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Project Summary

Project staff utilized the ODFW Aquatic Inventory protocol to assess habitat in selected small, medium, and large sized streams in the Lower Columbia River Watershed Council (LCRWC). The 2009/2010 habitat surveys completed the remaining non-surveyed salmon freshwater habitat streams found within the Lower Columbia River Watershed. Any additional habitat located after the 2009/2010 surveys can be added into the stream summary binder that accompanies this prioritization summary report. In this way, the data binder generated serves as a working document that can be updated and compared to significant changes in stream habitat from either natural or artificial processes.

During the 2009/2010 seasons we surveyed 66 stream reaches in 31 streams totaling 82.89 kilometers (51.39 miles) of habitat.

We identified:

- 45 stream reaches using our 2009/2010 habitat survey data that we believe should receive the priority for Large Woody Debris (LWD) placement
- 15 large stream (> 12m active channel width) reaches using our 2009/2010 habitat survey data that we believe should be investigated for Large Woody Debris (LWD) placement in the secondary channels
- 51 stream reaches using our habitat survey data that we believe should receive priority for Riparian Enhancement
- 30 fish migration barriers that at least partially impede adult and/or juvenile Coho passage

Deliverables developed include a binder that provides detailed habitat survey information on each of the 66 stream reaches.

This project has greatly improved our understanding of where our priorities for habitat restoration and LWD placement should be.

Background

The Lower Columbia watershed is divided into three major Watersheds: Youngs Bay, Nicolai-Wickiup, and the Lower Columbia River Watershed Council boundaries. The Youngs Bay watershed is located south and east from the City of Astoria and is made up of the Youngs, Lewis and Clark, and Klaskanie Rivers. The Nicolai-Wickiup watershed is located just east of Astoria and is made up of Big Cr, Gnat Cr, and several other smaller streams. The furthest east, Lower Columbia River Watershed, is made up of the Plympton Cr, Clatskanie R., and several other smaller streams. These three watersheds basically cover the entire northwest corner of Oregon.

During the last 150 years land management practices have drastically affected the rivers that salmon use. Dike building, logging, water diversions, and road construction significantly reduced the availability of habitat for Coho¹. Road culverts and hatchery facilities can be 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 habitat². 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. During 2005 and 2006, ODFW habitat surveyed 49.4 kilometers (30.6 miles) of streams in the Big Creek watershed. These surveys were conducted during the winter season to gain additional knowledge on winter stream conditions, but due to the large size of the watershed this left an incomplete picture of the habitat conditions for Coho bearing streams within the Nicolai-Wickiup Watershed.

The Lower Columbia River Watershed Council Habitat Assessment Project (2009/2010) was initiated to determine the condition of the habitat in the remainder of the Lower Columbia River watershed councils freshwater streams not surveyed. Specifically, the study was designed to determine:

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

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

- 1) *Stream reaches most suitable for restoration* - stream reaches where LWD placement, riparian enhancement, and/or artificial barrier replacements will increase off channel habitat and hence salmon productivity,
- 2) *Current habitat conditions in streams* – which stream reaches would have a high potential for increasing salmon production, but due to current conditions, the habitat has a low carrying capacity.

In addition, we wished to produce information that could be used by the Oregon Department of Fish and Wildlife (ODFW) as part of their Oregon Plan for Salmon Recovery.

The Oregon Watershed Enhancement Board (OWEB) provided a grant for 3/4 of the cost of the project. The project leader, the Lower Columbia River Watershed Council (LCRWC), Boswell Consultants staff, Knappa H.S students and their teachers (Jeff Skirvin) provided volunteer time for the required 1/4 in kind local match.

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 in the last 10 years;

We found 50 streams covering more than 100 kilometers (62 miles) in the LCRWC 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.

We initiated our first Habitat Assessment project in the Lower Columbia during the winter of 2005. The Youngs Bay Habitat Assessment Project was conducted to begin assessing unknown habitat conditions for restoration project planning. At completion, eighty-seven (87) kilometers (53.94 miles) were surveyed covering thirty-three (33) streams. This left the Nicolai-Wickiup and the Lower Columbia-Clatskanie watersheds to be assessed during the coming years to complete our knowledge of the Lower Columbia restoration priorities.

