 2.0 Off-Channel Habitat Enhancement
- Attachment C – Barrier Nets for Entrainment Reduction Yale Hydro Project, dated January 8, 2009.
- Attachment D – WDFW comments on the Draft Lewis River Baseline Monitoring Study Plan, dated February 11, 2009
- Attachment E- USDA Forest Service PowerPoint Presentation, Pine Creek Instream Nutrient Enhancement, Clear Creek Instream Habitat Restoration,

Pepper Creek Instream Habitat Restoration and Spencer Peak Road Decommission

- Attachment F – Lower Columbia Fish Enhancement Group PowerPoint Presentation, North Fork Lewis River RM 13.5 Habitat Enhancement

# Lewis River Spawning Gravel Evaluation

*Final Report*

*Prepared for:*
PacifiCorp
825 Multnomah
Suite 1500
Portland, OR 97232

*Prepared by:*
Stillwater Sciences
1314 43rd Street
Seattle, WA 98105

December 2008

Stillwater Sciences

# Table of Contents



Deleted: 3
Deleted: 4
Deleted: 4
Deleted: 4
Deleted: 4
Deleted: 5
Deleted: 5

## List of Figures



## List of Tables

# 1 INTRODUCTION AND PURPOSE

This report is the final component of studies that began in 2005 as part of the Lewis River Spawning Gravel Analysis (Stillwater Sciences 2006). The original study objectives were to:

(1) Outline a monitoring program that provides a reliable basis to describe present conditions and changes over time in spawning habitat area in the Lewis River below Merwin Dam, and
(2) Provide a means to determine when spawning gravel supplementation efforts to preserve or expand such areas is warranted.

A report completed in 2006 provides important background information, objectives and initial results (Stillwater Sciences 2006). The results and discussion presented here summarize three years of monitoring spawning habitat on the Lewis River downstream of the Merwin Dam and upstream of the Lewis River Fish Hatchery. A method for future monitoring of the areal extent of spawning habitat is also presented.

Deleted: the results of

#### Summary of Findings

1. There has been no loss of spawning habitat since 2005. Hence, the immediate addition of spawning gravel is not warranted at present.
2. While stable, spawning habitat area between Merwin Dam and the Lewis River Fish Hatchery at present levels of escapement, is fully utilized and thus is limiting further gains in Chinook salmon productivity.

## 1.1 Approach and Method

#### Spawning Habitat Mapping

We used visual observation of physical evidence of both prior and active spawning to indicate areas of suitable spawning gravel. Areas with no evidence of spawning were assumed to be unsuitable. Spawning areas were sketched as polygons of spawning gravel directly onto field maps of high resolution aerial photography that were made in 2005. Observations were made from a motorized drift boat in 2005 over the course of two days, but no observations were made in 2006 because high discharge obscured visibility and made working on the river unsafe. In 2007 and 2008 observations were made from a jet boat and, on each occasion, mapping took about 6 hours. Subsequent to the field effort, the polygons were digitized as GIS data layers to form overlays of suitable spawning habitat. The new composite GIS data for all years will be sent separately from this memo.

This approach assumes that all available spawning habitat in the river between the Lewis River Fish Hatchery and the Merwin Dam (the "upper river") is being utilized even in years with low adult returns, as Chinook adults appear to prefer this location for spawning. This assumption is based on redd superimposition modeling and analysis of redd survey data that shows that all available spawning habitat in the upper river is being used for spawning (Stillwater Sciences 2006). We also assume that in the last four years, the total area of available spawning habitat in the upper river has not changed. This assumption is based on the fact that high flows from Merwin during this period did not exceed the calculated *threshold flo*w at which bedload movement would occur. Hence, observed spawning activity in each year of observation was a reliable indicator of the total area of suitable spawning gravel and that areal extent has remained unchanged.

#### Statistical Analysis Using Monte Carlo Simulations

Monte Carlo simulations were used to calculate the probability of detecting a change in spawning gravel area, given a range of potential losses (expressed as percent of total area) in spawning gravel after *threshold flows.* A threshold flow is a high-flow event sufficient to initiate bedload movement and thus triggers the necessity to monitor the area of spawning habitat (see section 1.6 below). First, the measurements of the baseline value for the total area of spawning gravels was simulated using a normal distribution with mean and standard deviation of measurements from 2005, 2007, and 2008 (baseline data set). It was further assumed that the mean of these measurements was the true quantity of spawning gravel area prior to threshold flows. Three values were randomly generated from this distribution using function "rnorm" within the R environment (R 2008) to simulate the process of taking the baseline measurements. The mean of these values was then used to represent baseline conditions.

Deleted:

To test the null hypothesis, which states that spawning gravel area after a threshold flow is identical to the area that existed prior to the incidence of the threshold flow, we assumed a normal distribution of differences between spawning gravel area before and after the threshold flow occurred. These represent conditions with a mean of zero and a standard deviation based on the variance from two identical distributions (each with the mean and standard deviation from the baseline dataset). This distribution was then used to calculate the probability of obtaining a pre- and post-project difference as large as that observed, given that there was no true difference in spawning gravel areas. The observed value of spawning gravel area after a threshold flow was simulated by drawing a single value from a normal distribution of values with a mean value equal to a given level of percent loss (ranging from 5 to 50%), and a standard deviation calculated based on the simulated observed value and assuming a coefficient of variation (i.e., ratio of the standard deviation to the mean) consistent with that calculated using the baseline dataset. The entire process was repeated 5,000 times to estimate the probability of correctly rejecting the null hypothesis (i.e., power).

## 1.2 Results

Based upon observations over four non-consecutive years, the average areal extent of mapped spawning habitat in the upper river is 154,207 $m^2$ (Table 1), with a standard deviation of ~ 13%. The general location and spatial extent of mapped polygons of spawning gravel has remained similar each year, but there are differences that reflect the imprecision in the methods used (**Figure 1**, **Figure 2** and **Figure 3**, appended).

Deleted: Table 1
Formatted: Font: Not Bold
Deleted: Figure 1
Deleted: Figure 2
Deleted: Figure 3

**Table 1.** Mapped spawning habitat area in the Lewis River between Merwin Dam and the Lewis River Fish Hatchery.

| Number of Polygons Mapped | 2001 spawning habitat area ($m^2$) [1] | 2005 spawning habitat area ($m^2$) | 2007 spawning habitat area ($m^2$) | 2008 spawning habitat area ($m^2$) |
|---|---|---|---|---|
| 1 | 17,245 | 1,448 | 2,021 | 6,733 |
| 2 | 4,332 | 14,517 | 4,930 | 6,495 |
| 3 | 7,214 | 13,153 | 46,659 | 1,260 |
| 4 | 9,916 | 1,936 | 2,956 | 921 |
| 5 | 522 | 49,972 | 7,426 | 1,696 |
| 6 | 54,858 | 15,561 | 32,521 | 12,784 |
| 7 | 18,319 | 23,958 | 1,045 | 146 |
| 8 | -- | 12,543 | 12,359 | 84 |
| 9 | -- | 2,441 | 2,855 | 29,949 |
| 10 | -- | 882 | 4,851 | 49,758 |
| 11 | -- | 455 | 5,142 | 19,494 |
| 12 | -- | 10,901 | 8,946 | 32,050 |
| 13 | -- | 9,933 | -- | -- |
| 14 | -- | 786 | -- | -- |
| 15 | -- | 6,666 | -- | -- |
| 16 | -- | 836 | -- | -- |
| 17 | -- | 1,756 | -- | -- |
| 18 | -- | 1,143 | -- | -- |
| 19 | -- | 650 | -- | -- |
| Total Area ($m^2$) | 112,407 | 169,539 | 131,711 | 161,371 |

1. 2001 spawning habitat area is derived from shapefiles generated by BioAnalysts, et al. (2003).

## 1.3 Discussion

### Variability and Repeatability of the Mapping Approach

Fall Chinook escapement in 2005, 2006, and 2007 was 10,668, 11,890 and 3,468 respectively (Groesbeck 2006, Groesbeck 2007, Groesbeck 2007). An estimate of 2008 escapement is not yet available. If we assume that 2008 will have at least as many Fall Chinook returning as 2007, then all available habitat will be utilized for spawning activity because even a few thousand spawners(~ 3,000 males and females) will begin building redds on top of one another according to our analysis (Section 3.1.2 in Stillwater Sciences 2006).

Our sediment transport modeling exercise calculates that the long-term, reach-average onset of sediment transport (incipient motion) begins at about 56,000 cfs in the upper reach and has a recurrence interval of about 7 years (i.e. ~ 14% probability of occurrence in any given year). Incipient motion is the point at which the shear stress associated with the threshold discharge is just high enough to cause particles on the bed surface to be dislodged and move downstream. Little appreciable sediment transport actually occurs at this flow magnitude at which incipient motion occurs. Incipient motion is distinct from the condition of measurable bedload transport, when the entire bed surface is in motion and appreciable sediment transport is taking place. Reach-average refers to a generalized estimate applied to the entire reach. Hence, the actual onset of incipient motion (and sediment transport) will vary within a river according to local sediment, hydraulic, and planform idiosyncrasies. For example, in 2005 several arrays of tracer rocks were installed in the river; the upstream-most (~RM 18.7) array is still more or less in the same arrangement as when it was deployed. In contrast, another array deployed at the same time near ~RM 16.8 has been mobilized, and the tracer rocks have been either buried or swept downstream into deeper water and have not been recovered. In addition, there is some error associated with any sediment transport equation, therefore our estimate of reach-average onset of incipient motion may be an over- or underestimate of the actual discharge associated with incipient motion in the upper river.

**Comment:** Hopefully my added text enlightens the issue you brought up Frank. The site at RM 16.7 has a similar bed texture as that bar just upstream of Hagerdorn's and I can see it incrementally translating downstream, especially with a discharge like that of late 2006.

A recurrence interval of this probability (e.g. ~7 years) is characteristic of a regulated river such as the Lewis River where a combination of bed coarsening and flow regulation reduces the chance of high flows sufficient to initiate sediment transport. Our sediment transport model (EASI, see Appendix D in Stillwater Sciences 2006) uses daily discharge (the average flow for a 24-hour period) to develop the sediment rating curve and predict incipient motion. Since 2005 when the initial component of this study was completed, the maximum daily discharges in each calendar year have been 35,200 cfs, 17,100 cfs, and 19,100 cfs, respectively. Peak flows in WY 2005, 2006, and 2007 were 16,500 cfs, 29,900 cfs, and 39,900 cfs. So, there has not been a discharge of sufficient magnitude to initiate measureable sediment transport in the upper river since 2005, and thus the total available spawning gravel available in the upper reach has not changed.

In our mapping exercise we found that the total available spawning area in the upper river has not changed appreciably. Given that high flow events during the three years of observations were too low to account for sediment transport and thus cannot account for differences in spawning areas, we conclude that all of the variability in the mapped spawning habitat is a consequence of inherent error in the mapping method, rather than underutilization by spawners or sediment transport. Factors affecting the repeatability (and hence the variability) of the mapping method include: differences in water clarity between years, run timing and degree of spawning activity, map scale verses sketching scale, inherent error in sketching, and inherent error in digitizing.

We have no empirical measure of the actual area of spawning habitat that may be lost at a given flow; we can only predict the sediment flux using our sediment transport model. For example, in water year 2006 there was one day that had a daily discharge of 39,900 cfs; the sediment flux on that day was estimated to be 1.6 tons/day. For the discharge at which incipient motion is predicted to begin in the upper reach, 56,000 cfs, the sediment flux for one day at the flow is estimated to be 30 tons/day.

**Detecting Actual Losses in Spawning Areas over Time**

We do know that generally speaking, given sufficiently high flows sediment movement occurs from upstream to downstream and thus spawning area loss would likely occur in the same direction. However, during a large flood, the entire bed of the river is likely to mobilize leading to possible rearrangement and loss of spawning habitat throughout the upper river. Whether spawning habitat is lost, or how much is lost, is unpredictable, but it is largely a function of recurrence of large flows which are typically of low probability. However, we can estimate our ability to detect a change in area of spawning habitat by comparison with our baseline habitat area surveys (Table 1).

Our analysis shows that as spawning habitat area loss increases, our ability to discriminate the loss also increases (Table 2). Small losses in spawning area are difficult to detect not only because of underlying error of the method, but also because small changes in spawning area would be expected to accompany lower discharges when less sediment is moving. In contrast, our method does well at detecting large losses in spawning habitat that would be expected to follow large flood events, when the sediment flux is high. For example, if there was 25% loss of total spawning habitat area, then we have a 56% chance of correctly discriminating the loss; in contrast, if there is a 40% loss of spawning habitat area, then we have 94% chance of correctly discriminating the loss (**Table 2**). Cumulative loss of spawning area over the course of several episodes of lower discharges could also be discriminated once a

**Deleted:** Table 2

larger total area had been lost. The power of the monitoring techniques to detect a smaller degree of change would increase as more years are added to the accumulated samples.

