Necanicum Habitat

Assessment Project

Written by:

Todd Boswell

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Juvenile Coho Winter Habitat

Priorities for

Large Wood Placement

and

Fish Passage Barriers

Sponsored by:

QWEB & NWC

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Project Summary

Project staff utilized the ODFW Aquatic Inventory protocol to assess habitat in selected small and medium sized streams in the Necanicum basin. In addition, the project personnel conducted a snorkeling survey to estimate juvenile salmonid distribution and abundance in these streams. The 2003 surveys completed all small and medium sized tributaries within the Necanicum Basin.

During the 2003 season we surveyed seventy-two (72) stream reaches in thirty-nine (39) streams totaling 57.208 kilometers of habitat.

We identified:

- 35 stream reaches using our 2003 habitat survey data that we believe should receive the priority for Large Woody Debris (LWD) placement
- 6 artificial barriers that impede adult or juvenile coho passage
- Large stream (> 12m active channel width) reaches should be investigated for large wood placement in the secondary channels, due to the complex meandering occurring within the Necanicum Valley.

We evaluated the effectiveness of 17 LWD placement projects.

We developed two large binders that provided detailed information on each of the 72 stream reaches.

The 2003 habitat surveys complete the coho habitat inventory for the small and medium sized streams in the Necanicum watershed. Additional surveys following similar protocol should be conducted for the mainstem Necanicum River to identify secondary channel LWD placement priorities. This project has greatly improved our understanding of where our priorities for habitat restoration and LWD placement should be.

Background

The Necanicum River is a coastal river in northwest Oregon with a mainstem length of 21 miles. The river is located entirely in the Coast Range. Peak discharge typically occurs during the winter between November and February, however, high flow events can occur as late as June. The watershed has several wild salmonid species including: winter Steelhead, Chinook, Coho, searun and resident cutthroat trout. No current hatcheries are operating in this basin, but several small private hatcheriers have operated over the past century.

During the last 150 years land management practices have drastically affected the rivers that coho use. Dike building, logging, water diversions, and road construction significantly reduced the availability of habitat for coho[1]. Road culverts became barriers that restrict use of streams by coho. The loss of large wood from streams reduced the number of pools and the amount of winter rearing habitat for coho.

Winter can produce a harsh environment for juvenile coho. Heavy rains create violent water surges that can kill these small fish. The primary defense for the juveniles is to retreat into calmer off-channel habitat[2]. The amount of this kind of rearing habitat is a function of stream gradient, amount of large woody debris, and valley and channel morphology.

The Oregon Department of Fish and Wildlife's (ODFW) Aquatic Inventory Project developed an excellent protocol for gathering information about stream habitat. This survey methodology came into use around 1989. In the last 12 years ODFW habitat surveyed approximately 50 kilometers of streams in the Necanicum basin. These surveys generally focused on the fish bearing streams in the watershed. Most of the habitat surveys were conducted during the summer of 1992. The 2003 Necanicum Habitat Assessment project conducted winter habitat surveys in the some of the same stream areas. However, methods for identifying end points for 2003 winter surveys were different from ODFW summer 1992 methods.

Prior to the beginning of the 2003 project the Necanicum watershed assessment completed an inventory of road stream crossings in the Necanicum Basin. This watershed assessment followed OWEB protocol and was conducted by Environmental Chemistry, Inc and completed in March 2002. They found:

1 259 road stream crossings.

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[1] The Oregon Plan recognizes that availability of off-channel rearing habitat is a limiting factor for the productivity of Coastal Coho Salmon Stocks.

[2] Includes backwaters, alcoves, isolated pools, and significant secondary channels

2 23 out of 259 had been surveyed by ODFW. 69% of the culverts surveyed were considered fish passage barriers

3 recommended prioritization for culvert replacement based on apparent gradient[3] of the reach made accessible, area of land drained, fish presence below culvert and estimated cost of culvert replacement

The 2003 project allowed Necanicum Watershed Council (NWC) to use the detailed information on coho habitat collected through the winter habitat surveys to guide future culvert replacements. Surprisingly, no major fish barriers were identified within the Necanicum Basin. Most barriers identified in this study were on small tributaries that partially impede fish passage.

