Limiting Factors Assessment and Restoration Plan

Preacher Creek

A Tributary of Lobster Cr in the Alsea River Basin

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Introduction

This document provides watershed restoration actions proposed to enhance the Coho Salmon population within the Preacher Creek 6th field in Lincoln County, Oregon. The stream is a 4th order contributor to the Alsea River, which enters the Pacific Ocean at Waldport, OR.

The goal of the restoration effort has been to identify the dominant processes and habitat characteristics that currently limit the production of Coho salmon smolts in the basin, and to develop a prioritized list of actions ("prescriptions") for removing the limitations in ways that normalize landscape and stream channel function.

Restoration and assessment protocols used in developing the plan are described in "Midcoast Limiting Factors Analysis, A Method for Assessing 6th field subbasins for Restoration", available at www.midcoastwatershedscouncil.org/GIS or by contacting the Midcoast Watersheds Council. Please refer to this document for detailed information on assessment, nomenclature, prioritization rationale and methodology.

Physical setting

Preacher Creek lies within a 1,740 hectare sub-watershed of the Five Rivers/Lobster Creek watershed of the Alsea River basin. Overall, its drainage pattern is dendritic, however the majority of the basin exhibits drainage characteristics that are functionally pinnate. The main direction of flow is northeast, joining Lobster Creek at RM 9.8.

The lower 3.3 miles[1] of Preacher Creek flows through a moderately open valley floor with primary constraints appearing as occasionally encroaching hill slopes on the west and multiple terraces. Gradients through this section are low, typically 2 % or less. At approximately RM 2.5, hill slopes begin to encroach more distinctly, and at RM 3.3 the valley becomes canyon-like and the gradient increases, eventually reaching 3% near the upper limit of salmonid distribution.

Eleven tributaries were identified in a 1995 survey conducted by A. G. Crook (see "Resources used in developing the plan"). Most are high gradient, narrow valley systems. Six were judged to provide sufficient flow to warrant surveying. Five of these were fish bearing in the lower .20 to .55 mile. More recent RBA inventories conducted by Bio-Surveys indicate that habitat for salmonids exists in 10 of the 11 documented tributaries.

The most significant surveyed tributary was definitively Jasper Creek, entering at RM 2.5 It was classified as fish bearing for .78 miles. This valley is wider than that of the other tributaries, and provides significant flow over gentle gradients similar to and contiguous with those of the main stem.

The current assessment will rely primarily on the 1995 and 1997 Aquatic Habitat Inventory work, which were both summer surveys and the 5 years of RBA juvenile salmonid snorkel data compiled within the basin.

For purposes of ownership influence and habitat assessment, it is convenient to view the main stem as composed of four segments in relation to the reach definitions of the 1995 and 1997 surveys:

- Segment 1: River mouth to first bridge crossing (RM 0.0 – 0.65): First part of Reach 1 of 1995 survey (data withheld from report at owner's request). Reach 1 of 1997 survey. Private ownership. Currently heavily grazed.
- Segment 2: First bridge crossing to Jasper Creek (RM 0.65 – 1.51): Second part of Reach 1 of 1995 survey (data reported). Reach 2 of 1997 survey. Private ownership is different from that of

[1] Due to inconsistencies in field-based distance measurements provided by various reports, river mile locations along the mainstem have been determined by map measurements.

Segment 1. Grazing terminated approximately 15 years ago; conifer replantings on upper terraces now maturing.

- Segment 3: Jasper Creek to Trib 9 of 1995 Survey (RM 1.51 – 3.32): Reach 2 of 1995 survey (not surveyed in 1997). Most is same ownership and use as segment 2; upper part is U. S. Forest ownership.
- Segment 4: Trib 9 to end of survey (RM 3.32 – 4.42): Reach 3 of 1995 survey (not surveyed in 1997). Confined canyon section of Preacher Creek. USFS ownership.

The Lobster/Five Rivers Watershed Analysis report (January 1997) identifies the flat (depositional) sections of the valley floor as most of the main stem up to the canyon section (a short section below the canyon is excluded), and approximately the lower 2/3rds of Jasper Creek (Tributary 4). All of these areas describe the zone that may be expected to have significance for rearing Coho.

This region of the Oregon Coastal Range is characterized by surface formations that are dominated by sand- and silt-stone deposits, creating a general tendency for hill slope instability and low recruitment of wear-resistant large substrates to the aquatic system. The Lobster/Five Rivers Watershed Analysis report (January 1997, p. 13) describes the soil stability characteristics of the Preacher Creek area more specifically:

> *In the Preacher Creek Area (LTA 3L), a large ancient landslide deposit dominates the landscape. Complex slopes characterize this area with short steep slopes intermingled with flat areas. Local ground water movement is unpredictable and seeps and springs can be found throughout. Drainage density is moderate. Soil strength in these old landslide deposits maybe be lower than in soils developed in place. As a result, susceptibility to both shallow-rapid and deep-seated landsliding is increased over that indicated by predictive models such as the one used later in this analysis.*

Fire (primarily the 1868 Yaquina fire), "slash and burn" homesteading initiated during the late 1800's, and timber harvest reaching peak efforts in the 1970's removed most upland large wood resources as well as riparian canopies while generating large movements of labile soft sediments and woody debris to the valley floor in the form of torrent flows. During the 1980's and 1990's, harvest continued on private lands including harvest of second growth, but diminished on public lands due to conservation measures.

From these events, a mixed aged patchwork of conifer re-growth has developed on the hill slopes. The riparian system is currently predominantly deciduous until segment 4 where riparian conifers become a more significant riparian resource.

Hill slopes and stream beds throughout the system are sand-gravel-cobble dominated. Larger substrates are uncommon, and very little bedrock exposure occurs. Development of channel complexity is therefore largely wood dependant The 1995 and 1997 surveys found a preponderance of scour pool and riffle habitat (giving way to rapid habitats in segment 4) in both the main stem and the tributaries (excluding channels covered by beaver ponds). Plunge pools, alcoves, trench pools, backwater pools, and glides were very uncommon. Given these conditions, the potential for the development of Coho spawning and rearing sites is high.

New stream channels have developed on the valley floor in the deepened sediments of the depositional zones. It appears that much of the wood content of these debris flows has become stabilized by subsequent vegetation overgrowth and by the diversion of the active channel on flood plain terraces, and thus continues to function in channel deflection. The result is that the main stem channel is highly interactive with the floodplain, and is often sinuous and complex, especially in Segments 2 and 3. However, strong differences exist in the status of the channel and riparian vegetation between Segment 1and upstream Segments 2 and 3 that are relatable to grazing and beaver activity.

The valley floor is almost completely privately owned. Conversion to pastureland had its origins in the early settlement of the region, and unfenced grazing continues to this time in Segment 1. The impacts of this use include bank decomposition, channel simplification and a reduction in the development of early seral stages of trees and shrubs. These effects largely prevent successional development toward a normally stocked coniferous and deciduous riparian canopy. In an undisturbed system this succession would shade the channel, provide woody debris for winter aquatic shelter and channel deflection, and contribute canopy litter and nutrients to the aquatic food web. Segment 1exhibits grazing effects as bank instabilities unrelated to normal channel activity, homogeneity in habitat structure (shallow pools and glides with limited scour and depth), a less sinuous channel compared to upstream segments, as well as a broken canopy more exposed to solar radiation.

Beaver activity is most evident in the Segment 2, where it is the dominate habitat influence. The 1995 survey found three beaver ponds in this segment, comprising 23% of the wetted channel surface. In 1997, comparable measurements were four ponds and 54%. Because these surveys span the 1996 high water year, it appears that the beaver colony and probably these dams are winter-stable. This is one of the most significant factors shaping the production potential of this 6th field for juvenile salmonids.

The 1995 survey also found beaver ponds in Segment 3 (11 for 41%), and in Jasper Creek (3 for 42%). Because these segments were not surveyed in 1997, their stability is uncertain. It is quite possible that they are satellite structures which are not maintained through winter high flows.

Acknowledging these differences among the lower main stem stream segments, the aquatic system can be assessed overall as in a state of stabilized recovery. The principle concerns appear to be the grazing impacts in Segment 1. Other conditions that require attention include: 1) The quality of spawning substrates as suggested in the earlier surveys, and 2) The location of possible migration barriers, which can be defined as man-made (culverts) given the geologic nature of the watershed.

Current status of Coho

The status of Oregon Coast Natural (OCN) Coho has been well documented in the Alsea basin by ODFW's Stratified Random Sampling Program for adult spawners and by the Midcoast Watershed Councils Rapid Bio-Assessment Inventory for estimates of the summer standing crop of juveniles. The adult data gives us a sense of the basin wide trends in abundance and the juvenile data gives us a purview of trends within specific 6th fields.

A 15 year review of basin wide trends in the Alsea indicate that adult escapement hovered at a very low level from 1990 to 1998 and only once during that period exceeded 1,700 adult Coho. This depressed status culminated in the 1998 cohort crashing to a total basin estimate of 213. From the period of 1999 to 2003 there has been a very significant and steady incline in spawner abundance in the basin that peaked at 8,957 in 2003. A 33% decline was documented in the most recent adult inventory (2004).

There were two major variables that were altered during this 5 year period of increasing adult abundance that could have dramatically impacted Coho abundance on the basin scale.1) There was a quantifiable and radical increase in the ocean survival rates of Coho smolts to spawning adults. This increase was observed in ODFW's Life Cycle Monitoring sites with ocean survival rates exceeding 10% in multiple locations. 2) There was the cessation of hatchery Coho releases in the Alsea basin from the Fall Cr. Production facility reducing potential negative genetic interactions between hatchery and wild stocks within the watershed. "*The primary genetic risk is that matings in the wild involving one or more hatchery origin parents results in the production of offspring with reduced fitness*" (Monitoring and Evaluation of Supplementation Projects. ISRP and ISAB, 2005).

To focus our review of status more narrowly to the Preacher Cr. 6th field, a review of the Rapid Bio-Assessment data indicates that during low abundance years, Preacher Cr. was not out performing other high quality 6th fields in the basin when Coho production is utilized as a metric. In 1999, Preacher contained 3.7 % of the total basin mileage but only 2 % of the total basins Coho production. In a higher abundance year (2001), Preacher contained 1.5% of the basins total stream miles and contributed 2.7 % of the total Coho population. This suggests that the Preacher Cr 6th field during higher abundance years begins to play a disproportionately greater role in basin wide production than many other 6th field subbasins. This is essentially verification that the 6th field is well qualified to be a high priority for enhancement and restoration as suggested in the Midcoast Watershed Councils 6th field prioritization document.

Juvenile abundance data was collected for Preacher Cr each of the five years from 1998-2002. During that period the highest summer production estimate for Coho was documented in 2001 at 9,210 (this was the result of an adult escapement estimate in the basin of 2,465). This estimate resulted in habitats that exhibited fully seeded densities above river mile 0.83 (see Preacher Cr Coho densities 2001 graphic). A pattern was replicated in most years with densities dropping off dramatically in segment 1 (below the first road bridge crossing). Preacher Cr has not been inventoried for juveniles during the most recent years of significant adult escapement (2003 brood @ 8,957 adults) and it is possible that greater escapement has not led to significant increases in juvenile production within Preacher.