**Table 2.** Probability of detecting a given percent change in spawning habitat area in the Lewis River between Merwin Dam and the Lewis River Fish Hatchery.

| Percent Spawning Area Lost | Probability of Correctly Detecting a Loss |
|---|---|
| 5 | 0.10 |
| 10 | 0.17 |
| 15 | 0.27 |
| 20 | 0.40 |
| 25 | 0.56 |
| 30 | 0.71 |
| 35 | 0.85 |
| 40 | 0.94 |
| 45 | 0.98 |
| 50 | 0.99 |

### 1.4 Effects of Spawning Area Loss

Since 2005, there has been no appreciable change in the area of spawning habitat in the upper river (Table 1); therefore we do not find that the addition of spawning gravel is warranted at this time. However, a discussion of the effects of the potential of future loss of spawning habitat is presented to support future decision-making discussions, should they be warranted.

Deleted: Table 1

Formatted: Font: Not Bold

One fundamental finding that we posit is that for Fall Chinook, at current escapement levels available spawning habitat is fully utilized and therefore limiting productivity in the Lewis River between Merwin Dam and the Lewis River Hatchery. As few as one thousand pairs (e.g. 2,000 adults) of Fall Chinook spawning in the upper reach between Merwin Dam and the Lewis River Fish Hatchery would produce as many as 4 million eggs (Figure 4 below; also see discussion section 3.1 in Stillwater Science 2006), and a similar number of fry depending on fecundity and density-independent mortality of eggs and larvae. Beyond about 3,000 adults, density dependant effects (i.e. redd superimposition) begins to limit the number of eggs and alevins that can be produced. Despite limited available spawning habitat, spawning habitat loss would need to be fairly high in the upper river to begin to have effects on the number fry in the lower river because so few adults are required to produce millions of juveniles, given the typical number of returning adults.

Deleted: Figure 4

Formatted: Font: Not Bold

By its nature, the total available spawning habitat in the upper reach below Merwin Dam is limiting, because it is confined by bounding bedrock terraces that are relatively steep compared to the reach below the Lewis River Fish Hatchery. Much of the apparent available habitat in the upper river appears to be utilized. In recent decades, seemingly ideal spawning habitat between the Lewis River Hatchery and Eagle Island is not frequently selected by returning Fall Chinook because it is either not suitable ( because of enduring site fidelity to the upper river) or for other unknown reasons. In any event, these apparently suitable spawning habitats in the lower river contribute little to the production of Fall Chinook in the Lewis River. Making the extensive potential spawning habitat upstream of Merwin Dam available is likely to have a far larger impact on the population than increasing spawning habitat downstream. In the near-term, addressing potential rearing habitat limitations below Merwin Dam may ultimately be a more practical and beneficial approach to increase smolt production than the addition of spawning gravel.

Deleted: and is

Deleted: being used

Deleted: e

Deleted: either

Deleted: ,

Deleted: ,

Deleted: s

Nonetheless, some threshold of "acceptable" loss of spawning habitat should be determined for the sake of maintaining a minimum level of spawning habitat, and in light of the expense and effort involved in adding spawning gravel to the upper reach as compensatory mitigation for the loss. Determination of the threshold level of spawning habitat loss is out of the scope of this report, but would need to take into consideration the change detection limits inherent to the assessment methods currently available. While these detection limits will improve over time with repeated measurements, at present it seems that a change in habitat area of ~ 35% would seem a reasonable interim threshold to us.

Deleted:

Deleted:

## 1.5 Monitoring Plan

The spawning gravel monitoring plan we recommend should consist of two components. The first component is monitoring of stream discharge that reaches or exceeds a minimum discharge (termed spawning gravel monitoring discharge). The second component would consist of spawning habitat mapping in the spawning season following the year that the spawning gravel monitoring discharge occurs.

## 1.6 Minimum Discharge

The results of the EASI modeling (Section 2.5, Stillwater Sciences 2006) indicate the daily average discharge at which incipient motion occurs at approximately 56,000 cfs for the upper reach and 42,000 cfs for the lower reach. We propose setting a spawning gravel monitoring discharge within the study reach of 42,000 cfs (instantaneous discharge), which is approximately a 4-year flow event.

## 1.7 Spawning Habitat Use Monitoring

Mapping of spawning habitat use in the upper reach should occur during the spawning season following the spawning gravel monitoring discharge. The method used to map the spawning habitat will be identical to that used and presented in this report. Very low escapement is required to saturate the available spawning habitat in the upper reach, so in most years under-representation of available spawning habitat is a low risk.

## 1.8 Spawning Gravel Augmentation Strategy Options

Since 2005, there has been no appreciable change in the area of spawning habitat in the upper river (Table 1; see section 1.3 and 1.4); therefore we do not find that the immediate addition of spawning gravel is warranted at this time.

**Formatted:** Font: Not Bold

**Deleted:** Table 1

The general design guidelines for future gravel augmentation, should it be required, may consist of one or a combination of the following two options:

1) An annual input of gravel equal to the average annual sediment transport rate for the upper reach, as determined by application of the results of the EASI modeling. The gravel should be introduced just below the dam, and the river would naturally entrain and route the sediment from upstream to downstream.
2) Site-specific augmentation of gravel should be targeted to areas with documented loss of spawning gravel. The volume and extent of gravel to be added will be determined on a case-by-case basis in the event gravel augmentation is required.

Option 1, introducing the sediment just below the dam and allowing the river to route it downstream, has three advantages. First, there is road access to the river immediately below the dam, making delivery relatively easy, with no need for heavy equipment to operate within the stream channel itself. Secondly, the section of the river immediately below the dam (RM 19.5 to RM 19.35) is not a key spawning area, so the addition of gravel will have low impact on spawning habitat. Thirdly, allowing the river to route the sediment will allow coarsened areas to fill in and be shaped as they would under natural conditions, eliminating the need for more costly and questionable engineering solutions. The potential disadvantage of this option is that if substantial channel incision has occurred, routing of the added gravel to critical downstream spawning areas may take many years because high flows with the capacity for transporting sediment under these conditions are relatively rare. In the interim, spawning habitat limitations may continue to substantially limit salmon production. This could be remedied by immediate addition of gravel to the channel, which is described below.

Option 2 would more immediately replace local gravels lost during the last flood event; however, it is difficult to determine the extent to which gravel loss has occurred and thus the amount to add to the channel. The main problem with this approach is that access to the channel to add gravel may be difficult or impossible in certain reaches, particularly in the gorge of the upper reach. Gaining access through private property may further complicate implementation of this option.

A third option is the immediate addition of gravel at RM 19.3 to create a spawning riffle and enhance available spawning habitat. This option has three advantages. In the near term, creating a new spawning riffle in the uppermost spawning area of the upper reach would increase spawning habitat quantity and quality in one of the most heavily used spawning areas, which already exhibits evidence of density-dependent habitat limitations (Section 3.1). In addition, while the new spawning riffle would be designed to be stable at most high flows, in the event of a very large flood event, it could act as a source of gravel for replenishing areas downstream that have lost gravel. If this occurred after spawning had occurred, the redds would likely be lost. Access to the upper reach is good and heavy equipment impacts to existing spawning habitat would be negligible. A third and most important advantage is that the gravel remaining within the reach after a high flow event could be used to indicate whether more gravel augmentation is needed. The main disadvantage of this option is that it requires equipment and cost outlay in the near term.

**Comment:** This area is currently already heavily used for spawning as is evident when flows are dropped to 1800 in November. For some reason it is not included within any of the drawn spawning polygons? This may be that surveys where done relatively early in the Fall Chinook spawn time (10/14 in 2008), and at flows limiting visibility.

**Comment:** When I inspect the maps, and locate RM 19.3 I see mapped polygons. Maybe our RM designations are off, and I'm looking at mapped habitat downstream of the location you're referring to? If that is the case I think that the factors that you mention contributed to missing that habitat and therefore its exclusion form our mapping products. That's a bummer. This approach definitely has the drawback of being reliant of low flows, and the abundant presence of active spawners: Two incidents that don't always line up too well.

## 1.9 Conclusion

The immediate addition of spawning gravel to the Lewis River below Merwin Dam is not warranted at this time. If however, flows of sufficient magnitude to mobilize the bed occur, we recommend that follow-up surveys be conducted. If a loss of spawning gravel area of 35% occurs, then an addition of spawning gravel may be warranted. Three options for future gravel augmentation should it be required have been presented.

The three options for gravel augmentation presented correspond to different philosophies: option 1 assumes that future gravel losses will be minor and that the purpose of augmentation is to maintain existing habitat; option 2 is more expensive but would increase spawning habitat quality and quantity for Chinook salmon; and option 3 preemptively increases spawning habitat and provides insurance against potential future losses. We believe option 3 can accomplish the objective with relatively small risk of damaging the habitat and a reasonable budget.

Before future gravel augmentation occurs a detailed plan should be developed and submitted for review. The detailed design should contain at minimum the following components: a bulk particle size analysis of the present river bed, a gravel particle size distribution for gravel to be added based on native bulk samples and desired outcome, and a risk evaluation of potential effects of gravel augmentation. If an annual gravel augmentation plan is implemented it should be reviewed every 10 years (up to three times during the license term) to determine if any adjustments are needed. This review may result in a termination, decrease, or increase of the amount of gravel added annually.

## 1.10 References

Bio-Analysts, EDAW, Historical Research Associates, Hardin-Davis, Mason Bruce & Girard, Meridian Environmental, Mobrand Biometrics, Montgomery Watson Harza, Northwest Hydraulic Consultants, Washington Department of Fish and Wildlife, and Watershed GeoDynamics. 2003. Final Licensee's 2001 technical study status reports for the Lewis River Hydroelectric Projects. FERC No. 935, 2071, 2111, 2213. Prepared for PacifiCorp, Portland, Oregon and Public Utility District No. 1 of Cowlitz County, Longview, Washington.

Groesbeck, M. 2006. Age composition of naturally spawning fall and spring Chinook, and fall chum in Washington Columbia River tributaries downstream from McNary Dam, 2005. State of Washington Department of Fish and Wildlife, Region 5. 2108 Grand Blvd. Vancouver, WA 98661. (downloaded from www.streamnet.org, December 2008)

Groesbeck, M. 2007. Age composition of naturally spawning fall and spring Chinook, and fall chum in Washington Columbia River tributaries downstream from McNary Dam, 2006. State of Washington Department of Fish and Wildlife, Region 5. 2108 Grand Blvd. Vancouver, WA 98661. (downloaded from www.streamnet.org, December 2008)

Groesbeck, M. 2007. Age composition of naturally spawning fall and spring Chinook, and fall chum in Washington Columbia River tributaries downstream from McNary Dam, 2007. State of Washington Department of Fish and Wildlife, Region 5. 2108 Grand Blvd. Vancouver, WA 98661. (downloaded from www.streamnet.org, December 2008)

R Development Core Team. 2008. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL http://www.R-project.org.

Stillwater Sciences. 2006. Lewis River Spawning Gravel Evaluation. Prepared for PacifiCorp, Portland, Oregon and Public Utility District No. 1 of Cowlitz County, Longview, Washington.

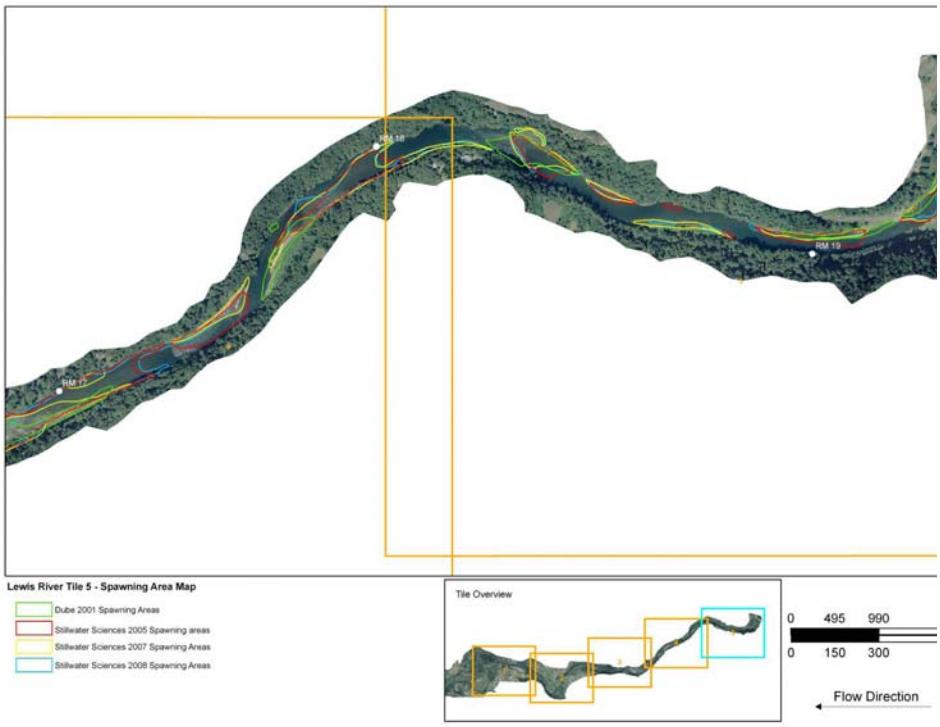



**Figure 1.** Mapped spawning habitat in the Lewis River between Merwin Dam and the Lewis River Fish Hatchery in 2001, 2005, 2( complete length of river surveyed, also see figures 2 and 3. Mapped habitat in 2001 derived from shapefiles generated by BioAn