The Necanicum Watershed Council initiated the 2003 Necanicum Habitat Assessment Project to determine the condition of the habitat in small and medium sized streams in the Necanicum watershed. Specifically, the study was designed to determine:

1) *Stream reaches most suitable for LWD placement* - stream reaches where LWD placement will increase off channel habitat and hence coho productivity,

2) *Current habitat conditions in streams* – which stream reaches would have a high potential for increasing coho production. Effectiveness of current LWD projects completed in previous years.

3) *Priorities for Artificial barriers impeding passage for adult or juvenile coho salmon.* – which artificial barriers are blocking essential coho habitat

In addition, we wished to produce information that could be used by the Oregon Department of Fish and Wildlife (ODFW) as part of their ongoing research in the Necanicum Basin.
The Oregon Watershed Enhancement Board (OWEB) provided a grant for 3/4 of the cost of the project. The project leader, the Necanicum Watershed Council (NWC), Clatsop Community College (CCC), Seaside High School students and their teacher provided volunteer time for the required 1/4 in kind local match.

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[3] Map reading at best gives only an approximation of actual field conditions.

Methods

Stream Identification

The report authors used Geographic Information System (GIS) data layers to create maps showing the locations of streams which:

1) appeared to be low gradient;

2) drained an area of greater than 300 acres

3) had not been surveyed by ODFW during winter season conditions:

We found fifty (50) streams covering 70 kilometers in the Necanicum Basin. These streams were potential coho streams. These were streams where LWD placement might be expected to improve coho productivity, but where existing data did not provide enough information to determine which stream segments were most important. During the 2003 project season, fifty-seven (57.208) kilometers were surveyed covering thirty-nine (39) streams. Since some streams are dropped after a field visit this completed the coho habitat inventory in small and medium sized streams.

Field Surveys

Two-two person survey teams conducted the habitat surveys and assisted in culvert and snorkel surveys. The Project Leader, provided technical assistance for the habitat surveys, conducted the snorkel surveys, and coordinated survey schedules. In addition, ODFW provided an expert in habitat surveying to assist with surveys for three days. This ensured that the information collected was almost identical to the ODFW surveys completed.

Survey teams used the 2002 ODFW Aquatic Inventory[4] protocol and associated data forms. The project leader and the surveyors had several years experience working as ODFW habitat surveyors. The project leader trained inexperienced surveyors in the same way ODFW trains surveyors each summer prior to the survey season.

The survey teams conducted their surveys between December 15 and March 31, 2003. The project leader and field staff first obtained landowner permission[5] for the surveys. They started their

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[4] To obtain more specific methods for the habitat surveys conducted refer to Aquatic Inventory Project: Methods for Streams Habitat Surveys 2002. NWC and OWEB received assurances from ODFW research staff that winter habitat surveys produce results as good as, or better than, those produced by summer surveys.

[5] Three stream reaches could not be surveyed because landowner permission could not be secured.

surveys at the mouth of each stream and continued until the stream size or gradient precluded stream use by coho.

The survey team took photos to record field conditions found during the surveys. The photos focused on the general valley and channel geomorphology and unusual attributes, (culvert, dikes, etc.).

Seaside High School students (Alternative Education class) conducted independent surveys in selected study areas. During the initial session, the project leader trained the students to use ODFW Aquatic Inventory survey protocol. They were then able to apply the knowledge gained in the field. They surveyed: China Cr, Coho Cr, and Upper Necancium River. The work was completed during weekdays during school hours. This included prearranged field trips on stream survey days.

The high school students resurveyed an area previously surveyed by ODFW (Upper Necanicum) to determine whether surveys conducted by different teams and at different times of the year produced the same results.

The habitat survey crew flagged pools they thought should be snorkeled. They flagged every fourth pool greater than six tenths of a meter deep, and all major off-channel habitats. The project leader conducted snorkel surveys in the flagged pools after the survey crews completed the habitat surveys. If necessary, he continued the snorkel survey above the flagged area until he found the end of coho presence.