During 2008 we initiated the Nicolai-Wickiup Habitat Assessment Project to conduct winter habitat surveys on all streams without a completed winter habitat survey by ODFW. A secondary objective was to start resurveying older ODFW habitat surveys that were greater than 10 years old. At completion, forty-one (41) kilometers (25.7 miles) were surveyed covering twenty-seven (27) streams. This left the Lower Columbia River Watershed Council boundaries to be assessed during the coming years to complete our knowledge of Oregon's Lower Columbia restoration priorities from Astoria to Rainier.

In 2009 & 2010, we surveyed the LCRWC boundaries not surveyed by ODFW as a basin survey. The surveys allowed the project staff to record all fish passage barriers and create detailed lists for future project opportunities for in-stream and riparian enhancement.. All three habitat assessment projects together will complete our knowledge on coho habitat and establish where our restoration priorities should be.

Field Surveys

Three, two person survey teams conducted the winter habitat surveys. The Project Leader, provided technical assistance, conducted habitat and snorkel surveys, and coordinated survey

schedules. In addition, ODFW staff provided personnel for assistance with data collection and data analysis. This ensured that the information collected followed similar procedures and methodologies to the ODFW surveys completed.

Survey teams used the 2009 ODFW Aquatic Inventory³ protocol and associated data forms. The project leader and crew had several prior years experience working for ODFW as employees conducting habitat surveys. When inexperienced habitat surveyors were hired, the project leader trained the new surveyors in the same way ODFW trains surveyors each summer prior to the survey season.

The survey teams conducted their surveys during the spring and fall of 2009, and winter and spring of 2010. The survey timing reflects high and medium flow conditions to record habitat information on the streams when the stream's active channel and floodplain can be easily recorded. This allowed for winter habitat conditions to be recorded, which is important for identifying off-channel winter rearing areas for juvenile coho.

The project leader and field staff obtained landowner permission⁴ prior to conducting most surveys. If reasonable efforts could not obtain landowner permission, the surveyors used adjacent properties to complete the needed information or it was skipped. Each survey started at the mouth of the stream or when necessary, at the head of tidewater (if and continued until the stream size or gradient precluded use by Coho or Steelhead. Where landowner access was denied, the survey was started at the next tax lot boundary or at the nearest reach change.

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 (culverts, dikes, etc.). All photos were taken with digital cameras and are stored on the disk that accompanies this report.

Several local schools were involved in this project. The high schools participating in habitat related surveys included: Knappa H.S and several independent interns from the local area. The students involved were sophomore thru senior H.S. students and undergraduate college. These students conducted independent surveys with the project leader in selected study areas. During the initial session, the project leader trained the students to use the ODFW Aquatic Inventory

³ To obtain more specific methods for the habitat surveys conducted refer to Aquatic Inventory Project: Methods for Streams Habitat Surveys 2009. LCRWC and OWEB received assurances from ODFW research staff that habitat surveys produce good results for determining off-channel habitat conditions for restoration project planning.

⁴ Three stream reaches could not be surveyed because landowner permission could not be secured.

survey protocol. The work was completed during weekends and holidays so that the students could actively participate in conducting habitat surveys on the stream.

This type of watershed council/local school cooperation is working successfully in Knappa school districts and the kids really enjoy the learning experience. Future activities for the high school students could be restoration activities or future research studies, such as specifically focusing on watershed processes. A separate class would eliminate any schedule conflicts and over working the teachers who already have a full agenda, even before taking watershed council related field trips.

Data management

The ODFW Aquatic Inventory Project provided computer programs for data entry and analysis. ODFW Access programs were used to generate summary data for each stream reach in the study. The process included:

- 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, riparian project potential, access for industrial equipment)
- USGS topographical map (1: 24 000); detailing the survey attributes (start, end, riparian transects, culvert crossings, etc.)

Data analysis

Large wood placement priority

The report authors have developed a simple and basic system for establishing priorities for LWD placement projects. 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 equations from other prioritizations. We chose to give LWD placement priority to streams that:

- 1) already had Coho present⁵,
- 2) were in a valley wide enough that large wood could create off channel habitat (Valley Width Index [VWI] greater than 2),

⁵ 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.

- 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 and from surveyor observations.

Finally, larger streams with potential off-channel LWD placement potential were identified using the 2009/2010 LCRWC habitat data. The larger streams identified for LWD placement potential were based on the same criteria used for smaller streams, except that the active channel was greater than 12 meters wide.