Resources used in developing the plan

Stream surveys for Preacher Creek are provided in the following:

- Oregon Fish Commission – "Stream Surveys of the Alsea River System 1947-57".
- Siuslaw National Forest, Alsea Ranger District – "Stream Assessment Surveys Summer 1979".
- G. Crook Company – "Preacher Creek, Siuslaw National Forest, Alsea Ranger District 1995".
- Oregon Department of Fish and Wildlife – " ODFW Aquatic Inventory Project, Stream Report, Preacher Creek, 1997".

Summer snorkel surveys of the Preacher Creek subbasin conducted between 1998 and 2002. These "Rapid Bio Assay" fish inventories identify the species, age class, density and distribution of salmonids in pools (sampling frequency is every 5th pool).

Coho habitat assessment model developed by the Oregon Department of Fish and Wildlife Research Division. This model utilizes baseline habitat inventory data to evaluate the quantity of spawning gravel, egg deposition rates, and amount of aquatic habitat by season in order to identify which seasonal habitat and Coho life stage limit the production of smolts from a stream section (referred to as the smolt production bottleneck).

Oregon Department of Forestry slide assessment maps, which identify failure-prone headwater slopes that are considered to be potential sources of wood and substrate to the aquatic corridor. These 6th field specific reviews have been compiled using the CLAMS modeling framework.

Bio-Surveys Field assessments conducted on May 27&28, 2005 and October 2&3, 2005 in conjunction with the development of this restoration plan.

General questions that guided the assessment

- How well is the current system functioning for Coho production (what part does each of the habitat subdivisions play)
- What temperature problems are apparent?
- Where are temperature refugia located?
- Where are the barriers?
- What is the sedimentation state of system?
- Where are the spawning areas, and how are they integrated with the summer and winter rearing sites?
- What needs to be done to make the Core habitat function for all life phases, and to function at a higher level?
- What work should be done in each area to facilitate a more completely functional whole?
- What is the best upslope work that supports the instream work?
- How are the fish currently using the system?
- What problems are generated by the current habitat configuration (e.g., temperature dependant movements that expose juveniles to predation)
- How and when are the greatest losses generated to the population?

- Within the Core habitat, what are the dominant limiting factors?
- Within the 6th field, what are the dominant limiting factors?
- Within the 4th field, what are the dominant limiting factors?
- Does the presence or absence of adequate winter habitat outside the spatial boundaries of the 6th field suggest or preclude the need for expanding the quantity or quality of winter habitat.

Pre-survey Mapping / Location of habitat subdivisions

Core Areas

The Core area describes the current summer distribution of juvenile Coho. The Core extends from the confluence with Lobster Cr to a point 4.2 miles up the mainstem. In addition, the Core extends up Jasper (0.7m), Trib A (0.4m), Trib B (0.8m), Trib C (0.2m), Trib D (0.1 m), Trib E (0.4m), Trib F (0.1m), Trib G (0.1 m), Trib H (0.1m) and Trib I (0.2m). See attached habitat distribution map.

Anchor Habitats (prioritized for greatest potential for restoration)

1) **Lowest mainstem** – 2,400 lineal ft, low terraces, broad active channel exhibiting significant potential for the development of large backwater surface areas during winter flow regimes. High sediment load in spawning substrates, low wood densities for encouraging gravel sorting. Significant bank degradation and channel simplification from livestock use are dominant morphological features. Two spawning tributaries enter within the identified anchor. Current function rated as poor.
3) **Middle mainstem** – 5,240 lineal ft, Alternating 3ft cut banks with low opposing terraces. High sinuosity, high wood complexity (primarily deciduous). Moderate levels of floodplain interaction. Trib D enters within Anchor and top of Anchor ends just below Trib E. Current Function rated as good.
4) **Upper mainstem** – 1,100 lineal ft, Long term historic presence of beaver community has provided the foundation to retain floodplain characteristics that emulate an Anchor site. Good floodplain interaction within narrow floodplain exhibiting hillslope confinement. Lower potential for creating additional off channel surface area through restoration because of channel confinement. Current function rated as good.
2) **Lower mainstem** - 1,135 lineal ft, currently dominated by a single large beaver pond surface area (7,500 sq meters) that is stable and withstanding multiple winter flow regimes. Exhibits highest current level of floodplain interaction. Spawning gravels are highest quality observed and off channel winter habitat potential is extensive. Currently rated as fully functional, excellent.
5) **Jasper Cr** – 1,815 lineal ft, Large deposition plain above a historic debris torrent jam. Broad valley floor with potential for significant floodplain interaction. Active channel is currently entrenched within this plain and the potential for wood recruitment is minor. The presence of beaver could alter this anchor site into a very productive zone. Wood additions would have limited effect because of the limited hydraulic potential of the tributary to move and accumulate debris. Current function rated as poor.

Secondary Branch Habitats

- Tributary A - 0.4 miles Coho distribution, contains 10 sq meters of spawning gravel (10 poor) 5 % of mainstem flow.
- Tributary B – 0.8 miles Coho distribution, contains 23 sq m of spawning gravel (17 fair, 6 good) 10 % of mainstem flow.
- Tributary C – 0.2 miles Coho distribution, contains 2 sq m of spawning gravel (2 poor) 10 % of mainstem flow.
- Tributary D – 0.1 miles Coho distribution, contains 0 spawning gravel 2-3 % of mainstem flow.
- Tributary E – 0.4 miles Coho distribution, contains 35 sq m of spawning gravel (10 fair, 25 good) 10 % of mainstem flow.
- Tributary F – 0.1 miles Coho distribution, contains 13 sq m of spawning gravel (6 poor, 7 fair), 20% of mainstem flow.
- Tributary G – 0.1 miles Coho distribution, contains 10 sq m of spawning gravel (6p, 3f, 1g) 20 % of mainstem flow.
- Tributary H – 0.1 miles Coho distribution, contains 15 sq m of spawning gravel (8p, 4f, 3g) 10 % of mainstem flow.

- Tributary I – 0.2 miles Coho distribution, contains15 sq m of spawning gravel (5p, 7f, 3g) 10 % of mainstem flow.
- Jasper Cr – 0.7 miles Coho distribution, contains 172 sq m of spawning gravel (28 fair, 144 good) 10 % of mainstem flow.

Critical Contributing Areas

Overall Prioritization of critical contributing areas (considers all attributes, including spawning, rearing, resource contribution, water quantity, water quality):
1) Jasper
2) Trib B
3) Trib E
4) Trib G
5) Trib F
6) Trib C
7) Trib A
8) Trib I
9) Trib H
10) Trib D

Tributaries below Core Area / Anchor Sites:
None of the critical contributing area tributaries enter the mainstem below all of the Anchor sites. This suggests that most organic resources and fry contributed from these areas have the opportunity for seeking and settling in high quality habitat in the mainstem of Preacher Cr.

Tributaries above Core Area / Anchor Sites:
All of the tributaries contribute above or into significant mainstem Anchor sites. In fact all tributaries have the potential of contributing resources and juvenile production to one or more mainstem Anchor site. Juveniles produced in all tributaries (except A and B) will be capable of utilizing the vast summer and winter habitat found in the highest quality Anchor habitats provided by Anchor Site #2.

Tributaries that contribute directly to Anchor Sites:
Tributaries A and B contribute directly to Anchor site #1. Tributary B in particular is delivering cold water for the maintenance of mainstem temperatures. Tributary D contributes directly to Anchor site #3 and also is most significant for its contribution to mainstem temperature profiles. There are insignificant levels of spawning or rearing habitats for salmonids in Trib D.

Lower Mainstem Area

Winter Habitat Potential

The lower mainstem reach is classified as the corridor from RM 0 at it's confluence with mainstem Lobster Cr. to a point at RM 1.3 at the confluence of Jasper Cr. The winter habitat potential in this reach is the best in the 6th field and classified as fully functional (Anchor #2) and it is the poorest in the 6th field in anchor #1 (also within the reach). The high quality portion has been stabilized by a well entrenched beaver community that maintains large surface areas (unquantified) of winter low velocity refugia for juveniles. The habitat in Anchor #2 can function as a winter habitat sink for the majority of the juveniles produced in the remainder of the basin. There is significant unrealized potential in Anchor site #1 for providing additional off channel refugia with the placement of wood complexity to boost floodplain connectivity and recreate channel complexity.

Summer Habitat Potential

The lower mainstem also provides both the best summer rearing conditions and the worst as described above. Anchor site #2 is a flooded complex of willows (see photo #2) providing excellent summer cover from both avian and piscivorous predation. Anchor site #1 exhibits it's most dramatic habitat impacts during summer flow regimes because of the increased use by livestock during hot weather cycles.

Livestock are lounging, grazing and simplifying these lower mainstem habitats during this time period. Even during high escapement years where Coho abundance was approaching its carrying capacity in upper reaches of the system, this lower mainstem corridor was below seeded summer capacity.

Lowland Area

Estuarine Marsh Habitat: None within the designated 6th field
Freshwater Marsh Habitat (Winter Potential): None within the designated 6th field
Freshwater Marsh Habitat (Summer Potential): None within the designated 6th field
Lake Habitat (Winter Potential): None within the designated 6th field
Lake Habitat (Summer Potential): None within the designated 6th field

Location of other resources

Spawning sites: See Distribution of spawning gravel graphic
Landmarks: See General Location Map
Road crossings: See General Location Map
High risk slopes: See ODF Risk Assessment graphic

Juvenile Coho

Summer distribution profile

Coho juveniles are consistently well distributed within the 6th field even though potential adult barriers exist in the form of stable beaver dam communities. No impedance has been documented for adults at any of the dam sites that ranged in 2004 / 2005 up to 5 vertical ft. (based on the distribution of summer parr above these sites documented in the summer RBA Inventories). Tributary spawning consistently occurs in tributaries A, B, E and Jasper. In addition, upstream juvenile migrations are common in tributaries C, D, F, and G. Jasper Cr. however, stands alone as the primary producer of juvenile Coho in this suite of tributary habitats. In the 2002 RBA inventory Jasper contributed 15% of the subbasins total Coho production. All of the tributaries combined contributed 23% of the total Coho production.

Goal: Determine correspondence with Anchor habitat location

Very extensive summer distribution data for 5 consecutive years indicate that there is no correlation between anchor site #1 and high fish abundance. This is the Anchor site that exhibits the morphological characteristics to function as high quality rearing habitat but consistently is not producing summer Coho parr.

There does not appear to be a good correlation with summer distribution of Coho juveniles and the location of Anchor site # 2 either. This is the anchor dominated by beaver pond surface area and providing the best functional summer and winter habitat in the 6th field. This indicates that there may be an additional environmental variable that is playing a significant role in limiting summer juvenile abundance in the lower 0.8 miles of mainstem Preacher.

There is a significant correlation between summer Coho abundance and the location of Anchor #3 indicated in years of high abundance (2001). This relationship is not evident in years of low abundance. Anchor #3 appears to maintain optimum summer rearing conditions (temperature, flow, juxtaposition to spawning locations, food production) for sustaining Coho densities at or above levels considered to be seeded to capacity (1.5-2.0 fish/sq m).