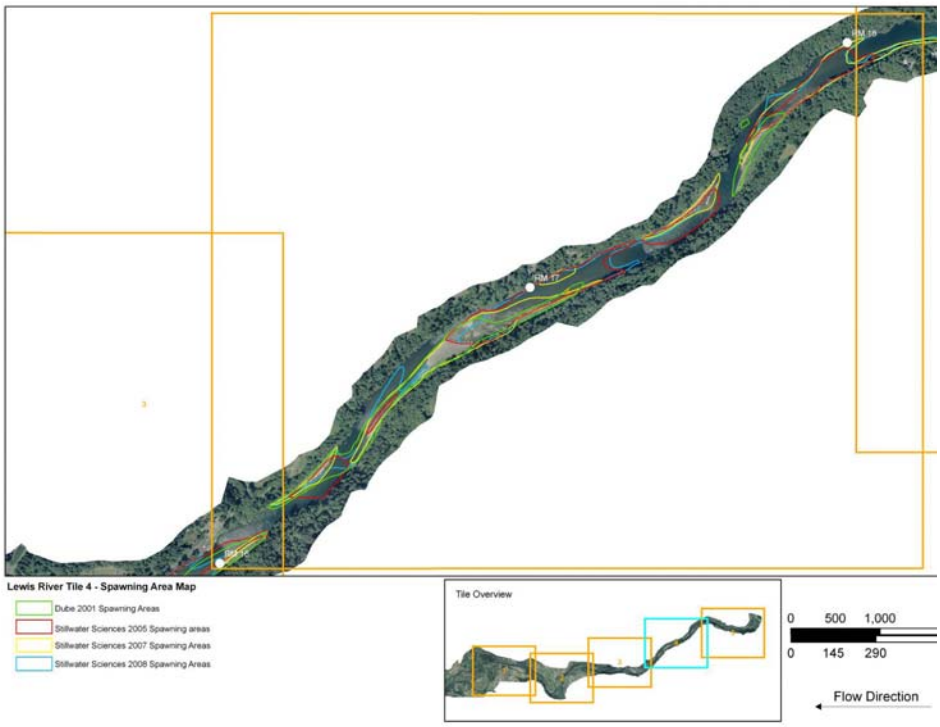



**Figure 2.** Mapped spawning habitat in the Lewis River between Merwin Dam and the Lewis River Fish Hatchery in 2001, 2005, 2( complete length of river surveyed, also see figures 1 and 3. Mapped habitat in 2001 derived from shapefiles generated by BioAn

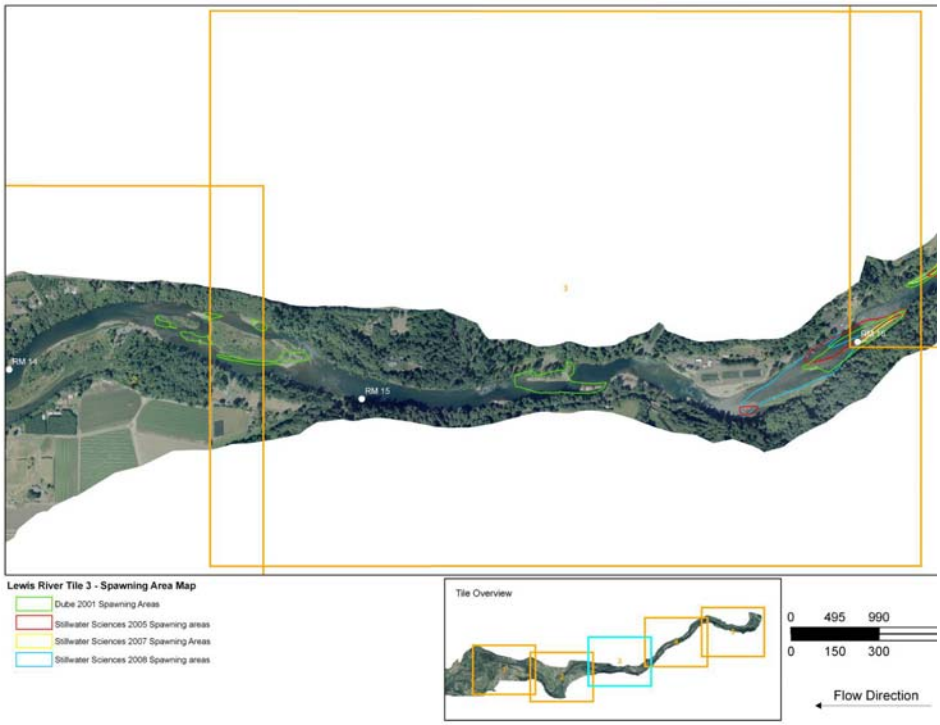



**Figure 3.** Mapped spawning habitat in the Lewis River between Merwin Dam and the Lewis River Fish Hatchery in 2001, 2005, 2( complete length of river surveyed, also see figures 1 and 2. Mapped habitat in 2001 derived from shapefiles generated by BioAn

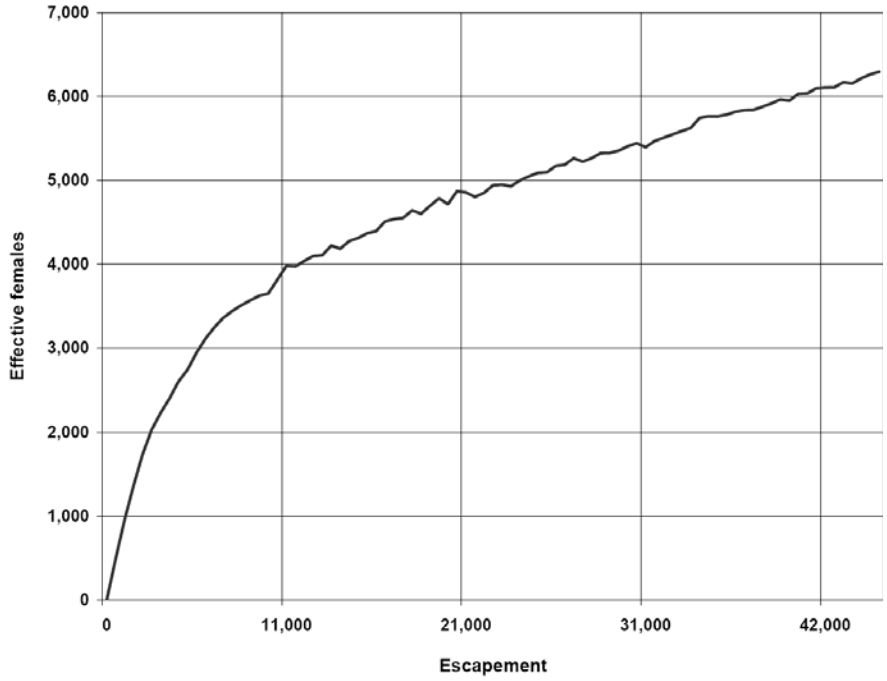



**Figure 4.** Chinook salmon effective females and effective eggs versus escapement from ESCAPE output (Figure 3 from Stillwater

# Plas Newydd RM 2.0
## *Off-Channel Habitat Enhancement*

PacifiCorp -- ACC 2009

Cowlitz Indian Tribe

# Presentation Overview:

1. Problem
2. Supporting Documents
3. Opportunity
4. Location
5. Proposal Components
6. Companion Projects

# Problem:

- The lower mainstem Lewis River contains only scarce amounts of off-channel habitat, which is essential for:
  - Chinook salmon, Lower Columbia River ESU, listed as *Threatened*
  - Chum salmon, Columbia River ESU, listed as *Threatened*
  - Coho salmon, Lower Columbia River ESU, listed as *Threatened*
  - Steelhead trout, Lower Columbia River DPS, listed as *Threatened*

# Supporting Documents (1):

- North Fork Lewis River Habitat Assessment (Keefe et al. 2004) identifies opportunities with the greatest potential to benefit salmonid production in the basin.
- Item 2 identifies the preservation of “small areas of intact forest within [the lower reach] of the Lewis River”, and specifically a portion of intact forest “on the south bank between river mile 2.0 and 2.7.”
- Maps and aerial photos indicate the site supports approximately 200 linear meters of intact, functional off-channel habitat. Therefore, this small, undiked portion of forested floodplain habitat is a significant and important remnant of scarce off-channel habitat once common in the lower river.
- The habitat assessment also says “preservation/restoration of floodplain habitats in this area is given a relatively high priority due to the scarcity of functional habitat throughout the first 7.3 miles of Lewis River mainstem channel.”

# Supporting Documents (2):

- The Executive Summary of the *Habitat Limiting Factors, Water Resource Inventory Area 27 (Kalama, North Fork Lewis River, and East Fork Lewis River)* (WCC 2005), states that the second most important recommendation to address limiting factors in the Lewis River is: “Increase and/or enhance off-channel and rearing habitat within the lower Lewis River.”

# Supporting Documents (3):

- Section 7 of the WRIAs 27 and 28 Watershed Management Plan (LCFRB 2006) states, "Restoring lowland floodplain function, riparian conditions, and stream habitat diversity" is a priority action in the lower Lewis River.

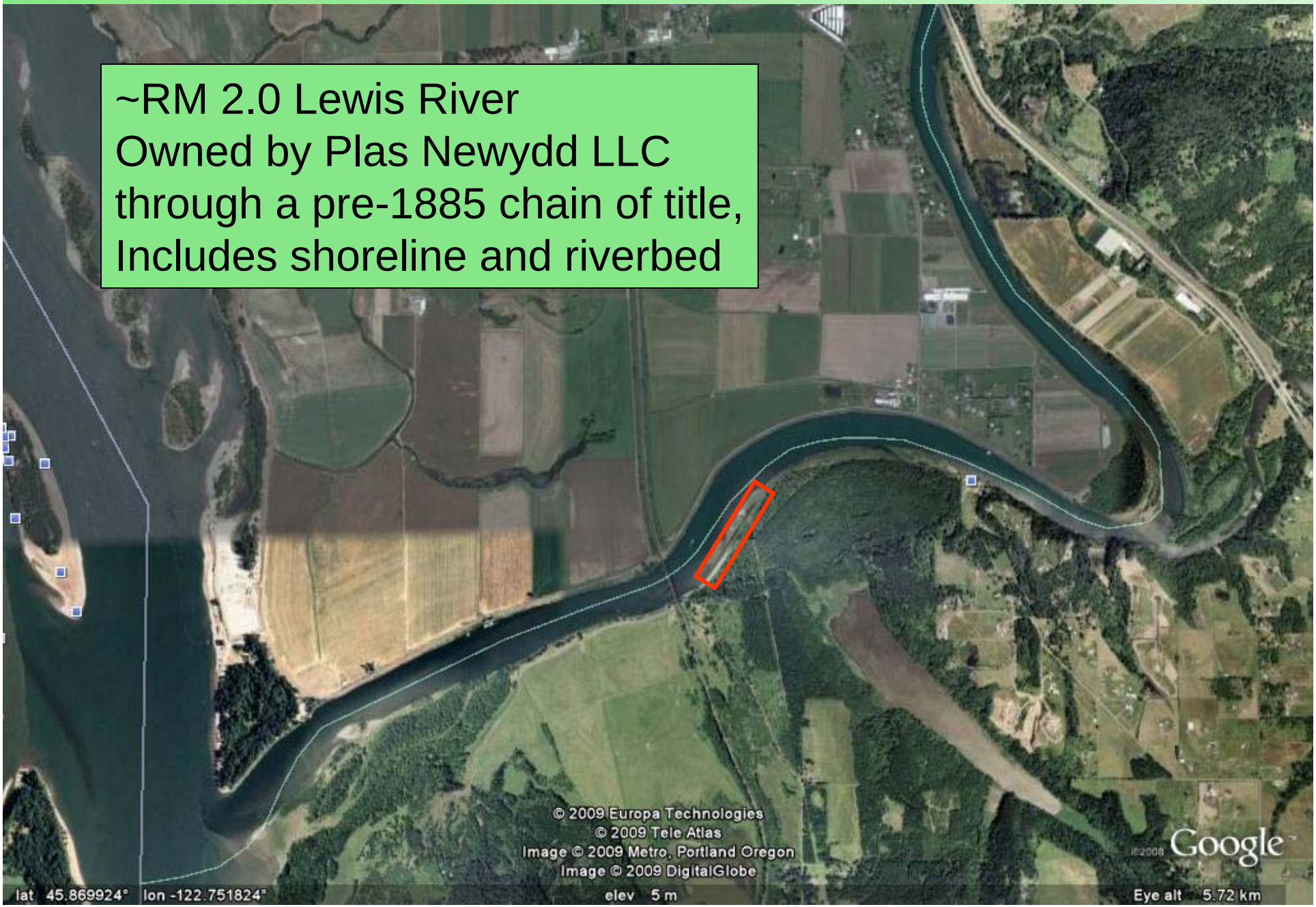
- In table 7.1 of that document, it prescribes, "Within authorities, conduct floodplain restoration where feasible along the [lower Lewis] mainstem and in major tributaries that have experienced channel confinement. Build partnerships with landowners and agencies and provide financial incentives."

- Implementation of this prescription will result in "restoration of floodplain function, habitat diversity, and habitat availability", with a "high" level of certainty.

# Opportunity:

- The enhancement of off-channel habitat described in this project proposal will benefit fish recovery throughout the North Fork Lewis River, with priority for ESA-listed species.
- In the short term, this project will increase the abundance of functional habitat in the lower river, an area of great need.
- The habitat will benefit and be utilized by both returning adults and out-migrating juveniles.
- Ultimately this project will allow the Lewis River to support larger populations of anadromous fish.