Riparian Enhancement Priority

The report authors have developed a simple and basic system for establishing priorities for Riparian Enhancement projects. Ultimately, we opted for an approach that was both easy to understand and easy to apply. We chose to give Riparian Enhancement priority to streams that:

- 1) had riparian vegetation dominated by hardwoods, shrubs, or grass.
- 2) recorded low average shade cover (< 70%).
- 3) did not have conifers well established within the riparian zone.
- 4) had current land use practices which could be adjusted to increase shade and/or large wood recruitment.

Stream reaches with an average shade cover greater than 70%, but lacked conifer establishment in the riparian areas were identified as stream reaches with hardwood conversion potential. These streams may have adequate shade, but were lacking the large wood recruitment. The authors understand that the habitat data can be revisited and additional riparian priority lists could be established using a different set of criteria.

Artificial Fish Passage Barriers

Once the 2009/2010 habitat surveys were conducted, the project staff completed an inventory of road stream crossings in the Lower Columbia River Watershed Council boundaries that potentially blocked stream habitat suitable for salmon. They:

1. identified 85 road/stream crossings that appeared on the low gradient streams surveyed.

2. visited all road stream crossings to determine if there was a culvert that appeared to block Coho passage⁶.
3. generated preliminary priorities for culvert replacement based on apparent gradient⁷ of the reach made accessible, area of land drained, fish presence below the culvert, and estimated cost of culvert replacement

In addition, Concrete fish ladders and Earth Dams were another type of artificial barrier that we identified from the completed habitat surveys. These dams were adult and juvenile barriers and blocked valuable fish habitat. Further investigation would be needed during the replacement planning phase to determine the exact purpose of the dams identified.

⁶ This survey did not include an analysis of the blockage. All culverts with a drop of over six inches were considered to have a potential for blocking Coho passage.

⁷ Map reading at best gives only an approximation of actual field conditions.

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 have learned from previous projects that the GIS layers the authors use normally overestimate the length of the low gradient sections of survey streams. This was due to natural gradient barriers, which eliminated some target sites after an initial field visit, or resulted in a shorter than expected habitat survey. At the completion, we found that we had surveyed Sixty-six (66) stream reaches in thirty-one (31) streams totaling 82.89 kilometers (51.39 miles) of habitat.

Priority for Large Wood Placement

Table 1 lists the 45 stream reaches that met our criteria for LWD placement priority during the 2009/2010 survey seasons. In addition, 13 stream reaches met our criteria for LWD placement priority for previously completed ODFW habitat surveys.

Table 1
Stream Reaches Given Priority for
Large Wood Placement
2009/2010 LCRWC Surveys

<u>Stream</u>	<u>Reach</u>	<u>VWI</u>	<u>ACW</u>	<u>KeyLWD</u>	<u>Gradient</u>	<u>Landowner</u>
Adams Creek	1	9	6.3	0.1	1.5	Rural Residential
Clats Trib-Keystone	1	3.7	7.5	0.8	2.5	Rural Residential
Clats Trib-Keystone	2	1.8	5.8	0.5	5.9	Rural Residential
Clats Trib-Little Clats	1	6.6	8.5	0.7	1.7	Private Timber
Clats Trib-Little Clats	2	7	8.8	1.8	1.1	Private Timber
Clats Trib-Little Clats	3	8.5	8	0.5	1.3	Private Timber
Clats Trib-Little Clats	4	4	7	0.3	0.9	Private Timber
Clats Trib-Merril Cr	1	15	5	0	1	Private Agriculture
Clats Trib-Merril Cr	2	3.3	4.3	0.6	3.6	Private Timber
Clats Trib-Perkins Cr	1	16.7	7.8	0	2	Rural Residential