Anchor #4 also does not stand out as exceptional habitat except in years of low abundance where it’s position in the 6th field (adjacent to target locations for spawning) suggests that it would receive and retain out migrant fry before any of the lower anchor sites. The distribution data does not suggest that this is lower quality habitat but that it is carrying summer Coho production at the same level as adjacent habitats that do not exhibit the morphological characteristic of high intrinsic winter potential (floodplain connectivity).

Anchor #5 exists in Preachers primary tributary, Jasper Cr. This anchor also does not exhibit any increased affinity for higher abundances of summer rearing Coho parr. Again, this site exhibits the morphological features that create a higher potential for the production of low velocity off channel habitat through floodplain connectivity during winter flow regimes.

Field Assessment

Evaluate habitat quality and Coho production

Riparian vegetation

Lineal distance / location of deciduous:
The Preacher Cr riparian is dominated by a deciduous canopy from it's confluence with Lobster Cr to a point 2.5 upstream (between Trib G and Trib H) where it shifts to a mixed deciduous/coniferous canopy (80/20) with fewer maples. The lower 0.5 miles of riparian can be classified as a narrow inner band of deciduous, dominated by an outer riparian of active pasture land.

Lineal distance / location of coniferous:
From RM 0.5 to RM 2.5 there is an outer riparian band of plantation Douglas Fir that when mature will effectively contribute shade and wood complexity to the mainstem corridor. Above RM 2.5 second growth Douglas Fir are present in the riparian (20%) and exhibit potential for contribution to the active channel. The riparian is completely Conifer dominated by the end point of the survey at the last major forks (RM 4.2).

Lineal distance / location of open canopy:
The mainstem of Preacher Cr. contains approximately 4.2 miles of aquatic and riparian habitats that are utilized by adult and juvenile Coho. Eleven percent (2,511 ft) of this lineal distance has been classified as exhibiting an open canopy condition. The open canopy zones are in blocks of less than 350 ft, they are generally receiving no more than 50 % solar exposure due to their aspect, adjacent hillslope impacts and the mitigating effect of adjacent vegetative blocks. The largest blocks of open canopy that may exhibit impacts from solar exposure are present in reach 1 (rural pasture zone) and in reach 2 associated with the long term presence of beaver in Anchor site #2.

Recruitment potential and time frame:
Steep opposing hillslopes above the junction of Trib I suggest that outer riparian conifers in this upper reach exhibit excellent potential for reaching and interacting with the aquatic corridor in reach 3. Below the confluence of Trib I, the potential for conifer recruitment to the mainstem is dramatically reduced. However, from RM 0.5 upstream there is a well stocked outer riparian of young plantation conifer ranging from 10 -25 yrs. that will become effective components of the riparian corridor with age.

Potential for thermal problems:
1) Where
Preacher Cr was listed in 1998 (and remains listed) on the DEQ's 303(d) list for exceeding temperature thresholds to RM 2.1. ODFW AQHI inventory data collected in August 1997 collected a mainstem temperature at RM 0.4 of 19 C (66.2 F) @12:43 (before the peak of diurnal fluctuation). USFS stream survey data from 1995 recorded a max temperature of 64 F on Sept. 18 in Reach 1.

RBA inventories have consistently documented lower abundances of summer rearing Coho below RM 0.8. This condition persists even during years of high abundance when habitats directly upstream have been retaining juvenile Coho at 2 fish/sq meter. In addition, RBA inventories on Trib B in 2000 indicate that juvenile Coho were migrating upstream from the mainstem of Preacher into Trib B in what appears to be driven by approaching temperature thresholds in mainstem Preacher. Trib B enters Preacher at RM 0.4. Tributary temperature data collected in August of 1999 is as follows:

- Trib A – 57 deg

- Trib B – 56 deg
- Trib C – 58 deg
- Trib D – 59 deg
- Trib E – 58 deg
- Jasper – 58 deg

2) Why
There are 3 potential factors that may result in providing a cumulative impact on mainstem Preacher Cr aquatic temperature profiles:

- Large beaver pond surface areas (7,500 sq m) on a broad interactive floodplain result in extensive, shallow pool area exposed to solar radiation and a tendency to exhibit increases in water temperature.
- Long term livestock presence in stream corridor to RM 0.6 has reduced pool complexity, depth and impacted vegetative succession in the riparian that would result in the provision of additional shade.
- Natural stream morphology in lower preacher (low gradient <1%) results in longer pool turnover rates which exacerbates any other upstream cumulative impact.

Channel form and floodplain interaction:
From the mouth to RM 0.6 the channel maintains an alternating low terrace that provides significant off channel connectivity during winter flow regimes. The channel appears to be highly mobile here and actively eroding new meander bends into agricultural ground with low rootmat complexity. The zone from RM 0.6 to RM 1.0 exhibits exceptional floodplain interaction. Above RM 1.0 to the confluence of Trib I the morphology of the channel (highly sinuous) exhibits opposing under cut banks and inside corner backwater and eddy habitats. Low terraces are common but not contiguous. Above Trib I the active channel is definitively hillslope confined and floodplain interaction is not a dominant feature of channel function.

Lineal distance / location of functional anchor habitat:
There were 5 distinct Anchor habitat sites identified within the Preacher Cr. subbasin. Combined they add up to 2.2 miles. This represents 30 percent of the aquatic corridor available to Coho within the subbasin. Only one of these Anchor sites has been classified as approaching fully functional (#2). Rated from the best to the worst current function we have the following (see map for actual location):
2) Lower mainstem (1,135 ft)
4) upper mainstem (1,100 ft)
3) Middle mainstem (5,240 ft)
5) Jasper (1,815 ft)
1) Lowest mainstem (2,400 ft)

Quality, quantity and location of spawning gravel (collected as a function of probable redd sites):
1,611 sq. m of spawning gravel was quantified for the entire Preacher Cr subbasin. Only 18 percent of that gravel was observed within the 11 documented tributaries. Sixty percent of the tributary spawning resource was present in jasper Cr. Qualitative assessments of the basins spawning gravel were made that ranked gravels as poor / fair / good based on the percentage of fines and sediments incorporated in the gravels. 58 percent of all of the gravels for the entire subbasin were classified as good (930 sq m). Gravels were broadly distributed from near it's confluence with mainstem Lobster to the headwater reach above the confluence of Trib I. The highest abundance of good quality gravels were located between the confluence of Jasper Cr. and Trib I.

Character and distribution of Summer Cover (lacks quantitative evaluation and relies on professional judgment):
The abundance of summer habitat is most obviously deficient from RM 0 – RM 0.6. Wood densities are extremely low (1.6 key pieces > 22 inch diameter/mile), pool depth has been compromised by consistent summer loafing by livestock and the lack of wood recruitment from the riparian. The habitats from RM 0.6 to the end of juvenile salmonid distribution exhibit a significantly higher level of complexity and cover for the provision of summer rearing habitat. Key wood densities are still extremely poor at 1.3 pieces/mile but

the abundance of small wood that is interfacing with the active channel nearly doubles from 34 pieces /mile in reach 1 to 65 pieces / mile above the Preacher Cr bridge crossing. In addition, the ability of the riparian in these two reaches to provide cover from overhanging vegetation is radically different with habitats above the Preacher Cr. road crossing exhibiting high quality early seral stage vegetation within the inner riparian band (providing root mat complexity that functions to create the foundation for undercut bank habitat).

Character and distribution of Winter Cover (lacks quantitative evaluation and relies on professional judgment)
Winter cover in Preacher ranges between two extremes. The lower 0.6 miles is dominated by a condition of low aquatic cover and complexity. The zone from RM 0.6 to RM 1.0 exhibits a condition dominated by exceptional floodplain interaction and consequently a high abundance of winter cover and habitat complexity. Above RM 1.0 to the end of salmonid distribution, winter cover and complexity is abundant and could be rated as partially functional. The morphology of the channel (high sinuosity) provides the foundation for alternate scenarios of under cut bank and inside corner backwater and eddy habitats. Actual winter cover appears to be substandard if utilizing the metric of available wood complexity.

Locate migration barriers

Location of barriers

- There were three potential migration barriers identified in the May 2005 inventory conducted by Bio-Surveys:
- Beaver dam at RM 0.7 (5 ft. vertical), long lived and stable colony (see photo #2).
- Road crossing culvert on Tributary E (3 ft perch, see photo# 12).
- Culvert on the USFS road 35 that crosses Trib B at RM 0.4. This is an 85 ft long 5 ft diameter corrugated pipe set on a steep gradient.
- Other known migration barriers on Tributaries A and B (culverts) were replaced by OWEB and the Midcoast Watersheds Council in 2003.

Species and age class affected

- Beaver dam is definitively not an adult barrier in any survey year. The dam does however terminate the potential for any upstream temperature dependant migrations of juveniles during summer flow regimes. The dam was documented in the same location during the 1995 USFS inventory and summer flows during that inventory were emanating from underneath the dam. Upstream juvenile migrations could be expected in mainstem Preacher and are known to occur in its lower basin tributaries (documented in Trib B).
- Road crossing culvert on Trib E has passed some adult Coho on every surveyed year. It is however a definitive juvenile barrier and exists in a location where upstream temperature dependant migrations out of the mainstem could be expected.
- Road 35 culvert is not an adult barrier as documented by juvenile inventories that indicate both Steelhead and Coho spawning above the pipe. However the pipe is probably a velocity barrier for upstream migrant juveniles. The pipe exists near the top end of what is typically classified as the upstream limit of temperature dependant juvenile migrations in small 3rd order tributaries (0.5 miles). Therefore the justification of replacement based on upstream juvenile migrations is blatantly week.

Identify potential sites for restoration work

Location

1) Private land corridor from Lobster Confluence to Preacher Cr road crossing (dominated by Anchor#1)
2) Culvert removal on Trib E
3) Upper culvert on Trib B
4) Anchor site #2
5) Anchor site #3

6) Anchor site #4
7) Anchor site #5
8) Road decommission above confluence of Trib E
9) All upslope areas targeted for harvest activity that contain live 1st and 2nd order Type N streams

Issue

1) Natural wood recruitment to the aquatic corridor has been compromised since the turn of the century settlement of the parcel. The fundamental loss of functionality is directly attributed to land use practices that continue to suppress the recruitment of Large woody debris to the aquatic corridor (wood removal for fire wood, wood removal to control bank erosion, livestock use that terminates vegetative succession). This mix of low wood complexity and livestock use has led to channel simplification (lack of depth in scour pools, lack of rootmat stability to maintain undercut banks, lack of both aquatic and riparian cover in the form of wood complexes that retain annual canopy litter).

2) 3 ft perch on corrugated culvert terminates the temperature dependant upstream migration of juveniles when summer mainstem temperatures exceed temperature thresholds for juvenile salmonids. In addition, adult passage is probably only possible during optimum high flow regimes that may not occur on a consistent enough basis to provide free and unobstructed access.

3) Detrimental conditions to upstream juvenile salmonid passage caused by high velocities and steep culvert gradients.

4) Anchor site #2 has been classified as trending toward a rating of fully functional. The young plantation conifer in the outer riparian has not reached a state of maturity where they can effectively contribute to aquatic wood complexities or provide channel shading. However, the site exhibits all of the other high quality features of functional aquatic habitat (fully integrated winter connection between floodplain and active channel, high sinuosity, abundant high quality gravel resource, extensive aquatic complexity, stable beaver community, etc.) The only issue within the anchor is the current sub standard density of LWD.