The project leader and staff conducted the snorkel surveys at night[6] to obtain the best counts of juvenile coho[7,8] For quality control, 10% of the snorkel surveys were resurveyed within 48 hours of the first count. This provided quality assurance that the snorkelers were observing the same fish species in similar densities in the pools snorkeled.

Data management

The ODFW Aquatic Inventory Project provided computer programs for data entry and analysis. No major problems associated with data entry and analysis were encountered during the 2003 project. ODFW Access programs were used to generate summary data for each stream reach in the study. The process included:

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6 To support the night sampling design a few surveys provided day/night comparisons.

7 During cold winter conditions Coho are quiet during the day and move about and feed during the night.

8 He needed two underwater lights: Underwater Kinetics High Pressure xenon lamp with a medium penetrating beam with a 3.2 in diameter lens and a Browning Submersible High Pressure xenon lamp with high penetrating beam with a 2.0 in diameter lens.

- Data entry for all habitat surveys conducted
- Calibrate estimated lengths and widths for surveys
- Generate stream reports summarizing database reports. This included a general summary, specific reach descriptions, and information on unusual attributes (LWD project potential, current LWD project effectiveness)
- USGS topographical map (1: 24 000); detailing the survey attributes (start, end, etc.)

Data analysis

Large wood placement priority

Last year the report authors tried a number of alternative protocols for establishing priorities for LWD placement for the 2002 Lower Nehalem Habitat Assessment project. Ultimately, we opted for an approach that was both easy to understand and easy to apply. This approach gives us almost the same result as the more complicated equation. We chose to give priority to streams that:

1) already had coho present[9],
2) were in a valley wide enough that large wood could create off channel habitat (Valley Width Index [VWI] greater than 3),
3) had a channel width small enough for wood to stay in place after periods of heavy rain. (Active Channel Width [ACW] less than 12 meters) and
4) did not currently have adequate large wood (<2.0 Key pieces per 100 m [Keylwd])

In addition to these factors access to the stream reach will be a significant factor in choice of sites for wood placement. We developed preliminary judgments about the difficulty of access from map readings.

Finally, larger streams with potential off channel LWD placement were identified as lacking habitat information needed to prioritize LWD placement sites. The large stream criteria should include:

- >12m ACW – larger streams category
- surveyor notes identifying LWD project potential

Further investigation is needed to plan effective placement sites in the mainstem Necanicum.

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[9] Coho were considered to be in a stream reach if they are found in a higher reach of the same stream. Coho were also considered to be in streams that had fish passage barriers if there were coho below the barrier.

Specifically, these surveys must be conducted during the summer season due to the high flows encountered during the winter in large rivers.

Assessing current LWD placement projects for their effectiveness

The authors used a variety of information obtained during the 2003 project season to determine the current effectiveness of LWD placement projects already completed within the Necanicum basin. The information used included: habitat survey data, habitat surveyor notes, peak count snorkel data (presmolt coho), and snorkel surveyor notes. The assessment was given one of two categories:

1. *Effective LWD Project*- appears to be creating stream complexity needed for juvenile coho winter rearing

2. *Non-effective LWD Project*- appears to not be creating stream complexity needed for juvenile coho winter rearing.

This is only a rough approximation for LWD project effectiveness. This information could be used to direct ODFW habitat biologists to revisit sites deemed non-effective. Hopefully, this will identify current LWD placement projects that could be modified to increase their productivity. Also, it is believed that successful LWD placement projects can be identified and modeled for future LWD placement projects.

Priorities for Artificial barriers impeding passage for adult or juvenile coho salmon

The habitat surveyors identified all culverts encountered during the winter habitat surveys. Each culvert identified was evaluated for fish passage. Specific recommendations were recorded by the surveyors on the current status of each culvert crossing encountered.

The authors used ODFW aquatic benchmarks supplemented with information on stream gradient and fish presence to assess the value of the habitat in stream reaches above culverts. The desirable and undesirable conditions for the stream reaches are given in Table 1.