Clatskanie River	11	3.5	7.5	0.5	1.8	Private Agriculture
Clatskanie River	12	8.8	11.5	0.6	2.1	Evenson
Clatskanie River	14	4.3	8.8	0.2	2.3	Rural Residential
Clatskanie River	15	8.3	8.8	0	1.1	Rural Residential
Clatskanie River	16	7	9.6	0	2.3	Rural Residential
Clatskanie River	17	7	8	0.1	0.8	Rural Residential/Timber
Clatskanie River	18	1.9	6.8	0	0.9	Rural Residential/Timber
Conyers Trib A	1	7.3	6.2	0.2	0.8	Rural Residential/Timber
Conyers Trib-West A	1	7	4.5	0	2.7	Second Growth/City
Conyers Trib-West Cr	1	5.5	5.2	0.2	3.6	Second Growth/City
Flume Creek	1	3.8	7.8	0.1	3.6	Rural Residential
Fox Creek	1	2	8	0	0.8	Urban/Rural Residential
Fox Creek	2	4	5.8	0.6	2.7	Rural Residential
Goble Creek	2	4.5	11.7	0.4	4.2	Rural Residential/Timber
Graham Creek	1	23.3	6.2	0	2.4	Rural Residential/Ag
Green Creek	1	3.5	7.5	0.1	1.4	Rural Residential
McBride Creek	1	5.6	7.4	0.2	1.4	Rural Residential/Timber
McBride Creek	2	2	5.7	0.2	5.1	Rural Residential/Timber
Merrill Creek	1	3.5	9.3	0.3	1.2	Rural Residential/Timber
Merrill Creek	2	5	10.4	0.2	0.8	Rural Residential
Merrill Creek	3	4	11.5	0	1.6	Rural Residential/Ag
Nice Creek	1	5	4.5	0.2	3.1	Urban/Rural Residential
Olsen Creek	1	12.3	10.3	0	2.4	Rural Residential/Ag
Plympton Creek	1	20	8.5	0	1.2	Urban/Rural Residential
Stewart Creek	1	17	6.8	0	0.6	Private Agriculture
Stewart Trib-NF	1	5.2	5.8	0.3	2.9	Rural Residential/Timber
Stewart Trib-SF	1	5.5	5.8	0.4	3.7	Private Timber
Tandy Creek	1	20	7.3	0	0.7	Private Agriculture
Tandy Creek	2	10	6	0.1	3.4	Private Timber
Tank Creek	1	6	4.9	0.2	1.9	Rural Residential/Timber
Tide Creek	1	15	11.5	0	0.3	Rural Residential/Ag
Tide Creek	2	8.5	9.5	0.2	0.7	Rural Residential/Ag
Unnamed Trib-Trojan	1	13.5	5.8	0.2	2.8	Rural Residential/Ag
West Creek	1	20	7	0	0.5	Rural Residential/Ag
West Creek	2	13	10	0	3	Rural Residential/Ag

Finally, using surveyor notes from LCRWC habitat surveys, the authors identified LWD

placement priorities for larger streams (active channel width greater than 12.0m).

Table 2 lists fifteen (15) stream reaches that met our criteria for LWD priority for wider channels (greater than 12m) during the 2009/2010 survey seasons. Future projects in these areas should be focused on the secondary channels due to the primary channels width.

Table 2
Reaches Given Priority for LWD Placement in off-channel areas
2009/2010 LCRWC Surveys

<u>Stream</u>	<u>Reach</u>	<u>VWI</u>	<u>ACW</u>	<u>KeyLWD</u>	<u>Gradient</u>	<u>Landowner</u>
Beaver Creek	1	5	13.5	0.1	0.6	Rural Residential
Beaver Creek	2	5	13.5	0.1	0.6	Rural Residential
Clatskanie River	1	6	17.7	0.8	0.6	Private Agriculture
Clatskanie River	2	14	13.5	1	0.9	Private Agriculture

Clatskanie River	3	11.8	13	1.5	1	Private Agriculture
Clatskanie River	4	12	26	0.2	0.8	Rural Residential
Clatskanie River	6	11.2	18.7	1.6	1.3	Rural Residential
Clatskanie River	7	2.7	17.1	1.2	1.7	Rural Residential
Clatskanie River	8	5.1	13.7	1	0.8	Evenson
Clatskanie River	9	2.5	13	0.1	1	Evenson
Clatskanie River	10	7.1	12.7	0.7	1.2	Rural Residential
Clatskanie River	13	6.2	12.8	0.8	1.8	Evenson
Goble Creek	1	4.5	20	0.2	1	Rural Residential
Plympton Creek	2	2.1	12.5	0.8	3.9	Rural Residential
Ross Creek	1	1.5	12	0.6	3.5	Rural Residential

Table 3 lists thirteen (18) stream reaches that met our criteria for LWD priority for previous ODFW habitat surveys.