5) Anchor site #3 exhibits an extensive legacy of resource contribution from historical debris torrent flows emanating from the Jasper Cr subbasin and headwater tributaries. Large volumes of mobile substrates are currently being stored in this depositional reach of Preacher Cr. Within these substrates are also unquantified volumes of LWD that will be recruited for decades through the process of channel meander. The fundamental issue that is currently interrupting this process of recruitment through meander is the lack of older age class riparian conifer that provides the foundation for deflection and bank erosion for maintaining sinuosity and meander.

6) Anchor site #4 is a short reach dominated by a series of stable beaver ponds. This zone is slightly compromised by the existence of a stream adjacent road bed that restricts the potential for floodplain interaction and may truncate resource contribution from two minor first order tributaries between tributaries H and I (see map). Aquatic wood densities are also below target levels within the anchor.

7) Anchor site #5 is a deposition plain in Jasper Cr (the primary tributary of Preacher). This anchor could be classified as transitional because of its relationship to the debris torrent jam that created it at RM 0.2. The current active channel is entrenched within this deposition plain and does not currently interact well with its floodplain.

8) The forest road that traverses private property to the confluence of Trib H and then transitions to USFS ownership currently compromises resource delivery to the mainstem from Trib E and from two minor first order tributaries on the west side of the drainage between Trib H and I. In addition, sections of the road bed (above the confluence of Trib E) have failed from improper drainage and this condition is bound to be exacerbated by the continuous lack of maintenance. The road bed functions to confine channel meander on the floodplain especially in and adjacent to Anchor site #4.

9) The Preacher Cr mainstem is currently struggling with temperature limitations from its confluence with Lobster Cr to a point 2.1 miles upstream. This suggests that any upslope activity within the basin that has the potential for elevating the temperature of contributing tributaries of any order (1^{st} ,2^{nd}, 3^{rd}) will have a negative cumulative impact on the mainstem condition (summer temperatures that exceed 64 deg.) that has been identified as the key limiting factor for the production of juvenile Coho.

Method

1) Propose livestock exclusion fencing to protect riparian corridor from habitat degradation and facilitate vegetative succession that will provide root mat complexity and provide aquatic cover and shade. Proposal to landowner should consider enrollment in CREP for programmatic cost shares that will return a rental payment to the landowners for acreage taken out of historic livestock production. Propose riparian planting strategy that provides a foundation for future LWD recruitment and provides rapid water quality benefits from shading to address the DEQ listing for temperature. Propose LWD structure placement (excavator or helicopter) to take advantage of the sites general morphology that lends itself readily to providing high quality floodplain interaction.

2) Propose road decommission and culvert removal from Trib E to end of current road bed (0.9 miles).

3) Propose culvert retrofit with welded baffle plate as a low cost alternative to addressing a juvenile migration problem that exists in a site where upstream juvenile migrations have not been documented and are less likely to occur than other locations because of its lineal distance from the mainstem (0.4 miles).

4) Propose only minor LWD structure placement in Anchor site #2 to provide support to the current condition that has been classified as excellent. The location of a full spanning jam just below the large beaver dam complex (there is a right angle corner in the thalweg where the stream shifts from flowing North East to North West) would provide the retention of large volumes of mobile substrates in the Preacher Cr subbasin when and If this dam is vacated or removed by a debris flow event. In addition, one other full spanning LWD complex could take advantage of a very interactive floodplain at the top end of the anchor (site above top end of young alder flat and below point where stream comes closest to existing road bed).

5) Propose helicopter wood placement within the reach to increase LWD densities and provide additional summer and winter habitat potential in the form of interactive floodplains (backwaters, alcoves). This directly benefits the issue identified in this analysis as limiting Coho production (the abundance of complex summer habitat in the form of pool surface area). Structure placement should focus on sites that emphasize the impoundment of low terraces.

6) Propose only minor LWD structure placement within the anchor site to support the retention of stored mobile substrates that exist in historical deposition plains created by the long term presence of beaver colonies.

7) Propose excavator structure placements designed to lift entrenched active channel back up in contact with the deposition floodplain. The site would not benefit from a helicopter placement because Jasper Cr typically does not develop the hydraulic potential necessary to move substrates, scour pool depth or accumulate migratory wood. The excavator placement would focus on creating full spanning structures with a large component of pre commercially thinned conifer to bind and retain leaf litter, silt and organics. The development of impounded habitats that emulate beaver ponds would be the explicit goal. This prescription directly addresses one of the factors defined as limiting Coho production from the Preacher Cr subbasin (the abundance of summer pool surface area).

8) Propose road decommission and culvert removal from Trib E to end of current road bed (0.9 miles). This is the same prescription identified above in item #2.

9) Propose that any management plan that includes upslope harvest prescriptions identify and protect all live stream corridors from the influence of solar exposure due to harvest activity. This would require additional buffer requirements for Type N streams that are currently classified as non fish bearing.

Expected problems

1) Landowner has historically expressed concern over surveys conducted on their property. Landowners have a long standing legacy of riparian grazing and significant accommodations would have to be made to develop alternative livestock watering strategies and crossings to facilitate the use of paddocks that exist on the opposite side of the stream corridor.

2) The road bed decommission and culvert removal would be problematic because it involves both private and National Forest properties. In addition, there is a buried utility line that would complicate the decommission from two perspectives a) maintaining access for maintenance b) additional costs associated with locating and repositioning this line to facilitate a proper decommission.

3) Investment in a passage retrofit (baffle plate) would be short lived because the existing corrugated pipe may only remain functional for another 10 years based on an assessment of its current condition. The obvious alternative of replacing the entire pipe also is complicated by the cost of replacing an 85 ft long pipe, over sizing it, and excavating a minimum of 20 ft of fill to provide improvement in only juvenile passage near the expected top end of their temperature migration range.

4) None expected, private landowner has been proactive in historical restoration activities.

5) None expected, private landowner has been proactive in historical restoration activities.

6) None expected, the location of these log placements would be on USFS ownership.

7) None expected, combined USFS and private ownership. Private landowner has been proactive in supporting historical restoration activities.

8) See issues identified in item #2 above. The overhead utility line transitions to an under ground cable in conduit at approximately the confluence of Trib G. Just below the confluence of Trib I the road and the buried cable have become exposed from the impacts of channel meander in the mainstem. A decommission should involve the removal of exposed cable as well as the removal of large base rock (rip/rap) at this site that compromises proper channel function.

9) Protecting upslope Type N riparian corridors as a restoration strategy for addressing limiting factors for Coho has not been a widely adopted strategy because it complicates the nature of sale administration (sites have to be identified, ground truthed, marked and monitored). In addition, it complicates the actual harvest activity.

Expected results

1) Reduction of solar exposure that contributes to cumulative negative impacts to water quality for both lower Preacher Cr and mainstem Lobster Cr. (also 303(d) listed by the DEQ). Reduction of stream bank degradation that compromises the development of complex habitats for salmonid cover (undercut banks). Increase the proliferation of stream side vegetation that provides the foundation for complete channel function (root mat complexity, development of shade, development of interactive aquatic cover, provides organics for macroinvertebrate production, etc.)

2) Provides unencumbered access to Trib E for both juvenile and adult salmonids. This is a multi species multi season benefit that directly addresses both of the factors classified as limiting salmonid production (the abundance of summer pool surface area and the availability of cold water summer habitats).

3) Any retrofit for improving juvenile passage at this site may have limited to no effect on the proliferation of salmonids in the basin as a whole.

4) Provides a short term solution (25 yrs) to low LWD densities in the reach until the ample conifer stocking in the outer riparian is able to contribute effectively to the aquatic corridor to accomplish the same job for the long term.

5) Provides a short term solution (25 yrs) to low LWD densities in the reach until the ample conifer stocking in the outer riparian is able to contribute effectively to the aquatic corridor to accomplish the same job for the long term.

6) Provides a short term solution (25 yrs) to low LWD densities in the reach until the ample conifer stocking in the outer riparian is able to contribute effectively to the aquatic corridor to accomplish the same job for the long term.

7) Provides an immediate benefit to the subbasin in addressing factors that are currently limiting salmonid production.

8) Provides an immediate and long term solution for improving resource delivery to the subbasin.

9) Reduction of solar exposure that contributes to the cumulative negative impacts to water quality for both mainstem Preacher Cr and mainstem Lobster Cr. (also 303(d) listed by the DEQ). In addition, additional buffers on Type N streams store valuable wood resources in delivery corridors for recruitment to the mainstem in storm driven debris torrent events.

Other restoration options considered / reason for not including

None

Document potential restoration sites with photos

See photos included as an appendix to this assessment.

List and rank the factors currently limiting Coho production

Two modeling efforts have been utilized to predict the habitats that are most limiting for juvenile Coho based on the abundance of different habitat types during different seasons. You can review the modeling efforts on the worksheets provided in the Appendix. The Nicholson Coho Production Model and the Alsea Watershed Study Model do not agree on the seasonal habitat that limits Coho smolt production from the Preacher Cr subbasin. The Nicholson Model suggests that essentially, both summer and winter habitats available in the 6th field have nearly identical smolt rearing capacities. The Alsea watershed Study suggests that summer capacity is clearly (by an order of magnitude) the limiting habitat issue. These modeling efforts to identify the habitat bottleneck do not make qualitative assessments of habitat condition and are only capable of classifying and quantifying habitat surface areas that are converted to fish production estimates.

In the Preacher Cr 6th field the DEQ 303(d) listing for temperature essentially adds an additional layer of data onto the Nickelson model that forces the result of that modeling effort to more clearly distinguish between summer and winter limitations. As mentioned, the model without qualitative data, suggests that each of these seasons are similar in their potential for production. With the additional qualitative data that describes mainstem Preacher as exceeding temperature thresholds for salmonids to RM 2.1, the availability of high quality summer habitat is definitively the limiting issue and in agreement with the Alsea Watershed Study Model.

The following ranks the primary limiting factors:
1) Late summer temperature profiles in mainstem Preacher Cr that exceed 64 deg from it's confluence with Lobster Cr. to RM 2.1. The most critical sub unit for improvement is the zone from the confluence of Lobster Cr to RM 0.8 where juvenile salmonid rearing densities appear to be impacted by temperature on both high and low abundance years.

2) The abundance of summer pool surface area.

Rank the list of restoration efforts

From the methods listed above, list and rank the restoration work that most effectively stabilizes the population at a higher base level and prioritizes the recovery of ecosystem function.

Short term

Item #
1
9
2
7
5
6
8
4
3

Long term

Item #
1
9
2
8
7
4
6
5
3

Combined

Item #
1
9
2
7
8
5
6
4
3

Explain how the modifications will interact and increase production

Primarily relevant to modifications that effect passage. An estimate of increased production should be developed for all habitats where access to salmonids has been denied or compromised. This will facilitate an evaluation of cost / benefit and assist in the development of a prioritized culvert replacement program.