# Location:  Lower Mainstem Lewis River



# Site Aerial Photo

# Proposal Components (1):

Plantings:

- Site-appropriate species
  - 2400 Willows (*Salix spp*.)
  - 550 Black Cottonwoods (*Populus trichocarpa*)
  - 550 Red-osier dogwoods (*Cornus stolonifera*)
  - 50 Oregon Ash (*Fraxinus latifolia*)
  - 3200 trees and shrubs total
- Species are able to survive inundation
- Densely planted in hex grid on 0.5m intervals

# Goals of Plantings:

- Enhanced habitat quality and function of the off-channel area for ESA-listed salmonids, through:
  - reduced water temperatures,
  - increased water quality
  - Increased organic inputs to the system
  - Eventual bankfall of large trees from a mature riparian forest will:
    - serve as source of large woody debris to the river
    - further enhance nutrient loads
    - create structure and habitat
    - armor both the proximal downstream riverbank and the off-channel habitat.

# Proposal Components (2):

## Carcass Additions:

- Carcasses weigh ~5kg each
- 110 carcasses ~ 550kg total
- Carcasses will be wrapped in durable Vexar mesh, and staked down
- Carcasses will be planted in the system in late fall or early winter of 2009; stakes and Vexar will be removed in early spring of 2010.

# Goals of Carcass Addition:

- Provide localized pulse of nutrients in readily accessible format:
  - Carcasses provide a direct source of nutrient-rich organic matter; flesh and eggs (in particular, lipids) for direct consumption by juvenile salmon
- Also promote a pulsed increase in the abundance of macroinvertebrates
  - Broad, low-gradient reaches that occur low in river systems are typically dominated by filter feeders
  - Decomposition of carcasses will allow enhance the population of shredders, collectors, and scrapers in the off-channel habitat, which are important prey for juvenile salmonids.

# Companion Projects:

- ACC2007
- LCREP2008
- ACC2008

# 1. Companion Projects: ACC 2007

# 2. Companion Projects: LCREP 2008

# Companion Projects: ACC 2008

# Companion Projects Summary:

- ACC2007 -- $75,000 +$10,000
- LCREP2008 – $33,200
- ACC2008 -- $43,500+$8,000
- Total value: $169,700

# Conclusions:

- Demonstrated ecological need for the project
- Demonstrated benefits to ESA-listed salmonids
- Willing landowner
- Complements several other projects already completed near or in the site
- Request: $50,000

# Proposal is consistent with aquatics fund objectives:

- **Priority 1:** *Benefit fish recovery throughout the North Fork Lewis River, with priority to federal ESA-listed species.*
- **Priority 2:** *Support the reintroduction of anadromous fish throughout the basin.*
- **Priority 3***: Enhance fish habitat in the Lewis River Basin, with priority given to the North Fork Lewis River.*


Questions?

# Barrier Nets for Entrainment Reduction
# Yale Hydro Project

January 8, 2009

PACIFICORP ENERGY
A DIVISION OF PACIFICORP

# Yale Dam


PACIFICORP ENERGY
A DIVISION OF PACIFICORP

# License Prescriptions

- Reduce entrainment of bull trout at the Yale intakes (SA 4.9.3)



PACIFICORP ENERGY
A DIVISION OF PACIFICORP

# License Prescriptions

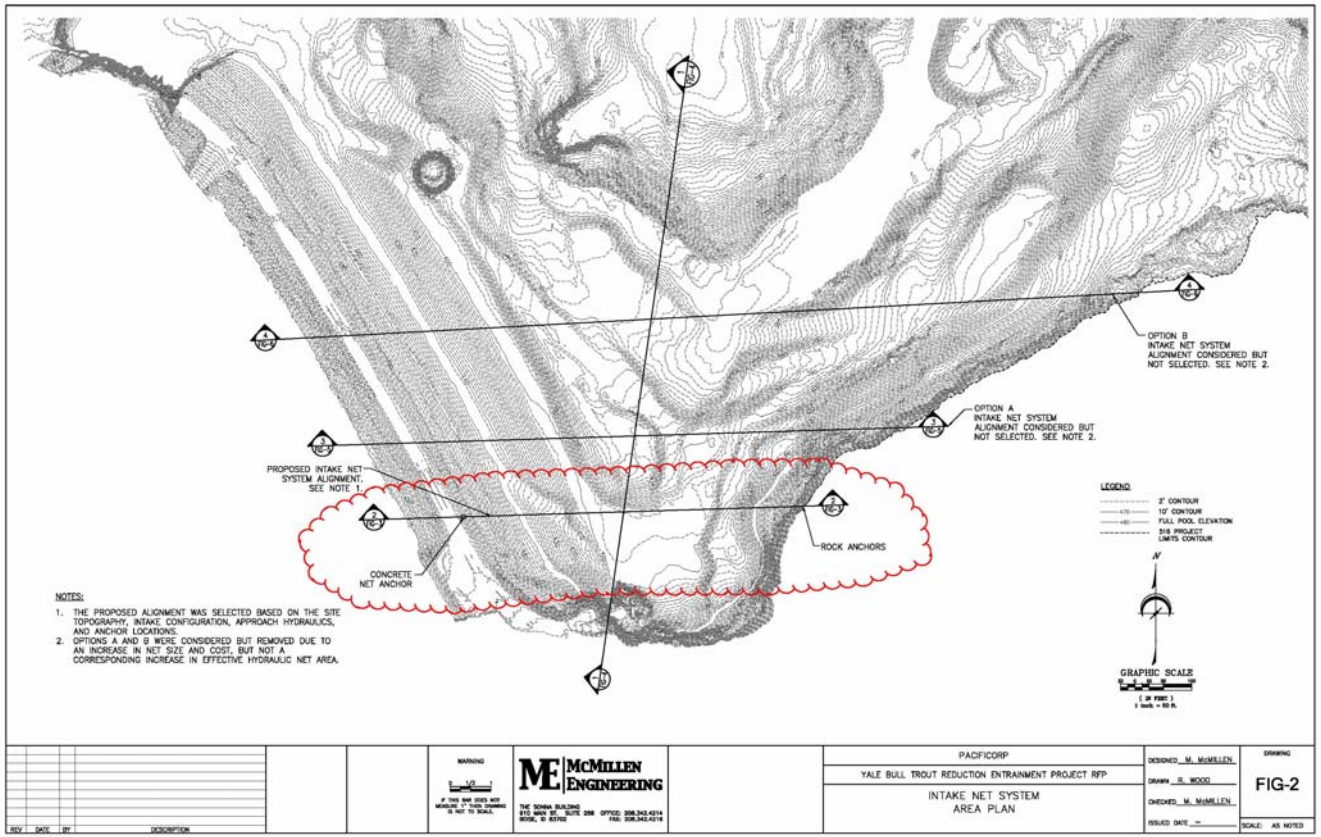
- Improve fish survival over the spillway during spill events (SA 5.1)

PACIFICORP ENERGY
A DIVISION OF PACIFICORP

# Project Scope for SA 4.9.3

- Barrier net spanning the intakes

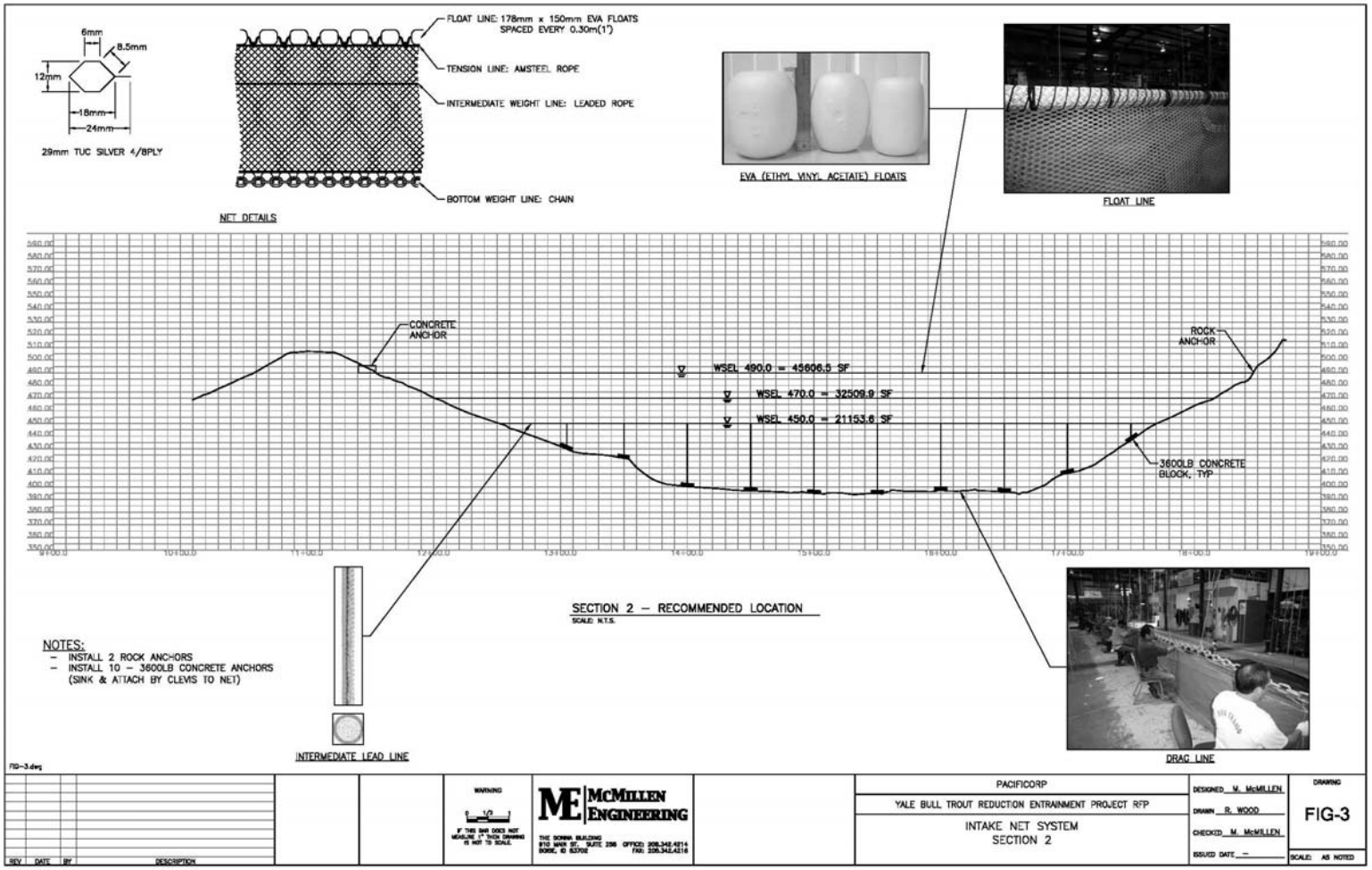
  Fixed net; in place year round; 1/2” mesh; full depth






PACIFICORP ENERGY
A DIVISION OF PACIFICORP

# Project Scope for SA 4.9.3




PACIFICORP ENERGY
A DIVISION OF PACIFICORP

## Schedule

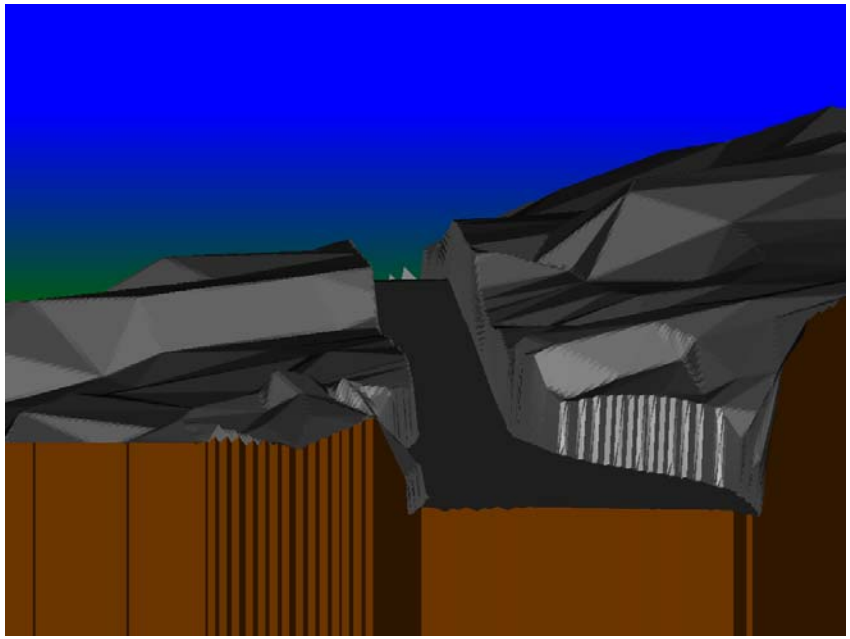
- Contract awarded February 10, 2009
- Design submittal due February 20, 2009
- Permit applications February 25, 2009
- Construction period is 30 days after permits and regulatory approvals are received.