Table 1

Desirable and undesirable conditions for the stream reaches

	Desirable	**Undesirable**
Surface area of stream reach	Large	Small
Stream gradient	Less than 3 %	Greater than 6%
Key Large wood/100m[10]	Greater than 3	Less than 1
Conifers/100 ft[1]	Large	Small
%Pools[1]	Greater than 35%	Less than 10%
Complex pools/km[1]	Greater than 2.5 per km	Less than 1.0 per km
Percent Gravel[1]	Greater than 35%	Less than 15% gravel
Fish presence down stream	Yes	No

[10] ODFW aquatic inventory benchmarks.

Results

The field staff dropped a number of streams from the survey due to:

1) the small size of the stream;

2) natural barriers that blocked any possibility of fish passage; and

3) lack of permission to access the stream.

In addition, we learned that we had overestimated the length of the low gradient sections of survey streams. This eliminated some target sites after an initial field visit. At the completion of the survey we found that we had surveyed seventy-two (72) stream reaches in thirty-nine (39) streams totaling 57.208 kilometers of habitat.

Snorkel Surveys

The Project Leader and staff snorkeled one hundred and ninety-six (196) pools. He found cutthroat in 115 of these pools, coho in 140 (fry in 85 pools[1] and pre-smolts in 130 pools), sea-run cutthroat in 28 pools, and adult steelhead in 42 pools. No chinook fry were found.

Priority For Large Wood Placement

Table 2 lists the 35 stream reaches that met our criteria for LWD placement priority during the 2003 winter survey season.

Table 2
Stream Reaches Given Priority for
Large Wood Placement
2003 NWC Surveys

Stream	Reach	VWI	ACW	Keylwd	Landowner	Road Access
Beerman Cr	*1*	*20*	*8.3*	*0.0*	*Private*	*Good*
Beerman Cr	*2*	*10*	*8.4*	*0.2*	*Private*	*Good*
Beerman Cr	*3*	*5*	*8.1*	*2.2*	*Weyerhaeuser*	*Limited*
Bergsvik Cr	*1*	*5*	*11.5*	*0.3*	*Weyerhaeuser*	*Fair*
Bergsvik Cr	*2*	*6*	*9.7*	*1.5*	*Weyerhaeuser*	*Fair*
Charlie Cr	*1*	*20*	*4.8*	*1.0*	*Private*	*Good*
China Cr	*1*	*1*	*40*	*0.0*	*Private*	*Good*
China Cr	*2*	*3*	*7.2*	*0.6*	*Private*	*Limited*
Circle Cr	*2*	*20*	*9.2*	*0.5*	*Private*	*Fair*

[1] Some of the surveys were done before the fry had a chance to emerge from the gravels.

Table 2(Continued)
Stream Reaches Given Priority for
Large Wood Placement
2003 NWC Surveys

Stream	Reach	VWI	ACW	Keylwd	Landowner	Road Access
Circle Cr	3	20	8.2	0.2	Private	Fair
Circle Cr	5	10	7.4	1.8	Weyerhaeuser	Fair - Good
Circle Cr	6	3.0	6.6	0.9	Weyerhaeuser	Fair – Good
Coho Cr	1	3	21	0.0	Private	Good
Coho Cr	2	10	4.1	0.4	Private	Limited
Grindy Cr	1	3	10.5	0.6	Longview Fiber	Limited
Grindy Cr	2	8	9.0	2.0	Longview Fiber	Limited
Grindy Cr T-1	1	10	4.6	0.4	Longview Fiber	Limited
Johnson Cr	1	15	5.2	1.7	Weyerhaeuser	Good
Klootchie Cr	2	7	4.2	0.2	Weyerhaeuser	Fair – Good
Little Humbug Cr	1	10	11.6	0.4	Private	Fair
NF Necanicum R	1	10	11.3	0.7	Weyerhaeuser	Poor
NF Necanicum R	2	10	9.3	0.4	Weyerhaeuser	Poor
Shangrila Cr	1	6	7.3	0.2	Private	Poor
SF Necanicum T-A1	1	4	4.3	0.5	Weyerhaeuser	Limited
Thompson Cr	1	20	4.8	0.0	Private	Good
Unnamed T-1	1	8	7.1	0.0	Private	Good
Unnamed T-2	2	6	7.9	0.4	Weyerhaeuser	Fair
Unnamed T-3	1	5	3.8	0.4	Weyerhaeuser	Fair
Upper Neawanna R	1	10	4.5	0.2	Weyerhaeuser	Fair
Upper Necanicum R	1	3	8.2	1.2	Weyerhaeuser	Poor
Volmer Cr	1	10	6.9	0.2	Weyerhaeuser	Fair – Good
Volmer Cr	2	6	3.9	0.9	Weyerhaeuser	Fair – Good
Warner Cr	1	8	7.0	1.9	Private	Good
Williamson Cr	1	6	4.0	0.9	Private/Weyerhaeuser	Fair
Wolf Cr	1	3	3.4	0.5	Private	Fair