The culvert removal (not to be replaced) proposed at Trib E (restoration Item #2) is an immediate benefit to juvenile salmonids conducting temperature dependant upstream migrations from the mainstem during late summer when mainstem temperatures exceed optimum thresholds for rearing. The additional benefit to production is not easily quantified with the standard method of estimating rearing surface area above the culvert and applying fish densities. In this case, Trib E has been traditionally been accessible to adult migrants and already maintains a summer rearing population of juvenile Coho. Professional judgment in this case would indicate that the benefit in terms of additional fish production would be minor. However, the maintenance of that adaptive life history strategy exhibited by those few individuals that chose to migrate upstream for survival is extremely valuable in restoring biotic function and genetic diversity to the subbasin. The culvert removal also immediately benefits system function by removing the impediment created by the associated road bed to resource migration from upslope corridors.

Assessment questionnaire

Morphology

Describe the valley form, constraint, and floodplain.

The lower 3.3 miles of Preacher Creek flows through a moderately open valley floor with primary constraints appearing as occasionally encroaching hill slopes on the west and multiple terraces. Gradients through this section are low, typically 2 % or less. At approximately RM 2.5, hill slopes begin to encroach more distinctly, and at RM 3.3 the valley becomes canyon-like and the gradient increases, eventually reaching 3% near the upper limit of salmonid distribution The system receives significant contributing flow from a palmate distribution of 1^{st} ,2^{nd} and 3^{rd} order tributaries which render the summer flows to minor at RM 4.1. The floodplain between RM 0 and RM 1.9 can be described as broad, depositional and exhibiting the morphological potential for channel meander and high levels of winter connectivity. Terraces are low in this zone with increases in terrace height gradually developing above the confluence of Jasper Cr.

Assess the potential for the development of meander, braiding, side channel, alcove, backwater channel forms.

As suggested above the potential for the development of interactive floodplain habitats and channel meander is extremely high between RM 0 and RM 1.9. Landowner ship would be the greatest deterrent to the development of extensive floodplain connectivity within this reach. There are two private landowners within this segment. One from the confluence with mainstem Lobster to RM 0.5 and the other from RM 0.5 to RM 1.9. The lowest owner currently maintains an active livestock operation that is utilizing 100% of the potential interactive floodplain. It is likely that this owner would require due compensation (CREP) for any habitat set aside to encourage floodplain interaction and riparian development. The upper landowner has no livestock operation and is currently managing the property as forest land. In addition, this upper landowner has been involved in aquatic restoration strategies in the past and restoring watershed function appears to be a common goal.

List and rank the factors currently limiting the development of channel complexity.

Given that 2 distinct morphological zones have been identified we choose to observe them separately in this ranking. The first zone from RM 0 – RM 1.9 exhibits a high potential for interactive floodplains and the development of channel complexity. Within this zone:

The lack of a developing riparian canopy in the zone from RM 0- RM 0.5 (which results in root mat complexity, riparian shade and potential wood recruitment) is the primary factor limiting channel complexity.

The low instream wood densities within this reach also result in limiting the development of channel complexity.

The presence of a stream adjacent forest road has compromised the systems ability to deliver raw resources to the mainstem (wood, gravel) and constricted the potential band width of the active channels meander corridor.

For the zone from RM 1.9 to the end of juvenile salmonid distribution at RM 4.1 we have observed that the morphological potential for floodplain interaction and therefore the potential for additional channel complexity is driven by steep opposing hillslopes and steeper gradients. Within this zone:

The lack of channel roughness from low instream wood densities is the primary issue constricting the development of channel complexity.

Are these factors addressable through restoration work?

The factors identified as limiting channel complexity above are easily addressable with simple restoration prescriptions. For the lowest reach from RM 0- RM 0.5 the primary objective would be to restore vegetative succession to the riparian corridor to initiate processes that are fundamental to proper system function. These processes are:

- Develop a vegetative under story that begins to stabilize stream adjacent banks for the formation of deep pools and undercut bank habitat.
- Develop a succession of vegetation that can provide overhanging vegetation that interacts with the active channel during both summer and winter flows to provide cover and complexity.
- Develop a succession of vegetation that can eventually provide shade, nutrients in the form of canopy litter and LWD to the active channel upon maturity.
- The most cost effective and well tested solution for initiating riparian vegetative succession is the prescription of livestock fencing and the planting of a mixed deciduous / coniferous over story.

Secondarily, instream wood placements (variable implementation strategies) would be prescribed to address the low wood densities that have been measured in multiple surveys for the last 15 years. Sites have been prioritized within this plan for wood placements that would most effectively address the seasonal limitations that have been identified as the production bottle neck for Coho juveniles.

Ideally, a road decommission would be conducted from the confluence of Trib E to the confluence of Trib I. There would be no culverts within this corridor and road crossings would be recontoured to match the natural hillslope and stream channel intersections.

Riparian corridor

Describe the riparian corridor and its potential to provide wood. How long before recruitment?
The Preacher Cr riparian is dominated by a deciduous canopy from it's confluence with Lobster Cr to a point 2.5 upstream (between Trib G and Trib H) where it shifts to a mixed deciduous/coniferous canopy (80/20) with fewer maples. The lower 0.5 miles of riparian can be classified as a narrow inner band of deciduous, dominated by an outer riparian of active pasture land. The lower 0.5 miles of Preacher Cr exhibits zero current potential for the recruitment of key wood (large conifer) to the aquatic corridor.

The next 2 mile corridor exhibits an outer riparian of plantation Douglas Fir that when mature will effectively contribute shade and wood complexity to the mainstem corridor. The potential for wood recruitment from the riparian is excellent from RM0.5 to the headwaters. Time to maturity ranges from 65 to 40 years as you proceed upstream from RM 0.5 (assuming some significant level of natural contribution can begin to occur at 80 yrs.). .High risk slopes that exhibit a higher probability of failure resulting in the delivery of resources to the mainstem have been identified within this analysis to begin the dialogue of developing strategies for protecting from harvest these initiation sites and their associated delivery corridors. These areas will eventually be the dominant source locations of LWD and gravel to the mainstem and play a more significant role in LWD recruitment and the development of channel complexity than wood originating from the stream adjacent riparian corridor.

To what degree would land use and ownership allow restoration work?
The ownership from RM 0- RM0.5 is private and the potential for the application of a restoration prescription in this zone is unknown. The ownership from RM0.5 to the headwaters is a mix of private and USFS and restoration prescriptions have been effectively applied in this corridor before. It is likely that additional restoration prescriptions would be well received in this zone.

What is the potential to increase channel complexity in the long term through natural recruitment processes, with and without restoration?
The long term potential for increasing channel complexity through natural recruitment is extremely high within the Preacher Cr subbasin except for the zone from the confluence with Lobster Cr to the Preacher Cr Bridge at RM0.5. However, this recruitment is currently at a low level because of stand age. Projected trajectories are for an increasing frequency of contribution with age. The prescribed wood placement strategies are definitively only short term solutions to boosting complexity until natural processes are restored. Key to this long term vision of proper function is the upslope management prescriptions that will

be part of the USFS management plan for the subbasin. Protection of the resources existing on high risk slopes within identified initiation sites and their associated delivery corridors will be the most important component of securing upslope resources for eventual delivery to the aquatic corridor. These upslope prescription will also need to focus on the LWD recruitment potential of Type N streams that are often not part of buffer prescriptions.

Core Area

Anchor sites

What proportion of the system's summer Coho production appears to be provided by each Anchor Site?
1)
2)
3)
4)
5)

Rank the group of Anchor sites for their ability to provide these combined functions (abundance of pool surface area, spawning gravel, % of summer production).
2
3
1
4
5

Which functions limit the site's production potential, and what causes these limitations?
1) Limited by summer temperature thresholds partially caused by dysfunctional riparian characteristics induced by long term livestock grazing.

2) Anchor is currently limited by summer temperature thresholds partially caused by the solar exposure on unshaded beaver pond surface areas. Limitation is exacerbated by a lack of lack of late successional canopy adjacent to beaver pond complexes for the provision of shade.

3) Limited by low densities of complex wood to initiate higher levels of floodplain interaction during both summer and winter flow regimes. Limitation is caused by low short term potential within the riparian corridor for coniferous LWD.

4) Limited by low densities of complex wood to initiate higher levels of floodplain interaction during both summer and winter flow regimes. Limitation is caused by low short term potential within the riparian corridor for coniferous LWD.

5) Limited by low densities of complex wood to initiate higher levels of floodplain interaction during both summer and winter flow regimes. Limitation is caused by low short term potential within the riparian corridor for coniferous LWD.

List and rank the restoration work at each Anchor site that would most effectively increase survival within the Anchor site and stabilize the core population at a higher base level.
1) Exclude cattle from riparian corridor with fencing and plant to allow vegetative succession to occur. Protect contributing headwater tributaries from riparian harvest that may negatively impact mainstem summer temperatures. Inject LWD to impound winter flows that will increase floodplain connectivity and provide complex habitat.
2) Protect contributing headwater tributaries from riparian harvest that may negatively impact mainstem summer temperatures.
3) Inject LWD to impound winter flows that will increase floodplain connectivity and provide complex habitat.

4) Inject LWD to impound winter flows that will increase floodplain connectivity and provide complex habitat.
5) Inject LWD to impound winter flows that will increase floodplain connectivity and provide complex habitat.

Secondary Branch sites

Describe how the Tributary contributes to spawning and summer and winter rearing

- Tributary A - 0.4 miles Coho distribution, contains 10 sq m of spawning gravel (10 poor), 5 % of mainstem flow. Less than 1% of the total available summer rearing habitat in the 6th field. Limited winter potential exists.
- Tributary B – 0.8 miles Coho distribution, contains 23 sq m of spawning gravel (17 fair, 6 good), 10 % of mainstem flow. Recent culvert replacement (2003) on Lane County right of way has accessed an additional 600 sq. meters of summer habitat potential for juvenile Coho. The Trib provides 5% of the total available summer rearing habitat in the 6th field. Limited winter potential exists.
- Tributary C – 0.2 miles Coho distribution, contains 2 sq m of spawning gravel (2 poor), 10 % of mainstem flow. Provides less than 1% of the total available summer rearing habitat in the 6th field. No winter potential exists.
- Tributary D – 0.1 miles Coho distribution, contains 0 spawning gravel , 2-3 % of mainstem flow. Provides 1% of the total available summer rearing habitat in the 6th field. Limited winter potential exists.
- Tributary E – 0.4 miles Coho distribution, contains 35 sq m of spawning gravel (10 fair, 25 good), 10 % of mainstem flow. Currently compromised by adult and juvenile passage barrier. Could be providing over 2% of the total available summer rearing habitat for the 6th field. Limited winter habitat potential.
- Tributary F – 0.1 miles Coho distribution, contains 13 sq m of spawning gravel (6 poor, 7 fair), 20% of mainstem flow. Providing less than 1% of total available summer rearing habitat. No winter habitat potential.
- Tributary G – 0.1 miles Coho distribution, contains 10 sq m of spawning gravel (6p, 3f, 1g), 20 % of mainstem flow. Provides less than 1% of the total available summer habitat in the 6th field. No winter potential.
- Tributary H – 0.1 miles Coho distribution, contains 15 sq m of spawning gravel (8p, 4f, 3g), 10 % of mainstem flow. Provides less than 1% of the total available summer habitat in the 6th field. No winter potential.
- Tributary I – 0.2 miles Coho distribution, contains15 sq m of spawning gravel (5p, 7f, 3g), 10 % of mainstem flow. Provides 1% of the total available summer habitat for the 6th field. Limited winter potential.
- Jasper Cr – 0.7 miles Coho distribution, contains 172 sq m of spawning gravel (28 fair, 144 good), 10% of mainstem flow. Provides 10% of the total available summer habitat in the 6th field. Extensive winter habitat available (unquantified) in beaver pond complexes.