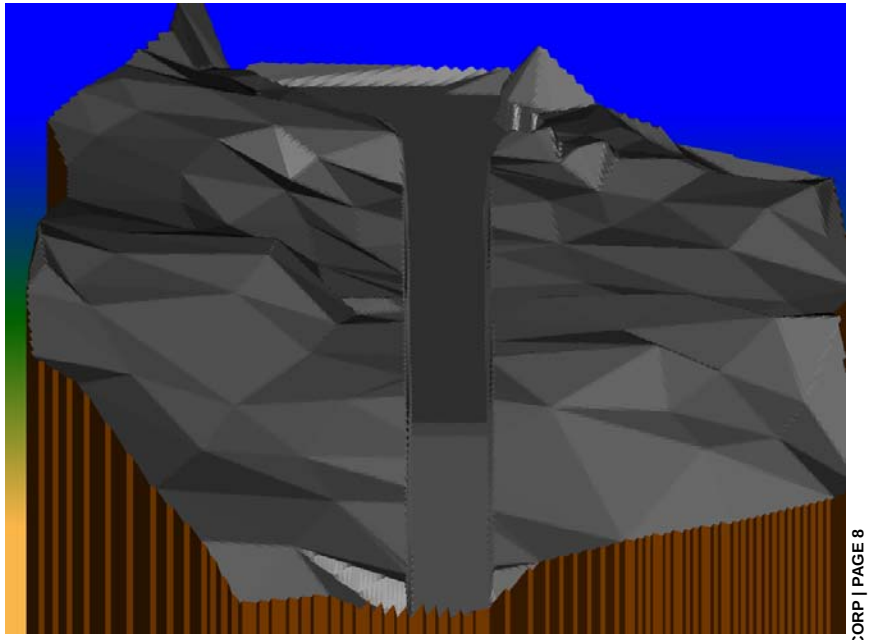
PACIFICORP ENERGY
A DIVISION OF PACIFICORP

# SA 5.1 – Concept from Settlement Agreement

Looking downstream



Looking upstream



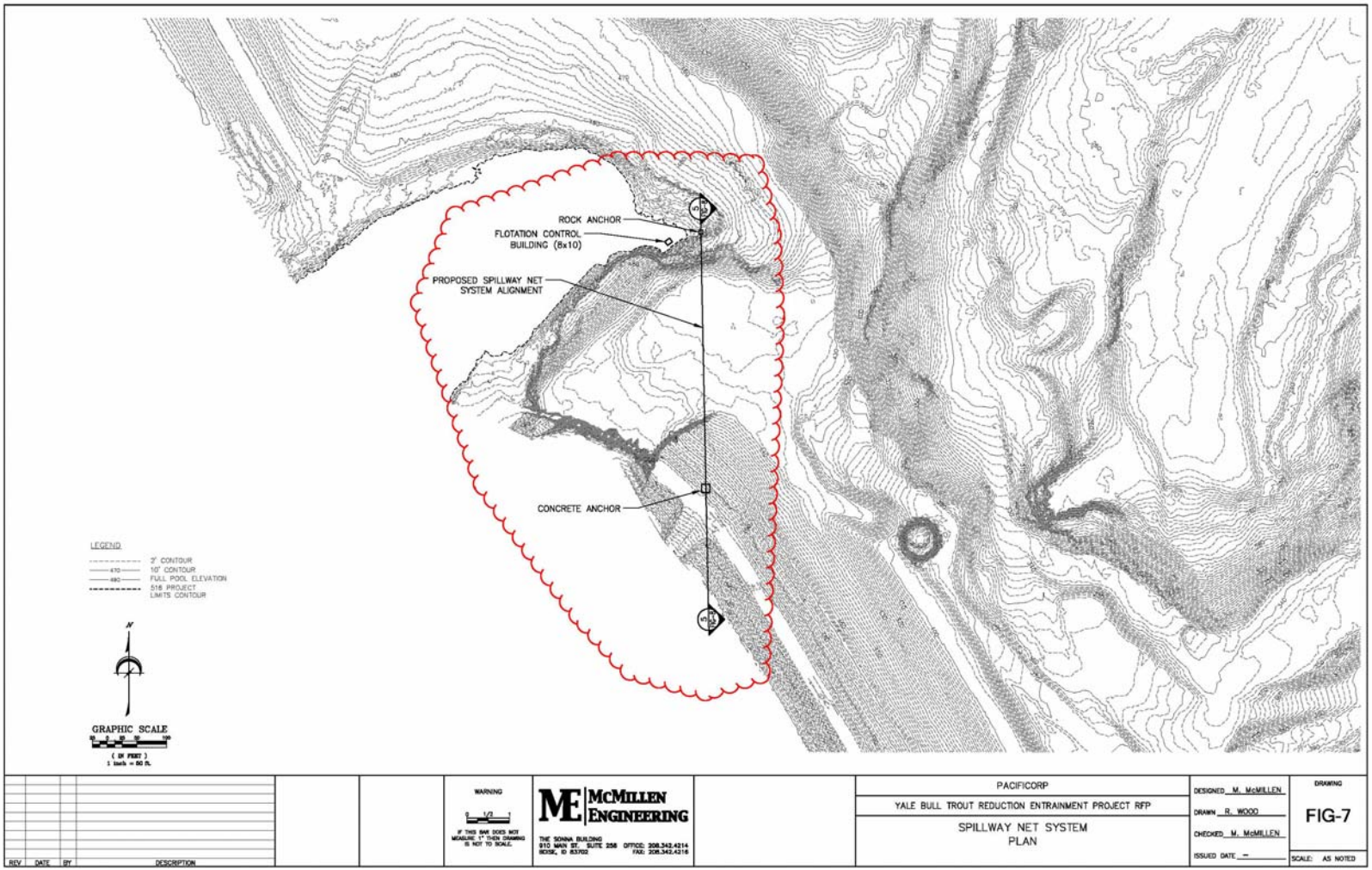


PACIFICORP ENERGY
A DIVISION OF PACIFICORP

## Current Proposal for Spillway

- Alternative approach is to protect bull trout by reducing entrainment in the spill flow.
- Additional fish protection benefit of reducing need to trap and haul bull trout from Merwin back to Yale.

# Barrier Net at Spillway




PACIFICORP ENERGY
A DIVISION OF PACIFICORP

Washington Dept of Fish and Wildlife
Region 5
2108 Grand Blvd.
Vancouver, WA 98661

February 11, 2009

Frank Schrier
PacifiCorp
825 NE Multnomah,
Portland, OR 97232

Dear Mr. Schrier:

The Washington Department of Fish and Wildlife (WDFW) appreciates the opportunity to comment on the Draft Lewis River Baseline Monitoring Study Plan (Draft Plan).

In general, WDFW supports the approach PacifiCorp outlined for the Baseline Monitoring Study Plan. We have the following specific technical recommendation for enhancing the Draft Plan:

Add an upper watershed fish production monitoring capability via screw trap sampling at the Eagle Cliffs site.

We would like to see operation of a screw trap at Eagle Cliffs from April through October when flows permit. We believe this will provide valuable information on fish production from the upper watershed prior to and subsequent to anadromous reintroduction. Two traps presently are available and the fastening rings on the cliff face are still in position. Staffing would be the major challenge.

Precedent for screw trap operation was set during the two years of trapping in 2001 and 2002, as specified by the Aquatic Resources Group within the relicensing process. Valuable timing and migration data were obtained for rainbow, cutthroat, whitefish and stickleback. Trap efficiencies allowed determination of estimates number of fish of individual species migrating into the reservoir. Test releases of spring chinook and coho salmon juveniles were also monitored and the number of migrants determined.

Important data on the sizes of juvenile bull trout migrants was obtained. Spring chinook migration extended later in the summer than anticipated. Rainbow trout appeared to be in two forms. Standard naturally produced rainbow and a second group appearing more like steelhead smolts. The number of these smolt like rainbow needs to be quantified prior to reintroduction, so that we will have the ability to differentiate them from migrating smolts produced from reintroduced steelhead adults.

Finally, capturing smolts at the head end of the reservoir will indicate some measure of egg to smolt survival for reintroduced fish production within the upper watershed. The trap also will provide a platform to collect and PIT or radio tag migrating fish to determine reservoir journey timing and potential reservoir losses as fish transit the reservoir.

The Cowlitz Tribe also supports the juvenile fish production monitoring at Eagle Cliffs. PacifiCorp, WDFW, and the Cowlitz Tribe could work collaboratively to staff, install and operate the trap. Due to safety and damage concerns the trap would need to be staffed 24/7 through the trapping period. WDFW requests that PacifiCorps provide an additional level of Scientific Technician funding for WDFW and the Cowlitz Tribe to accomplish this important monitoring. We propose that WDFW and the Cowlitz Tribe will meet with PacifiCorp to determine the person-months of technician time to accomplish this work. WDFW plans to provide Project Leader time for oversight, and coordinate the ongoing Bull trout sampling with this project to maximize staff time efficiency over the duration of the Eagle Cliffs monitoring.

WDFW biological staff will be available to meet with PacifiCorp, the Cowlitz Tribe, and other ACC members to discuss the proposed Draft Plan enhancements in more detail. Please don't hesitate to contact Steve Vigg (360) 906-6710, John Weinheimer (360) 906-6746 or Jim Byrne (360) 906-6751 to set up a meeting or conference call.

Sincerely,

Patrick Frazier
Regional Fish Program Manager

# USFS ACC Projects 2009

# Clear Creek

- The lower 1.3 miles of Clear Creek lacks large woody material and provides minimal structure for fish habitat.
- 900 pieces of Large Wood Material would be added to the lower 1.3 miles to create pool habitat and provide complex structure to the stream.
- This would create and improve rearing opportunities for chinook, coho salmon and steelhead trout.
- In addition it would improve spawning opportunities for reintroduced adult chinook and coho salmon and steelhead trout.
- Wood for this project would come from USFS lands and from Swift Reservoir cleaning operations.
- Most of the woody material will be placed downstream of the 93 road bridge to avoid potential problems with both the bridge and the proposed acclimation pond.

# Method of work

- Wood for the project would be transported by log truck to Clear Creek from a nearby timber sale thinning unit- part of the Wildcat Stewardship Timber Sale.
- A skidder or front end loader would transport trees to project sites in Clear Creek.
- An excavator would place trees into clusters along streambanks- burying ends as needed to anchor the structures.

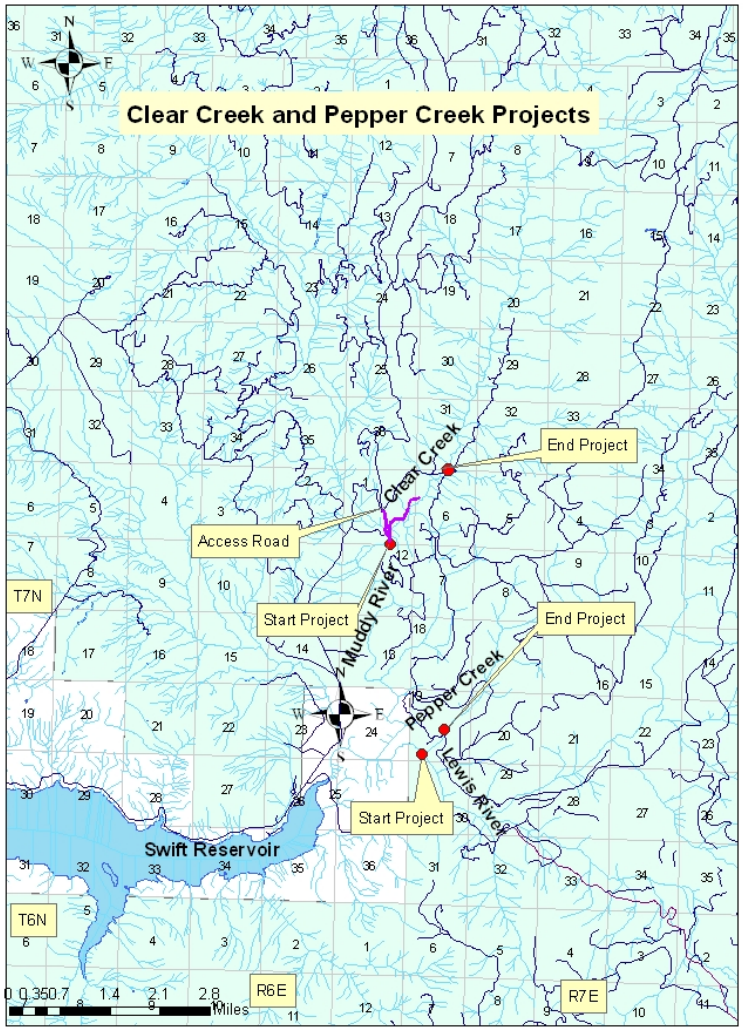
# Present Condition- lack of large wood and pool habitat in many areas