Additionally, large stream surveys were not prioritized, because there was a lack of habitat data addressing LWD placement potential.

Effectiveness of current LWD projects

The 2003 NWC habitat surveys identified 17 previous artificial placement projects (LWD or Boulders) that over lapped with our target survey sites. The authors wanted to identify the current conditions of the projects and attempt to categorize the projects as currently effective or non-effective (Table 3).

Table 3
Current Effectiveness of
Large Wood Placement Projects
2003 NWC Surveys

Stream	Reach	Channel Location	PEAK Coho Presmolt Count	Landowner	Effective	Comments
Beerman Cr	*1*	*Primary*	*0*	*Private*	*NA*	*Landowner denied access to survey*
Beerman Cr	*2*	*Primary*	*25*	*Weyerhaeuser*	*Yes*	*Needs more time, appears to be productive at creating pool complexity*
Bergsvik Cr	*2 & 3*	*Primary*	*8*	*Weyerhaeuser*	*Yes*	*Productive at creating pool complexity, may create secondary channel habitat*
Circle Cr	*6*	*Primary*	*10*	*Weyerhaesuer*	*Yes*	*Productive at catching gravel, but no pooling present*
Johnson Cr	*1 & 2*	*Primary*	*11*	*Private/ Weyerhaeuser*	*Varying*	*Some sites have created small pocket pools and others have no observed response*
Little Humbug Cr	*2*	*Primary*	*50*	*Private/ Weyerhaeuser*	*Yes*	*Catches a lot of gravel; No pools observed*
Little Joe	*1*	*Primary*	*0*	*Weyerhaeuser*	*Yes*	*Very recent; Productive at creating pool complexity*
Klootchie Cr (1)	*1*	*Secondary*	*35*	*Weyerhaeuser*	*Yes*	*Good Alcove & secondary complexity*
Klootchie Cr (2)	*1*	*Primary/ Secondary*	*11*	*Weyerhaeuser*	*Varying*	*Some sites are creating pool complexity with medium sized logs(<.6m dbh)*
Klootchie Cr Seg. II	*1*	*Primary*	*15*	*Weyerhaeuser*	*Varying*	*No deep complex pools*
Mail Cr	*1 & 2*	*Primary*	*23*	*Weyerhaeuser*	*Yes*	*Very recent; Productive at creating pool complexity*

Table 3 (continued)
Current Effectiveness of
Large Wood Placement Projects

2003 NWC Surveys

STREAM	REACH	CHANNEL	PEAK SNORKEL COUNT	LAND-OWNER	EFFECTIVE	COMMENT
NF Necanicum Trib A	*1*	*Primary*	*5*	*Weyerhae user*	*Yes*	*Additional LWD recommended, nice dammed pools*
SF Necanicum R	*1*	*Primary*	*29*	*Weyerhae user*	*No*	*Boulders placed in stream. No gravel or pools created*
Upper Necanicum R	*1*	*Primary*	*5*	*State Park*	*No*	*Gabblons placed have eroded around edges, minimal gravel and no pools*
Upper Necanicum R	*2*	*Primary/ Secondary*	*9*	*Longview Fiber*	*Varying*	*Most LWD placed have been buried or washed our*
Volmer Cr	*1 & 2*	*Primary*	*11*	*Weyerhae user*	*Varying*	*Most upper LWD is located in clearcur; no deep pools observed*
Warner Cr	*1*	*Primary*	*20*	*Private*	*Varying*	*Some nice pools; Artifical alcoves are shallow with little complexity*