What proportion of the system's summer Coho production appears to be provided by this site(s)?
Trib A – 0%
Trib B – 1%
Trib C – <1%
Trib D – <1%
Trib E – 5%
Trib F – <1%
Trib G – <1%
Trib H – <1%
Trib I – <1%
Jasper Cr – 15%

Rank the site in terms of its combined provision of these attributes (abundance of pool surface area, spawning gravel, % of summer production).

1) Jasper Cr
2) Trib E
3) Trib B
4) Trib I
5) Trib A
6) Trib H
7) Trib F
8) Trib G
9) Trib C
10) Trib D

Which functions limit the site's production potential, and what causes these limitations?

- Trib A – Access is compromised by head cutting in clay and sandstone 125 ft upstream from the confluence with mainstem
- Preacher – 2.5 ft falls terminates upstream juvenile passage
- Trib B – Gradient and hillslope confinement establish a ceiling for floodplain interaction (morphology)
- Trib C – Gradient and channel entrenchment limit rearing potential (morphology)
- Trib D - Gradient, flow and confinement (morphology)
- Trib E – Access denied from 3 ft perched culvert
- Trib F – Gradient and channel confinement (morphological)
- Trib G – Gradient and channel confinement (morphological)
- Trib H – Gradient, flow and confinement (morphological)
- Trib I – Gradient and confinement (morphological)
- Jasper – Channel confinement

List and prioritize the secondary branch habitats where limiting factors could be addressed by restoration.

1) Jasper Cr – Structure placement in the deposition plain above the historical debris torrent jam could result in lifting the entrenched active channel up to interact with a vast depositional floodplain.
2) Trib E – Removal of the perched culvert (with no crossing replacement) and recontouring of the old road bed to match hillslope widths of Trib E could provide additional summer potential that has been identified as the primary limiting factor in the basin.

Lowlands outside the 6th field subbasin

Do lowland habitats exist outside the 6th field that could function as potential winter habitat for Coho?
Yes.

If so, describe the location, dimensions, gradients, and salient habitat features.
There are no adjacent lowland rearing opportunities for juvenile salmonids that engage in a nomadic downstream migration in the fall and winter. Their fate is uncertain as they seek alternate winter refugia. Winter fish distribution inventories conducted in mainstem Five Rivers have indicated that very little winter rearing is occurring in this large 5th order corridor. Therefore, it seems plausible that fall and winter out-migrant pre-smolts are destined for estuary habitats some 20 miles downstream. The assumption is that a higher mortality rate can be associated with these migrants because of the increased potential for predation. It is the goal of this restoration planning effort to retain pre-smolt migrants in natal streams to reduce mortality.

Appendices

Appendix 1. Preacher Creek spawning gravel estimates

Spawning gravel	**Poor**	**Fair**	**Good**	**Total**
Amount (m2)	127	554	930	
Effectiveness rating	0.25	0.50	1.00	
Effective gravel (m2)	31.8	277.0	930.0	**1,239**

Appendix 2. Preacher Creek limiting habitat analysis based on the Nickelson model

SECTION 1. SMOLT CAPACITY AND SURVIVAL RATES

Table A. Coho salmon rearing density for each habitat type in each season.

HABITAT TYPE	SEASON		
	SPRING	SUMMER	WINTER
Cascades	0	0.24	0
Rapids	0.6	0.14	0.01
Riffles	1.2	0.12	0.01
Glides	1.81	0.77	0.12
Trench Pools	0.99	1.79	0.15
Plunge Pools	0.84	1.51	0.28
Lateral Scour Pools	1.29	1.74	0.35
Mid Chan Scour Pools	1.29	1.74	0.35
Dam Pools	2.56	1.84	0.56
Alcoves	5.75	0.92	1.84
Beaver Ponds	2.56	1.84	1.84
Backwaters	5.75	1.18	0.58

Data of Tom Nickelson based on ODFW research.

Tables B1 and B2. Survival rates to smolt

Table B1. ODFW research data.

Life stage	Survival rate
Egg to smolt	0.3200
Spring to smolt	0.4600
Summer to smolt	0.7200
Winter to smolt	0.9000

Data of Tom Nickelson based on ODFW research.

Table B2. Alsea study data.

Life stage	Survival rate
Egg to smolt	0.0270
June to Smolt	0.0644
Fall to smolt	0.1110
Winter to smolt	0.2870

Data of Jim Hall based on OSU FW research.

Table C. Egg and maximum rearing densities

Life stage	#/m2
Spawning (eggs)	833
Spring	5.75
Summer	1.84
Winter	1.84

Data of Tom Nickelson based on ODFW research.
Egg density is based on 2500 eggs/redd & 3 m2/redd
Spring, Summer, and Winter values are maximums from Table A.
These data currently do not contribute directly to spreadsheet calculations.

SECTION 2. DATA INPUT

Table D. Data entry

1) Enter length of reach or group of reaches analyzed (km).		(currently not used)
2) Effective Spawning Gravel referenced from the Spawning Gravel worksheet)	1238.75	

3) Enter summer habitat area totals below from the Summer Hab Areas worksheet.

Habitat Type	Season	
	Summer	Winter
Cascades	217	
Rapids	5,595	
Riffles	8,882	
Glides	625	
Trench Pools	0	
Plunge Pools	157	
Lateral Scour Pools	7,465	
Mid Chan Scour Pools	4,752	
Dam Pools	7	
Alcoves	140	
Beaver Ponds	12,613	
Backwaters	36	
Total	40,490	0
Pool Area	25,170	0
Percent Pools	62%	#DIV/0!

Table E. Calculation of seasonal rearing capacities for each habitat type.

Habitat Type	Season		
	Spring	Summer	Winter
Cascades	0	52	0
Rapids	0	783	0
Riffles	0	1,066	0
Glides	0	481	0
Trench Pools	0	0	0
Plunge Pools	0	237	0
Lateral Scour Pools	0	12,989	0
Mid Chan Scour Pools	0	8,269	0
Dam Pools	0	12	0
Alcoves	0	129	0
Beaver Ponds	0	23,208	0
Backwaters	0	42	0
Total	0	47,269	0

No winter data are available.

Therefore the spring rearing capacity could not be calculated by this method.

Winter rearing capacity was calculated using a separate methodology (see "Winter Smolt Capacity" sheet") and entered by reference below.

Calculation of egg deposition and smolt production depending on which seasonal habitat is limiting.

Table F1. Results using ODFW research survival rates.

Life Stage	Potential Seasonal Capacity	Potential Smolts Produced
Spawning (# eggs)	1,030,000	329,600
Spring (# fish)	0	0
Summer (# fish)	47,269	34,000
Winter (# fish)	*36,998*	33,300

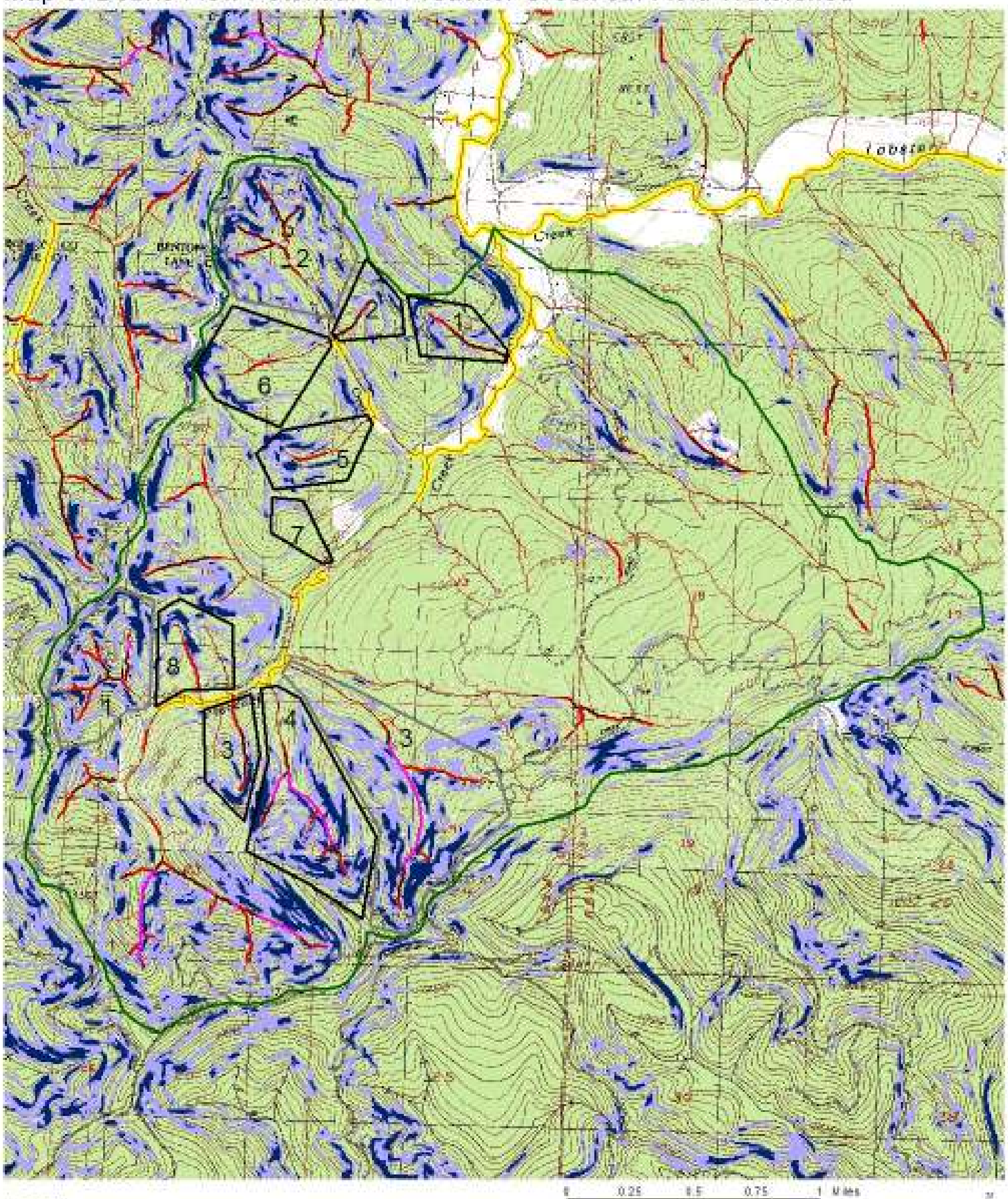
Table F2. Results using Alsea study survival rates.