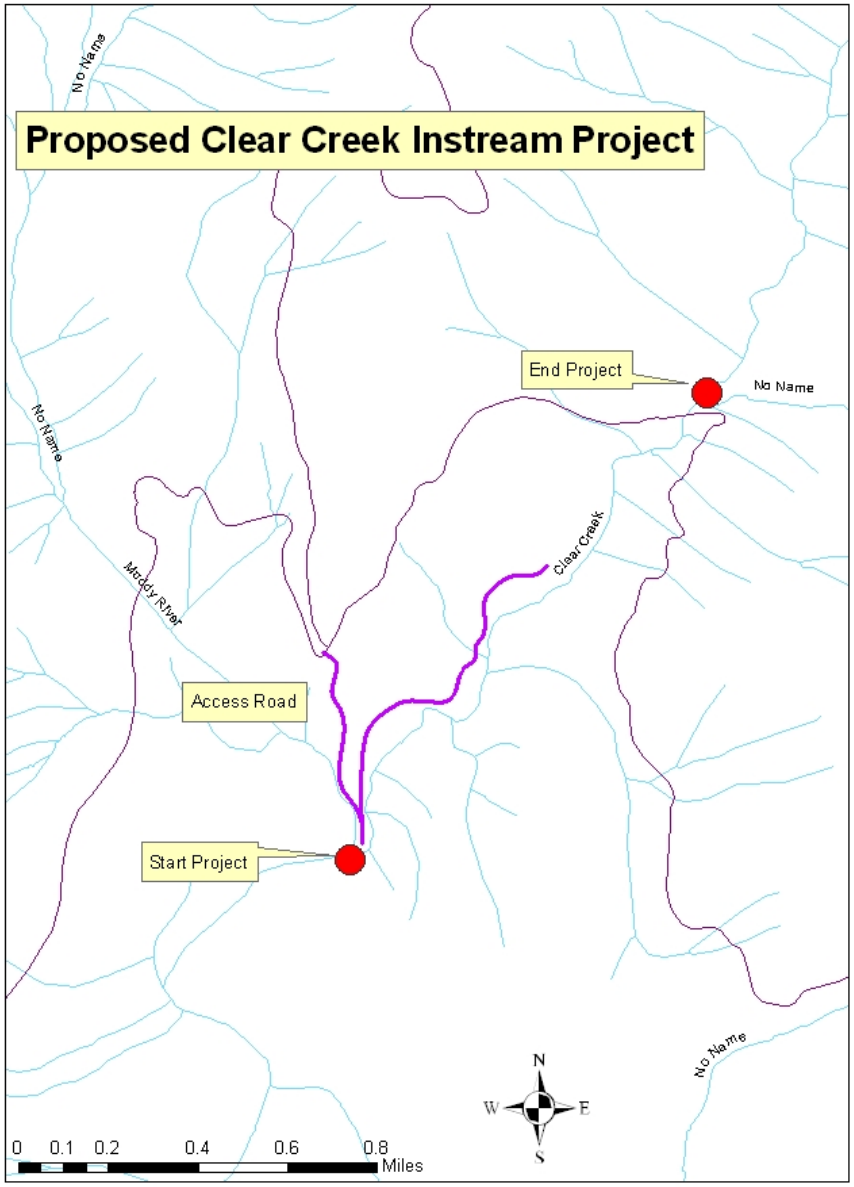
# Present Condition-banks failing in some areas

# Present Condition-banks failing in some areas

Present Condition-natural accumulations of wood create pools for rearing, help to stabilize streambanks, and add structure to the creek.  This are similar to the types of structure we want to create.  Not channel spanning, but clusters of 30 trees along the streambanks

# Proposed Project Location




Proposed Clear Creek Instream Project
End Project
Start Project
Access Road
No Name
No Name
No Name
No Name
Muddy River
Clear Creek
N
W
E
S
0 0.1 0.2 0.4 0.6 0.8
Miles

# Project partners to date

| Partner | Contribution | Funds |
|---|---|---|
| USFS | Personnel time<br>900 pieces of woody material | 15K<br>90K |
| Ecotrust | Riparian planting project<br><br>Project personnel time including monitoring | 10K-Cash<br><br>30K-Cash |
| Swift Community Action Team (SCAT) | One month of excavator time and hauling | 7.5K |
| Mount St. Helens Institute (MSHI) | Personnel time and monitoring, and Youth Stream Team | 4K |
| ACC | Project implementation dollars and project support dollars | 106K |
| **Total** | | **256K** |

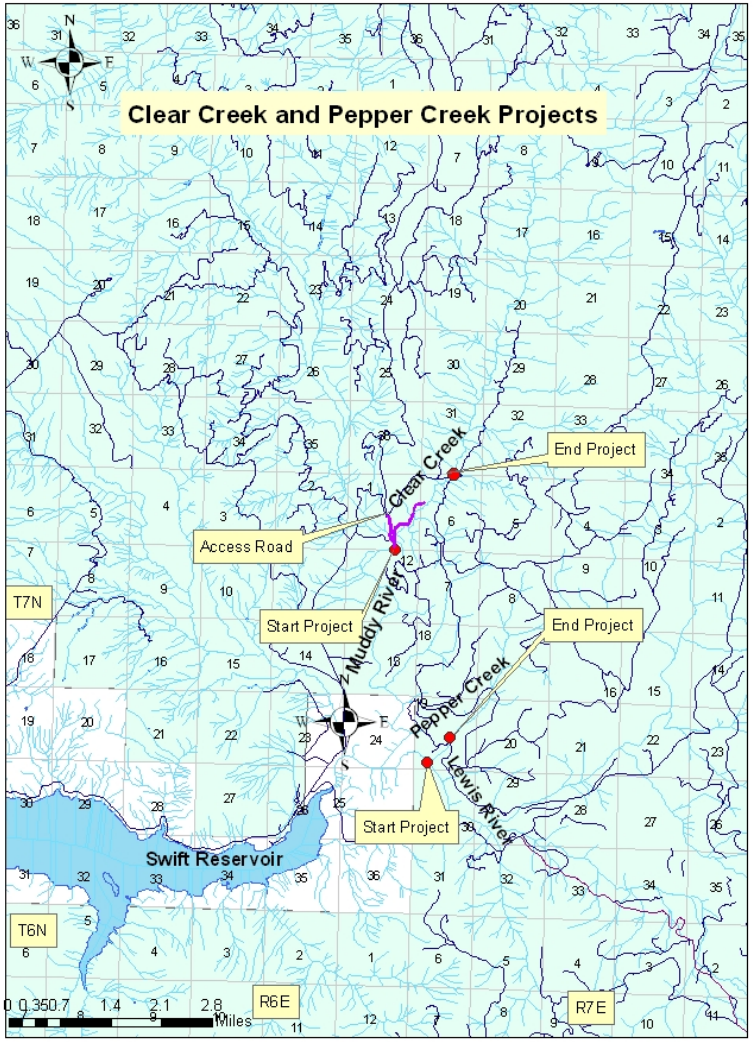
# Pepper Creek

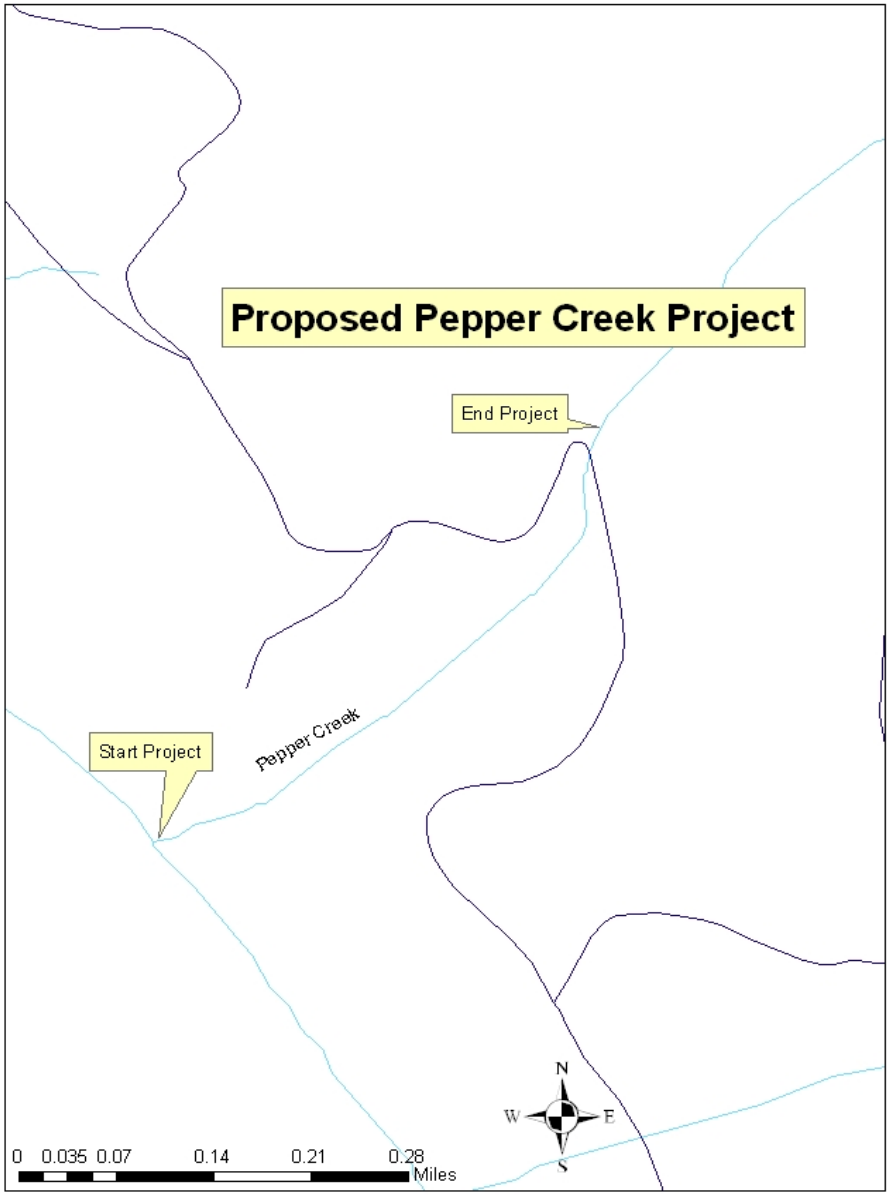
- The lower 0.5 miles of Pepper Creek lacks large woody material and provides minimal structure for fish habitat.
- 150 pieces of Large Wood Material would be added to the lower 0.5 miles to create pool habitat and provide complex structure to the stream.
- This would create and improve rearing opportunities for, coho salmon and steelhead trout. In addition it would improve spawning opportunities for reintroduced adult coho salmon and steelhead trout.
- Wood for this project would come from USFS lands and from Swift Reservoir cleaning operations.

# Method

- Wood for the project would be transported by log truck to Pepper Creek from a nearby timber sale thinning unit- part of the Wildcat Stewardship Timber Sale.
- Woody material would be flown into the creek using a mobile yarder set up at strategic locations along the road.
- An all terrain excavator (Spyder) would walk up the creek placing the wood into clusters and logjams to create rearing pools and spawning opportunities for fish

# Proposed Project Location




Proposed Pepper Creek Project
End Project
Start Project
Pepper Creek
N
W
E
S
0 0.035 0.07 0.14 0.21 0.28
Miles

# Project Partners to Date

| Partner | Contribution | Funds |
|---|---|---|
| USFS | Personnel time<br>150 pieces of woody material | 8K<br>15K |
| Swift Community Action Team (SCAT) | Equipment hauling | 1K |
| Mount St. Helens Institute (MSHI) | Personnel time and monitoring, and Youth Stream Team | 2K |
| ACC | Project implementation dollars and project support dollars | 46K |
| **Total** | | **72K** |

# Pine Creek Nutrient Enhancement

•Because of the lahar flows of 1980, the 1996 floods, and the blockage of anadromous fish by Merwin Dam, Pine Creek is nutrient deficient.

• This results in reduced primary and secondary production, creating poor fish habitat, and a poor food base.

•This project will utilize coho salmon carcasses to add nutrients to Pine Creek. We plan to add up to 4,000 carcasses to the system over a six mile reach using mostly helicopter support to distribute fish because of poor access.

•A second method we could use would be carcass analogs produced by Skretting fish food company. They are made from a pacific whitefish and have the same nutritional value as a salmon carcass analog. Using analogs would allow us to target fry emergence in early spring.