Priorities for Artificial barriers impeding passage for adult or juvenile coho salmon

The 2003 NWC surveys identified 6 culverts that impede passage for coho. Surprisingly, none of the barriers blocked more than 1 km of coho habitat. Several culvert replacement projects appear to have dealt with the major passage problems in the Necanicum watershed. Table 4 lists the remaining culverts that block coho passage. None are high priority, but are still blocking habitat suitable for coho.

Table 4
Culverts that block coho passage

Culvert	*Stream*	*Comment*
ODOT (Hwy 26)	Unnamed Trib #3	Passable, but in poor condition
ODOT (Hwy 26)	Wolf Creek	No survey above culvert-Denied access
Elementry school	Coho Creek	Design work in process
300 spur road	Klootchie Cr seg II	1st culvert from start of survey
ODOT (Hwy 26)	Alder Creek	Partial Barrier; poor habitat upstream form culvert
Sugerloaf ML	Brandis Creek	Low flow barrier

Discussion and Recommendations

Large Wood Placement

The findings from this study focus our concern on 35 stream reaches. Stream reaches identified were located in small and medium sized streams. Additional surveys in the mainstem Necanicum should be conducted. This will identify potential off-channel LWD placement in larger streams. Specific target areas are in secondary channels and alcoves associated with spring seeps.

There are two maps included in this report. The first map (Appendix A) lists all recommended large wood placement sites for the Necanicum Watershed. This includes habitat survey information from 2003 NWC project season. The map does not include earlier ODFW surveys. Significant overlap exists between the 2003 NWC surveys and previous ODFW surveys conducted during the 1992 summer season. However, the information was collected at different times of year. Additionally, the 2003 NWC surveys were conducted after the 1996 flood where major channel alterations occurred changing stream habitat conditions. The second map illustrates coho presence identified during the winter night snorkel surveys.

During the next year Watershed Council staff should visit all 35 stream reaches with ODFW biologists and landowners to determine the feasibility of LWD placement. The Watershed Council should either remove from the list or give lower priority to stream reaches that are not accessible from roads or where large wood placement would threaten existing structures.

NWC should begin discussions with the Oregon Department of Forestry, Weyerhaeuser and Longview Fibre with the intent of developing OWEB grant proposals for LWD placement in priority stream segments on their land.

It is recommended that NWC habitat survey the entire mainstem Necanicum. The meandering channel dynamics have created additional off channel habitat areas that could be restored with an LWD placement project. During data analysis, the authors found that only a small amount of the ODFW habitat surveys have been conducted in the mainstem Necanicum. Obviously, these surveys will need to be conducted in the summer survey season during low flow conditions. This is mostly due to the large river making surveying impossible during high flow conditions. This information on mainstem habitat conditions may identify additional LWD placement sites in secondary channels and near spring seeps.

Effectiveness of Current LWD Projects

The 2003 NWC surveys identified 17 previously completed LWD placement projects. There were eight (8) projects that were considered effective at increasing pool complexity. There were six (6)

(6) varying effective and the two (2) non-effective LWD placement projects to determine what modifications could improve their status.

Priorities for Artificial barriers impeding passage for adult or juvenile coho salmon

The NWC 2003 surveys identified six (6) culverts that impede fish passage. None have been characterized as high priority, due the limited amount of habitat above the barrier. However, these barriers are blocking habitat suitable for coho.

During the next year ODFW staff should visit all 6 identified barriers and determine what could improve their status. Landowners should be included to address other concerns. Additional culverts should be investigated in the upper reaches in the watershed. Specifically, in stream reaches above coho habitat, but still in cutthroat habitat. This will identify additional culverts that block passage for cutthroat trout.