Life Stage	Potential Seasonal Capacity	Potential Smolts Produced
Spawning (# eggs)	1,030,000	27,810
June (# fish)	0	0
Fall (# fish)	47,269	5,200
Winter (# fish)	*36,998*	10,600

*Winter capacity is entered by **cell reference** to the "Winter Smolt Capacity" worksheet*
No estimate of spring capacity or potential smolts produced is possible with current data.
Calculation of Spawning (# eggs) is base on the assumptions of 2500 eggs/redd and 3 m2/redd

Appendix 3. Preacher Creek ODF slope risk analysis map

Map of Debris Flow Potential for Preacher Creek 6th Field Watershed



Legend

Preacher Creek Watershed

Coho Intrinsic Potential (CLAMS)

Good

Probability of Debris Flow Initiation (Slope %)

moderate (60% - 79%)

high (80%+)

Probability of Debris Flow Occurrence (CLAMS)

low

moderate

high

very high

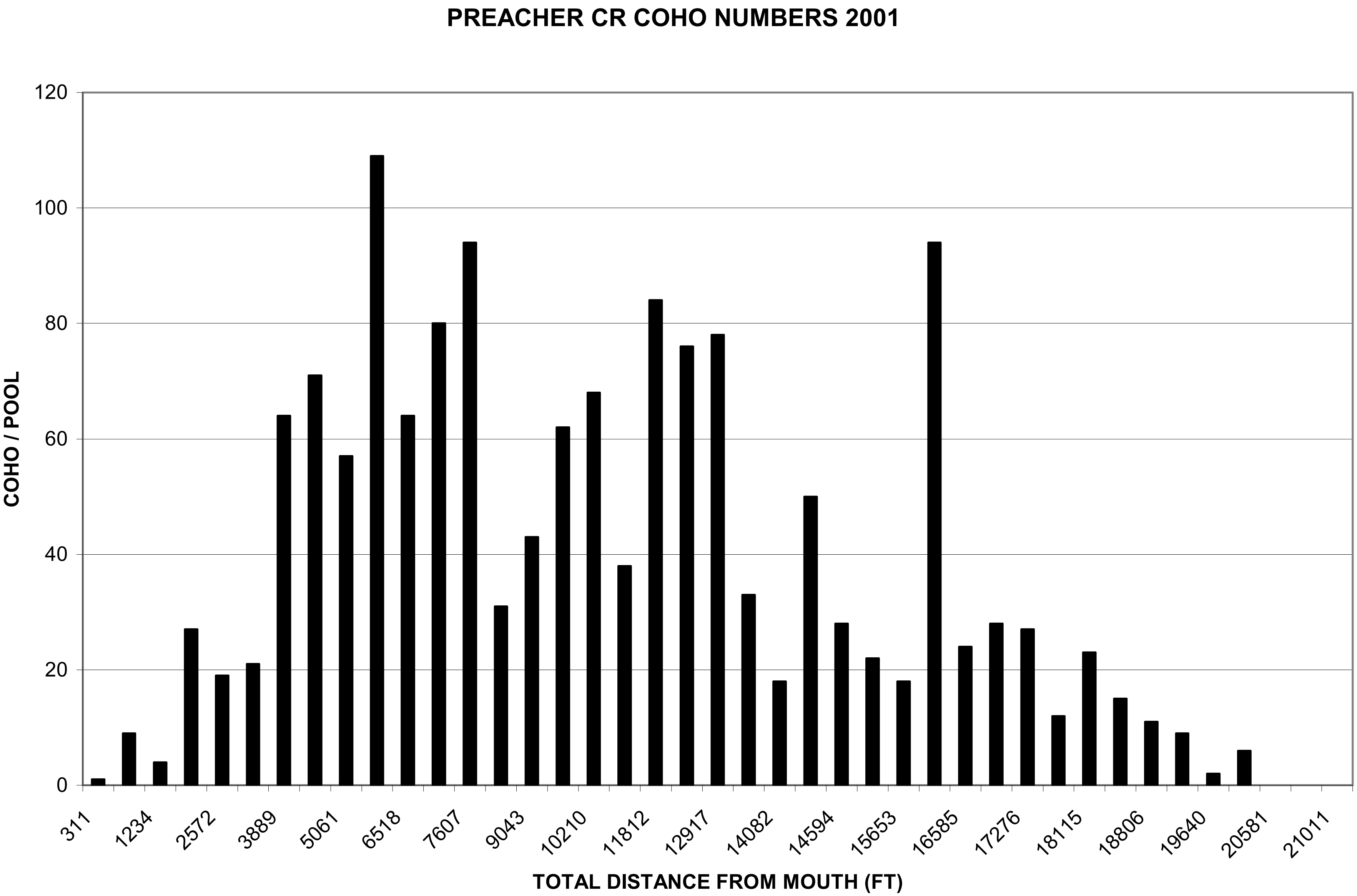
Sub-basin with Indirect Debris Flow Delivery to Coho

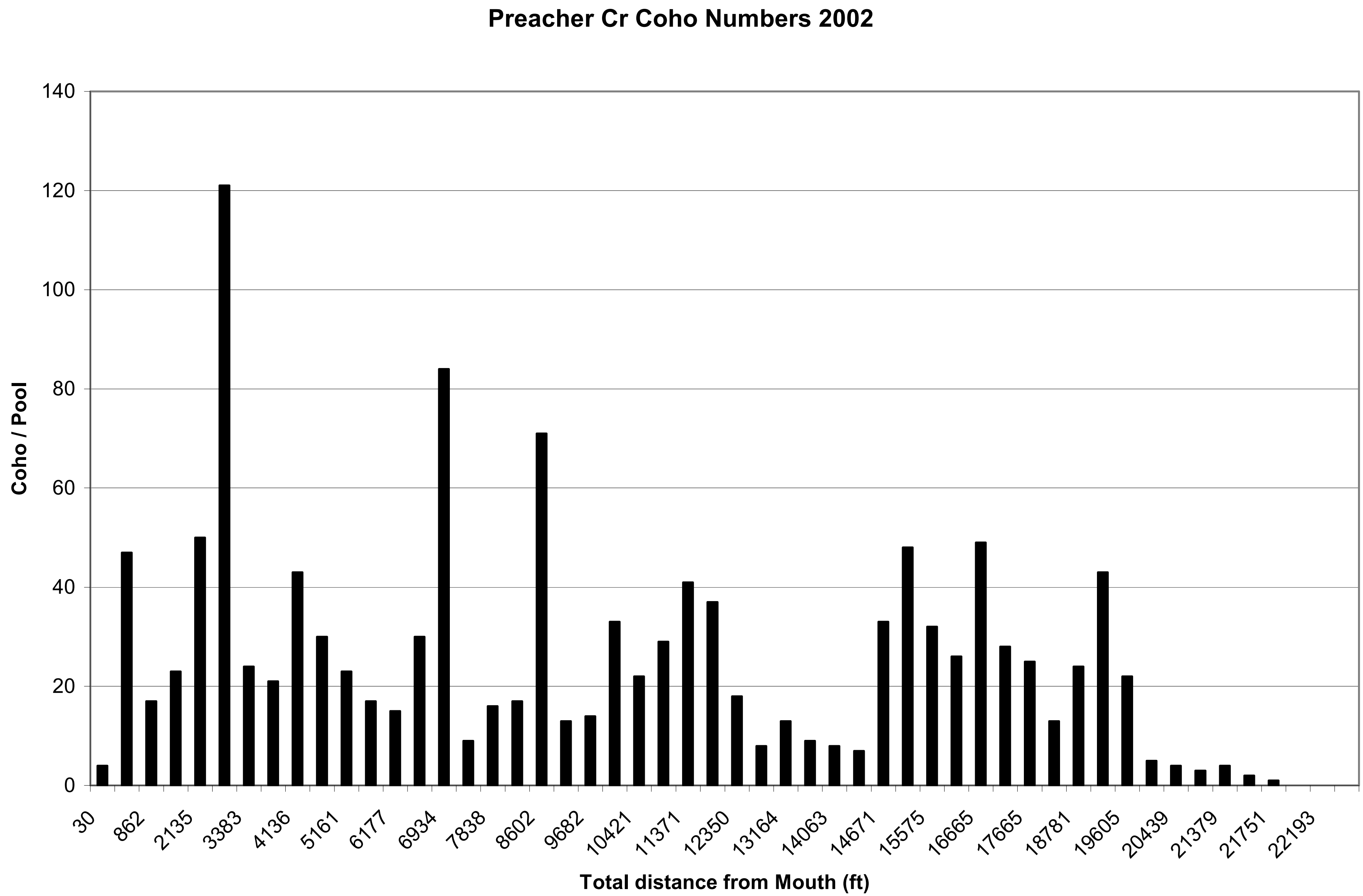
Sub-basin with Direct Debris Flow Delivery to Coho

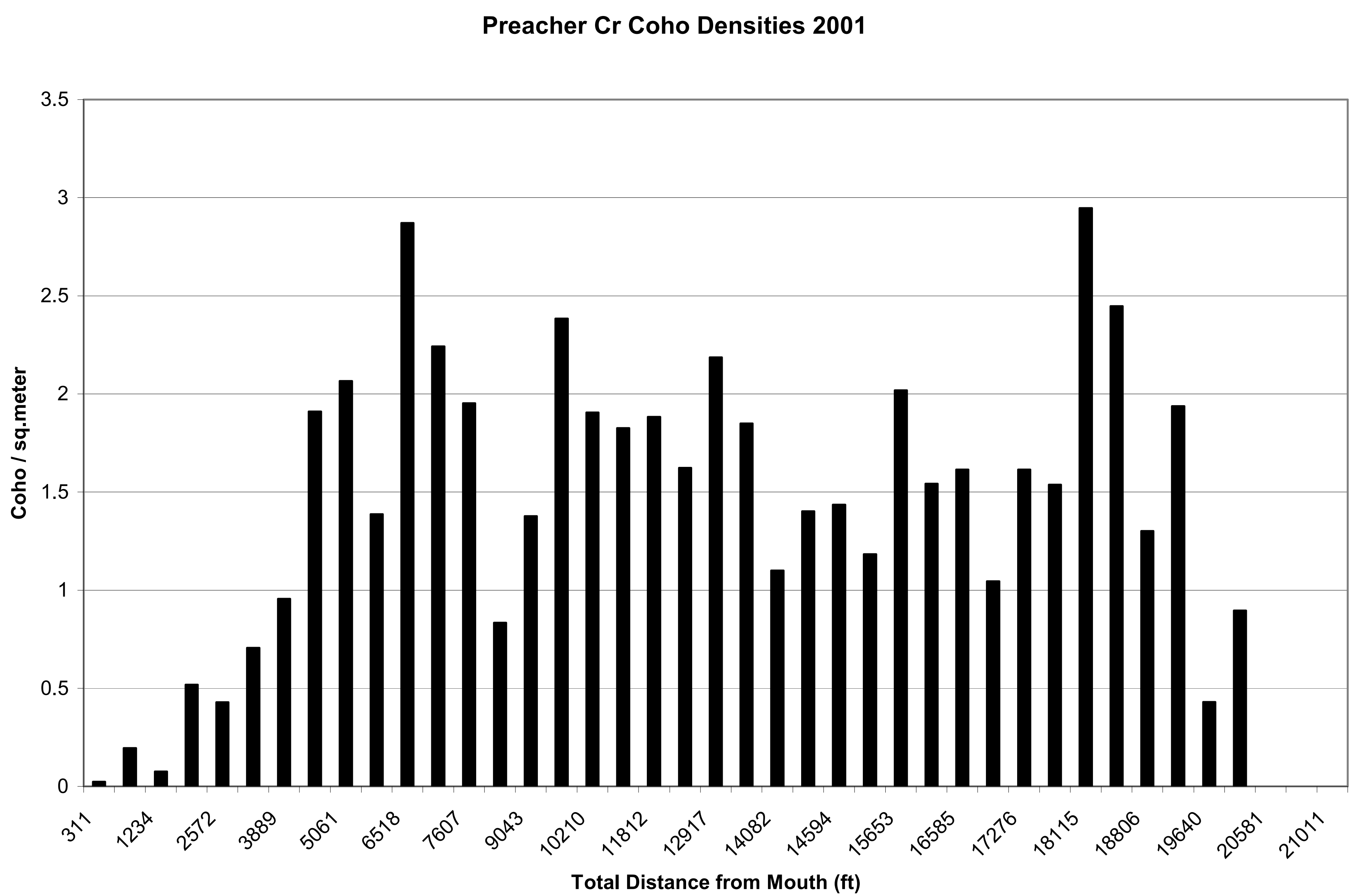
Jason Hinkle, Geotechnical Specialist
Oregon Department of Forestry
12/8/2005