# Carcasses being loaded into a specialized helicopter bucket for deployment- The bucket can hold 800-1000 lbs of carcasses

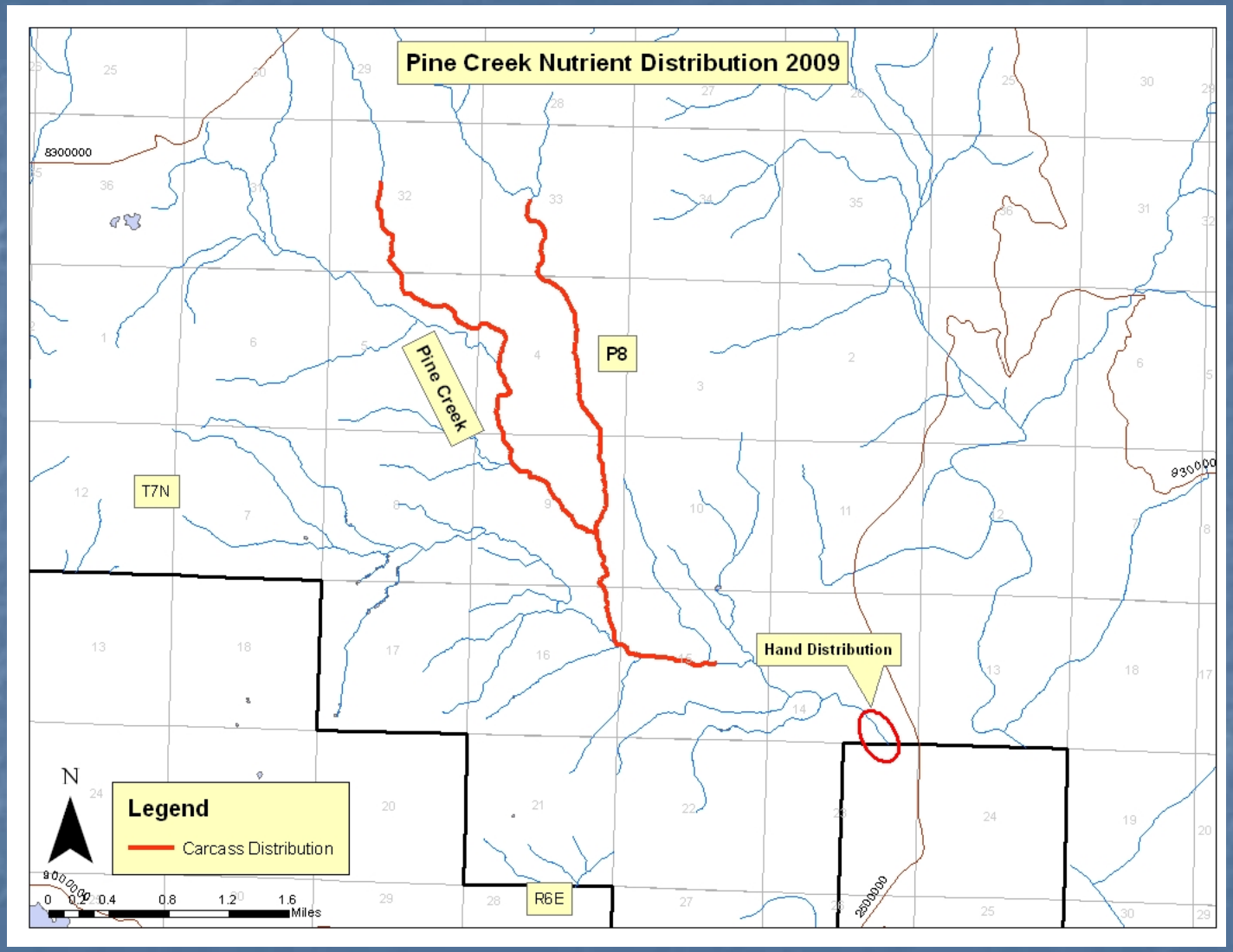
# Helicopter with bucket of salmon

**The pilot can control the trap door on the bucket so that the carcasses can be spread out over a long stretch of the creek.**

# Carcass Analogs

**Benefits of the project include:**

- **Increased stream biota**
- **Increased food base for fish**
- **Increased riparian vegetation growth**
- **Long-term source of large woody debris for Pine Creek**


Pine Creek Nutrient Distribution 2009
8300000
Pine Creek
P8
T7N
Hand Distribution
R6E
N
Legend
Carcass Distribution
0 0.2 0.4 0.8 1.2 1.6
Miles

# Project Partners to Date

| Partner | Contribution | Funds |
|---|---|---|
| Forest Service | Project development, Contracting, Permitting, Monitoring | $12,000 In-kind |
| Clark Skamania Fly Fishers | Labor for carcass collection, Nutrient distribution, Vehicle use 200 miles | $2,000 In-kind |
| Mt. St. Helens Institute | Monitoring | $3,000 In-kind |
| Olympic Resource Management | Agreements, road use | $1,000 In-kind |
| ACC | Project implementation and support dollars | $41,000 Carcasses OR $30,000 Analogs |

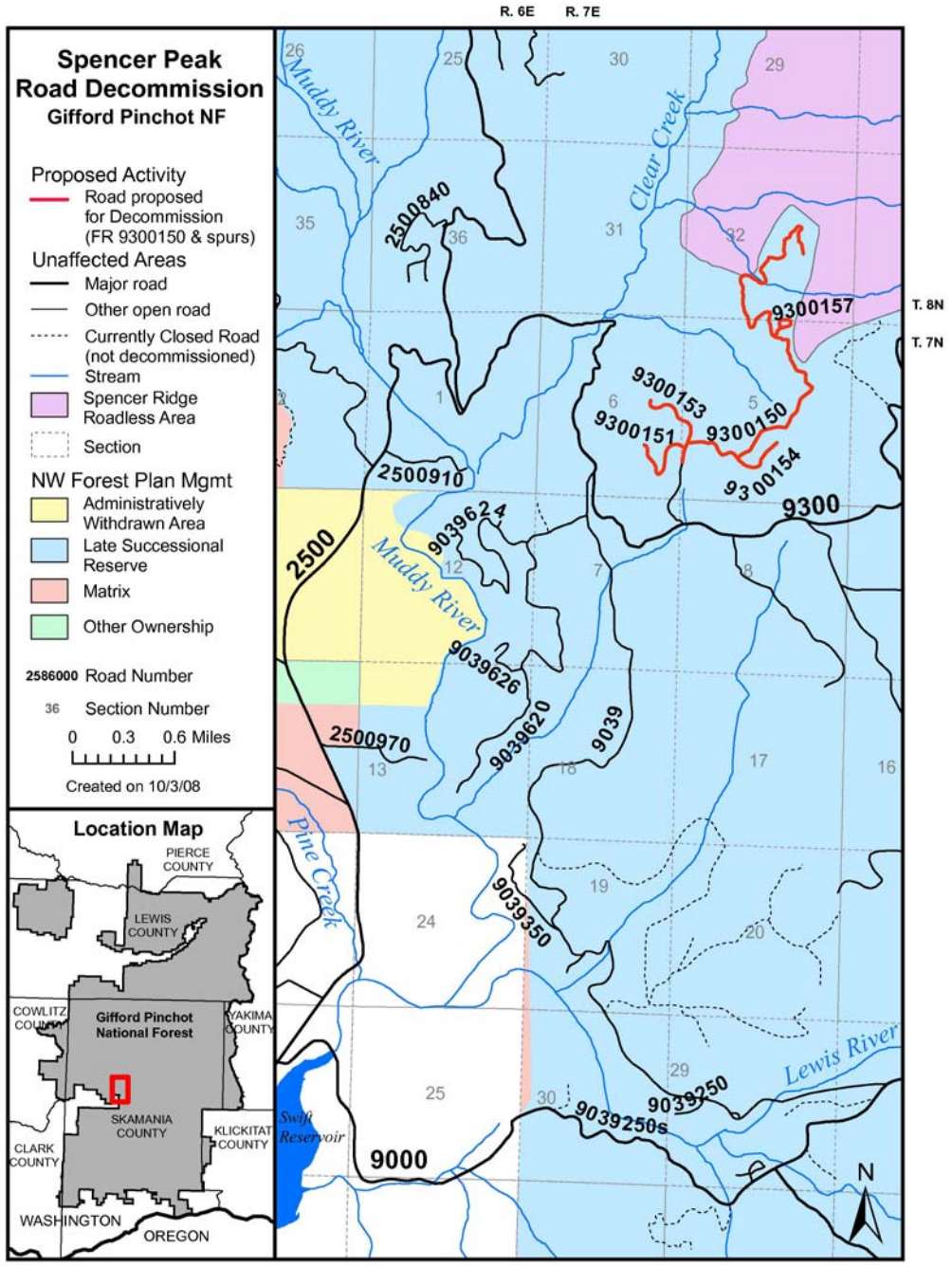
# Spencer Peak Road Decomissioning

- Remove all  culverts along the last 2.6 miles of Forest Road 9300150 and spur roads.
- Reconstruct channel at each stream crossing (1 perennial and 2 intermittent)
- Re-vegetate disturbed areas with native vegetation

# Benefits of the project include:

- Reduced erosion
- Reduced sediment delivery to Clear Creek
- Removal of risk of culvert failure- total sediment risk is 2235 cu yards for the perennial culvert and 2,000 cu yards for the intermittent culverts

# Spencer Peak Road Decomission



# Project Partners to Date

| **Partner** | **Contribution** | **Funds** |
|---|---|---|
| USFS | Personnel time | 20K |
| GP Task Force | Personnel time<br>Contract<br>Other | 3K<br>30K<br>7K |
| ACC | Project implementation dollars and project support dollars | 33K |
| **Total** | | **73K** |

# Spencer Peak Road Decommissioning

- Remove all culverts (stream crossings and ditch relief) along the last 2.6 miles of Forest Road 9300150 and spur roads.
- Reconstruct channel at each stream crossing (1 perennial and 2 intermittent)
- Re-vegetate disturbed areas with native vegetation
- Close vehicular access

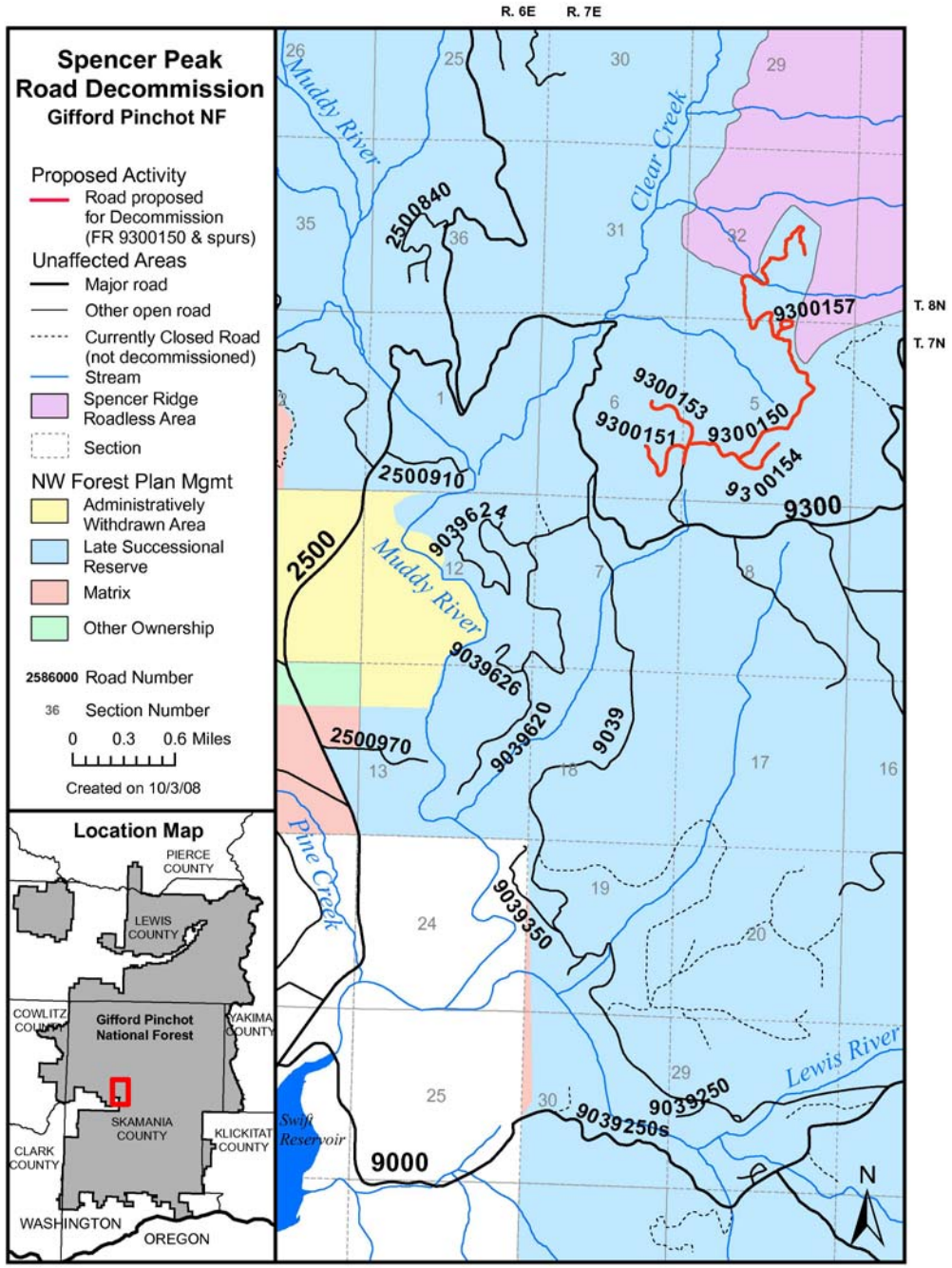
# Road Decommissioning Background

- Culvert fill, constructed primarily of coarse angular rock (2-6”), is delivered to streams when a failure occurs.
- High gradient streams transport the coarse angular rock to lower gradient streams where it can be deposited amongst or on top of smooth rounded spawning sized sediments.
- Eroded material from road surfaces are mostly fines and sand sized sediments which are readily transported far distances in streams.
- Road related fines and sands also can settle out where spawning sized sediment occur.