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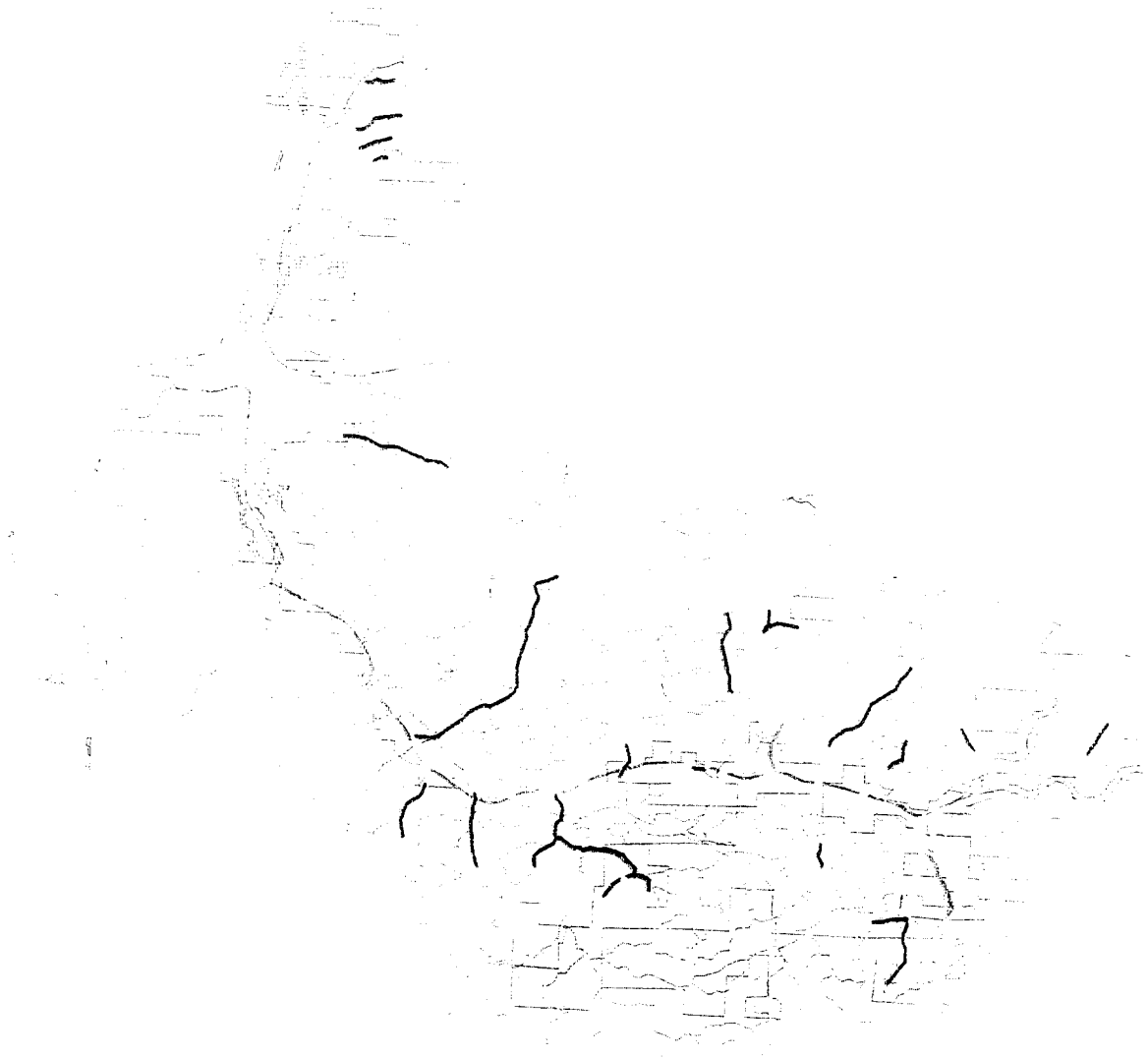
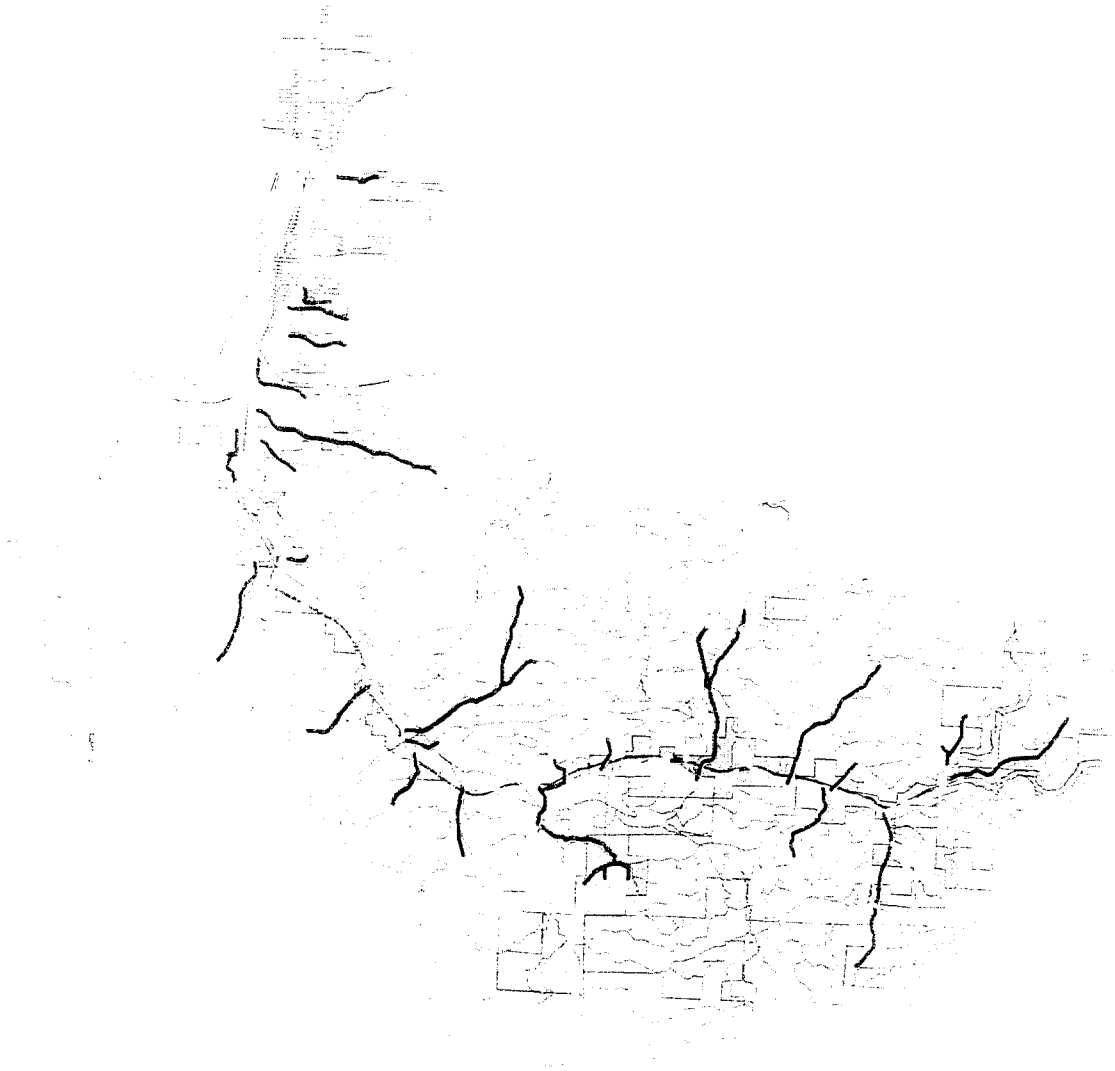
Large Wood Priorities - Necanicum River



Coho Streams - Necanicum River



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