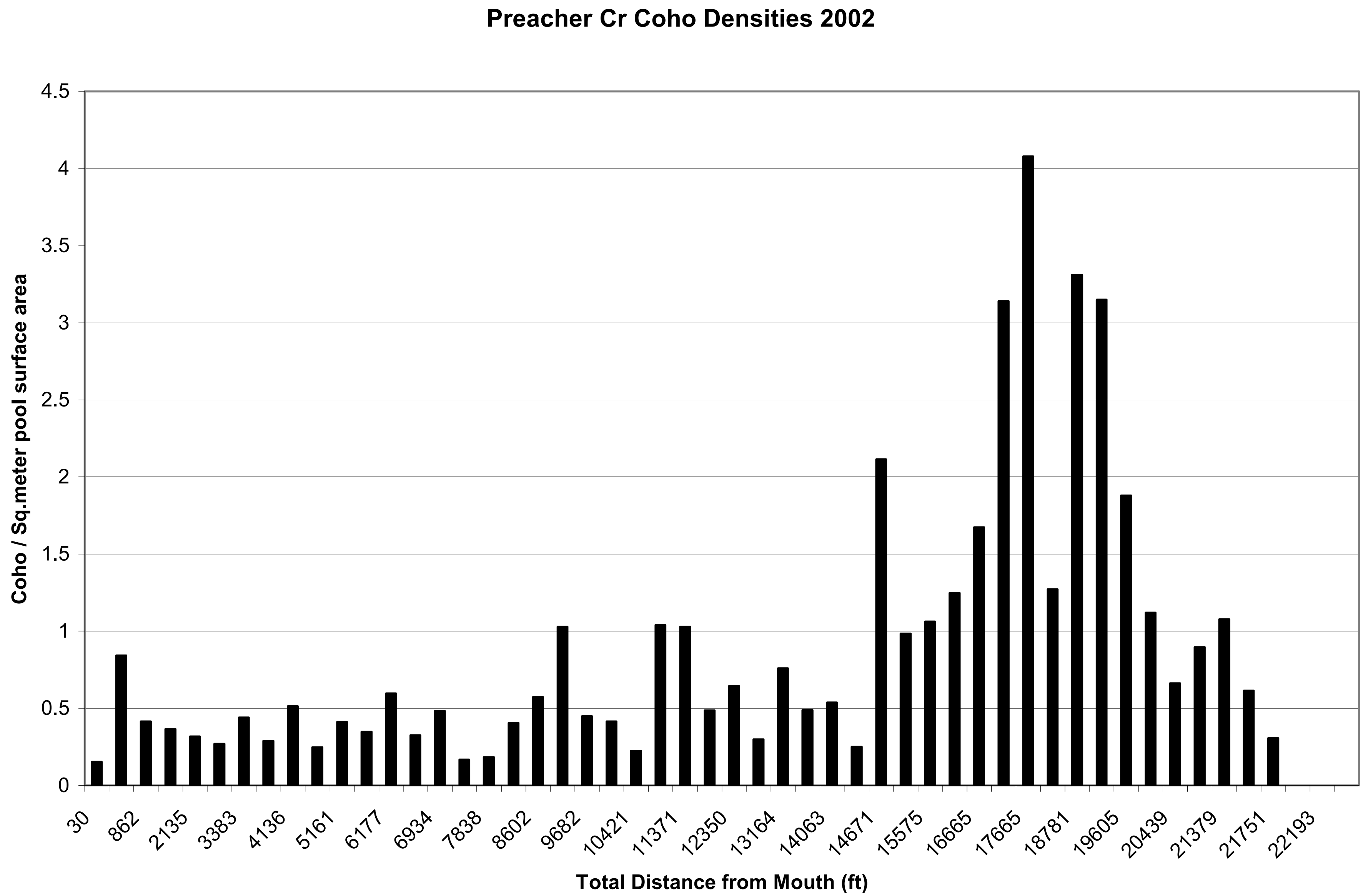
NOTE
-This map is based on qualitative geotechnical judgement applied to quantitative DEM measurements. DEM data is not always accurate.
-Both sets of sub-basins are ranked; 1 = most significant.
-Data for coho intrinsic potential and probability of debris flow occurence modified from CLAMS.

Appendix 4. Preacher Creek summer Coho distribution charts

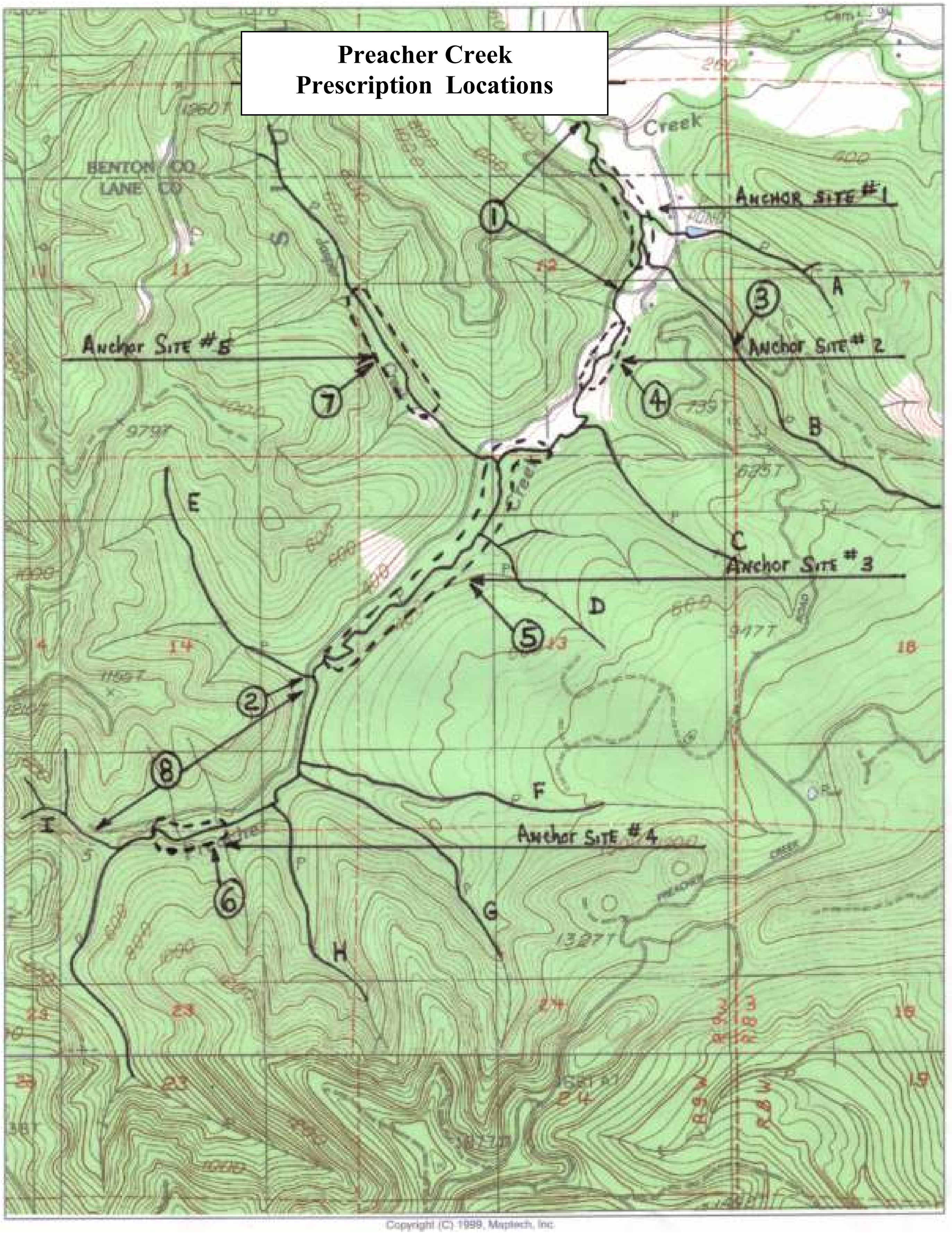



Preacher Cr Coho Numbers 2002
Coho / Pool
140
120
100
80
60
40
20
0
30
862
2135
3383
4136
5161
6177
6934
7838
8602
9682
10421
11371
12350
13164
14063
14671
15575
16665
17665
18781
19605
20439
21379
21751
22193
Total distance from Mouth (ft)


Preacher Cr Coho Densities 2001
Coho / sq.meter
0
0.5
1
1.5
2
2.5
3
3.5
311
1234
2572
3889
5061
6518
7607
9043
10210
11812
12917
14082
14594
15653
16585
17276
18115
18806
19640
20581
21011
Total Distance from Mouth (ft)


Preacher Cr Coho Densities 2002
Coho / Sq.meter pool surface area
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
30
862
2135
3383
4136
5161
6177
6934
7838
8602
9682
10421
11371
12350
13164
14063
14671
15575
16665
17665
18781
19605
20439
21379
21751
22193
Total Distance from Mouth (ft)

Appendix 5. Preacher Creek prescription location map



Appendix 6. Preacher Creek photos

Photo 1. Begin Anchor Site #2 at 5 ft beaver dam complex (stable and complex).

Photo 2. Long view of Jasper Creek subbasin.

Photo 3.Upslope condition of Jasper Creek subbasin.

Photo 4. Anchor site #5 in Jasper Creek (deposition plain from 1964 debris torrent event).

Photo 5. Deeply incised active channel in Jasper Creek.

Photo 6. Anchor Site #3. Complex channel characteristics, high quality spawning grounds.

Photo 7. Anchor Site #3. Legacy wood buried in floodplain and recruited with meander.

Photo 8. Anchor Site #3. Legacy wood and some minor recruitment of riparian alder.

Photo 9. Anchor Site #3. Historical LWD placements simple.

Photo 10. Anchor Site #3. Alternating undercut banks, an indication of high sinuosity and excellent channel function.

Photo 11. Perched culvert on Trib E; definitive juvenile barrier.

Photo 12. Existing simple LWD placements in Anchor Site #3.

Photo 13. Heart of Anchor Site #4.