# Benefits of Road Decommission

- Reduce the risk of coarse sediment delivery to anadromous habitat of Clear Creek (Tier 2 reach) from road culvert failures
  - total sediment risk is 2235 cu yards for one perennial culvert and 2,000 cu yards for two intermittent culverts
- Eliminate chronic road surface erosion
- Restore drainage connectivity critical for riparian dependent species

# Spencer Peak Road Decomission



# Project Partners to Date

| Partner | Contribution | Funds |
|---|---|---|
| **USFS** | **NEPA**<br>**Final Design, Project Management and Supplies**<br>**Contract Administration** | **10K**<br>**10K**<br><br>**3K** |
| **GP Task Force** | **Contract**<br>**Contract Administration and Administrative overhead**<br>**Monitoring and Reporting** | **36K**<br>**3K**<br>**1K** |
| **ACC**<br>**Request** | **Contract**<br>**Revegetation Technician**<br>**Monitoring and Reporting** | **30K**<br>**1K**<br>**2K** |
| **Total** | | **96K** |

*Lewis River Aquatics Fund - Proposal*

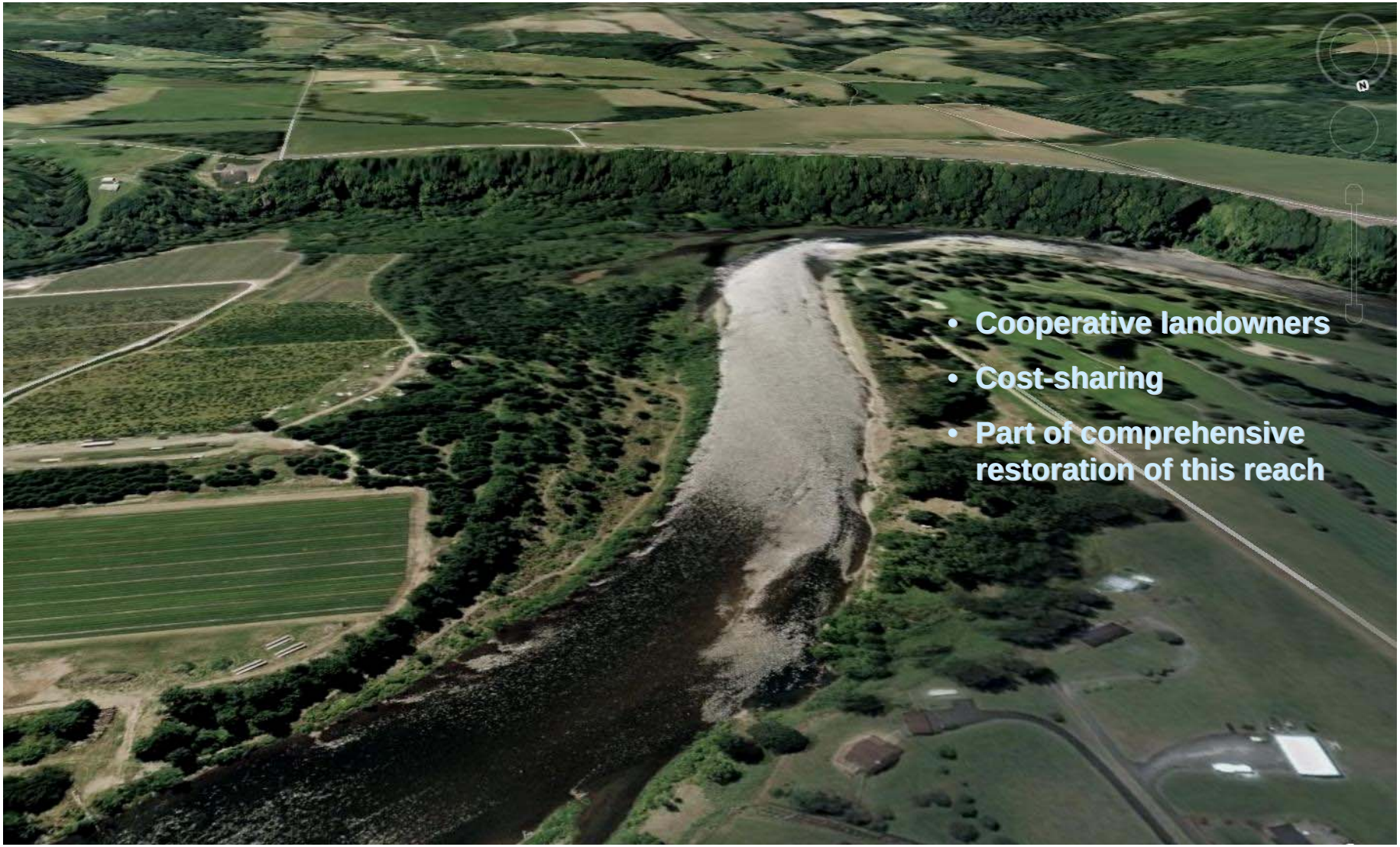
# Lewis River – RM 13.5 Habitat Enhancements


*Lewis River Aquatics Fund - Proposal*

# Lewis River – RM 13.5 Habitat Enhancements


*Lewis River Aquatics Fund - Proposal*

# Lewis River – RM 13.5 Habitat Enhancements




*Lewis River Aquatics Fund - Proposal*

# Lewis River – RM 13.5 Habitat Enhancements

*Lewis River Aquatics Fund - Proposal*

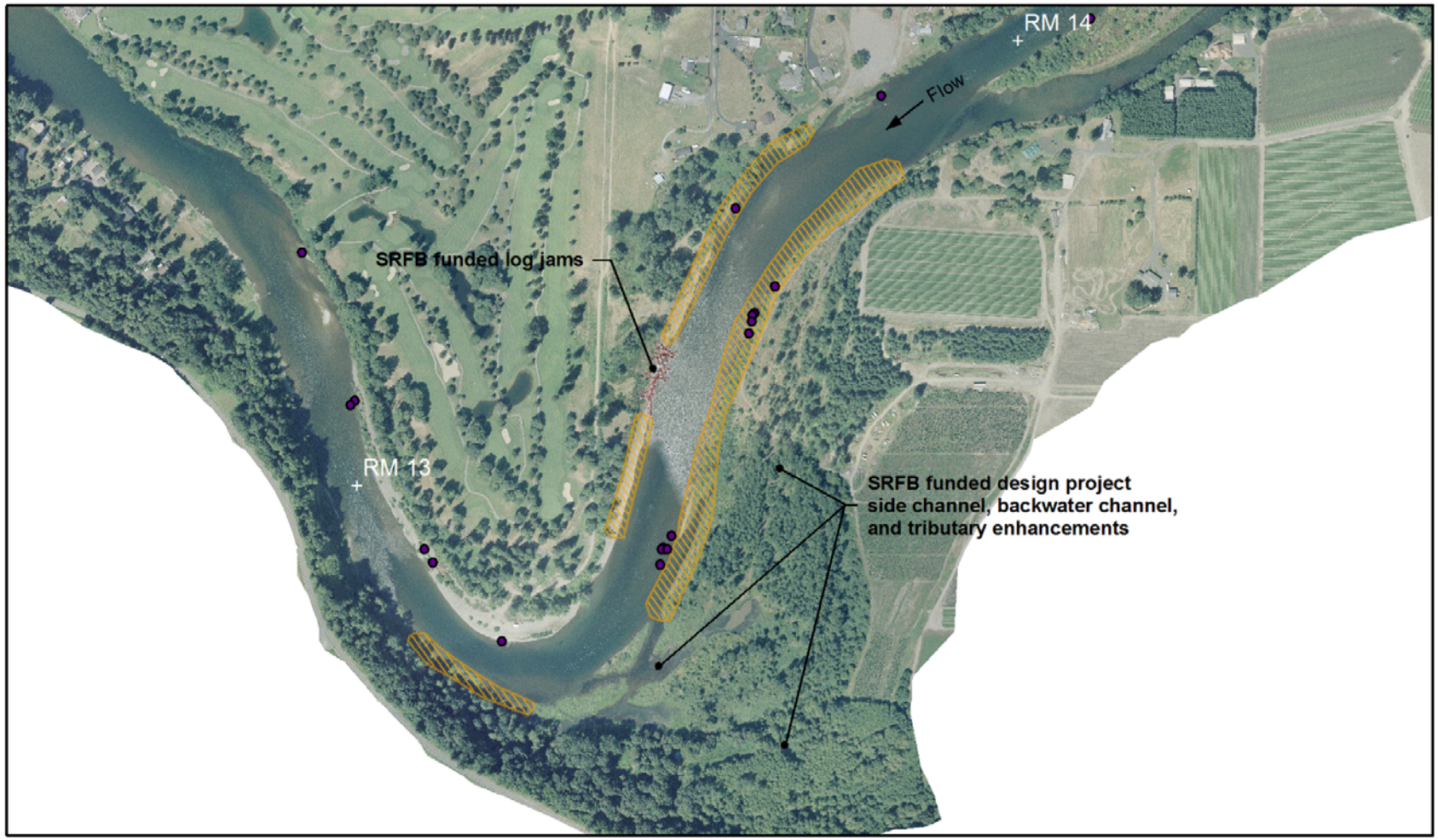
# Lewis River – RM 13.5 Habitat Enhancements

## Project Objectives

- Increase channel complexity and velocity refuge along channel margins to benefit adult holding and juvenile rearing
- Promote development of high quality scour pool habitat with wood cover
- Increase wood quantities
- Restore the native riparian plant community

# *Lewis River Aquatic Fund - Proposal*

## Plan View for: North Fork Lewis River RM 13.5 Habitat Enhancements



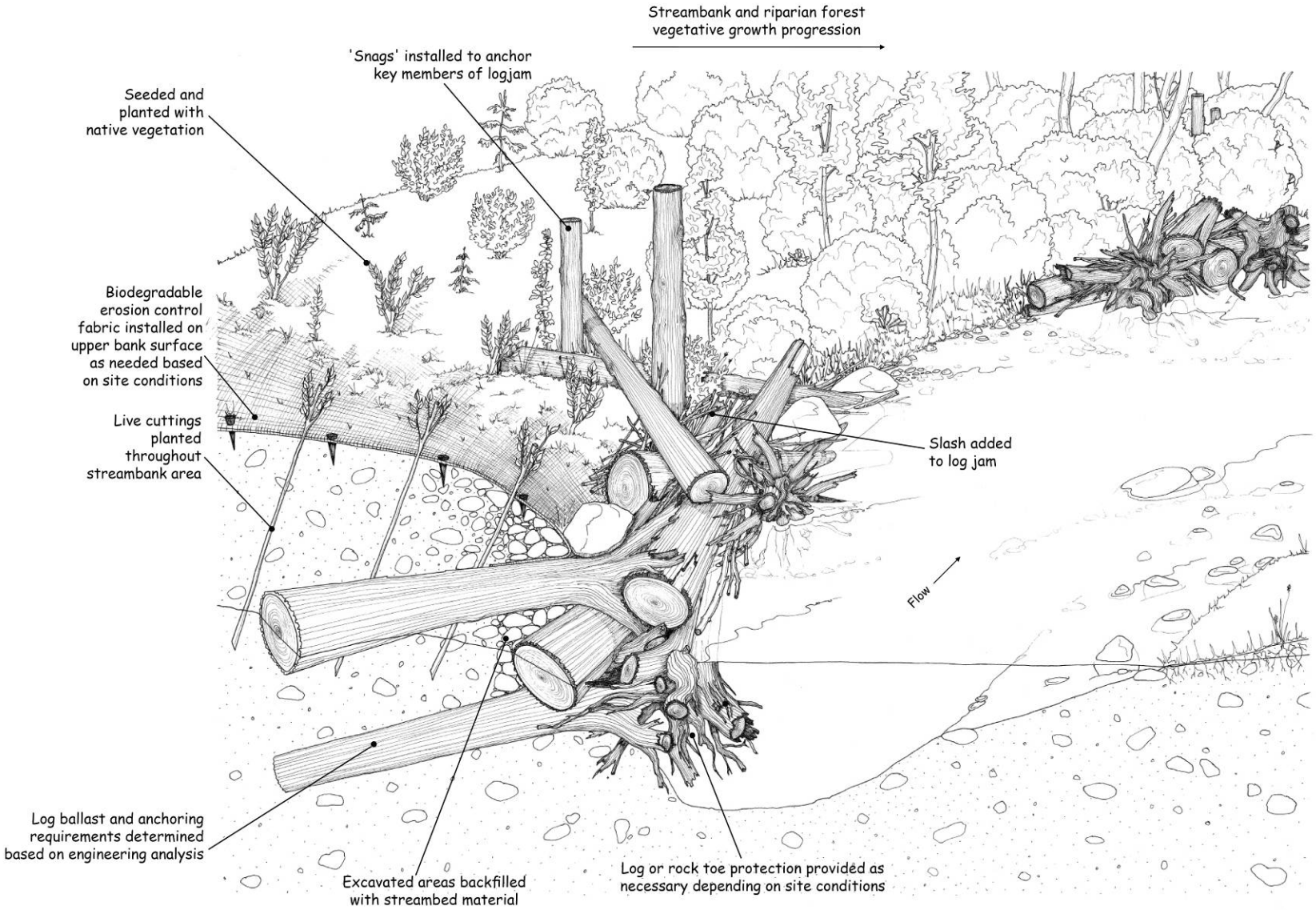

**Legend**

- Potential locations for habitat structures
- 2008 Winter Steelhead redd locations (WDFW data)
- SRFB-funded log jam placements

0 250 500 1,000 1,500 2,000 Feet

N

*2005 aerial photography obtained from PacifiCorp*


Streambank and riparian forest vegetative growth progression
'Snags' installed to anchor key members of logjam
Seeded and planted with native vegetation
Biodegradable erosion control fabric installed on upper bank surface as needed based on site conditions
Live cuttings planted throughout streambank area
Slash added to log jam
Flow
Log ballast and anchoring requirements determined based on engineering analysis
Excavated areas backfilled with streambed material
Log or rock toe protection provided as necessary depending on site conditions