Table 3
Stream Reaches Given Priority for LWD Placement
 Previous ODFW Surveys

<u>Stream</u>	<u>Reach</u>	<u>Landowner</u>	<u>Access</u>	<u>Comments</u>
Carcus Creek	1	Private Timber	Good	Narrow valley may reduce opportunities
Carcus Creek	2	Private Timber	Poor	Good project potential area
Carcus Creek	3	Private Timber	Poor	Natural Falls ends survey
Conyers Creek	1	Rural Residential	Good	Large/Wide single channel; alcove development
Conyers Creek	2	Rural Residential	Fair	Houses nearby may reduce opportunities
Conyers Creek	3	Rural Residential	Good	Single Channel throughout-power-lines overhead
Conyers Creek	4	Rural Residential	Good	Rural Residential is replaced by forest land
Conyers Creek	5	Private Timber	Fair	Continued Forest land
Goble Creek	3	Rural Residential	Good	Houses nearby may reduce opportunities
Goble Creek	4	Rural Residential	Good	Houses nearby may reduce opportunities
Goble Creek	5	Rural Residential	Good	Houses nearby may reduce opportunities
SF Goble Creek	1	Rural Residential	Good	Houses nearby may reduce opportunities
SF Goble Creek	2	Rural Residential	Good	Houses nearby may reduce opportunities
Miller Creek	1	Private Timber	Good	Recent culvert replaced/Good project potential
Page Creek	1	Private Timber	Good	Recent culvert replaced/Good project potential
Page Creek	2	Private Timber	Fair	Good project potential area
Page Creek	3	Private Timber	Fair	Good project potential area
Page Creek	4	Private Timber	Poor	Good project potential area

Riparian Enhancement Priorities

Table 4 lists the 51 stream reaches that met our criteria for Riparian Enhancement priority during the 2009/2010 survey seasons.

Table 4
Riparian Enhancement Priorities
 2009/2010 LCRWC surveys

<u>Stream</u>	<u>Reach</u>	<u>Veg</u>	<u>Average Shade (%)</u>	<u>Land Use</u>	<u>Recommended Action</u>
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of 180)

Adams Creek	1	M30/C15	62	ST/RR	Conifer planting
Beaver Creek	1	G/D15	36	RR/ST	Conifer planting
Clats Trib-Keystone Cr	1	D30/G	83	ST/RR	Hardwood conversion/planting
Clats Trib-L. Clatskanie	1	D30/M30	58	ST	Hardwood conversion/planting
Clats Trib-L. Clatskanie	2	M30/C30	37	ST	Hardwood conversion/planting
Clats Trib-Merril Creek	1	G/D15	63	HG	Conifer planting
Clats Trib-Merril Creek	2	D30/D15	82	ST	Hardwood conversion/planting
Clats Trib-Perkins Cr	1	D15/G	78	RR	Hardwood conversion/planting
Clatskanie River	1	G/C50	42	HG/YT	Conifer planting
Clatskanie River	2	D30/G	64	AG/LG	Hardwood conversion/planting
Clatskanie River	3	D30/G	66	LG/EX	Hardwood conversion/planting
Clatskanie River	4	D30/M30	69	RR/ST	Hardwood conversion/planting
Clatskanie River	5	D30/M30	58	LG/RR	Conifer planting
Clatskanie River	6	M30/M50	60	ST/RR	Fencing/Conifer planting
Clatskanie River	8	M30/D15	66	ST	Conifer planting
Clatskanie River	12	D50/C90	78	ST	Hardwood conversion/planting
Clatskanie River	14	M30/D15	92	ST	Hardwood conversion/planting
Clatskanie River	15	C30/M30	93	ST	Hardwood conversion/planting
Clatskanie River	16	M30/M15	87	ST	Hardwood conversion/planting
Clatskanie River	17	M30/M15	73	ST	Hardwood conversion/planting
Clatskanie River	18	M30/M15	45	ST	Hardwood conversion/planting
Conyers Trib A	1	D15/M3	70	RR/ST	Hardwood conversion/planting
Conyers Trib-West Tr A	1	D15/D30	80	ST	Hardwood conversion/planting
Conyers Trib-West Cr	1	D15/S	88	ST/YT	Hardwood conversion/planting
Flume Creek	1	C30/M30	76	ST/RR	Conifer planting
Fox Creek	1	G/S	71	UR/WL	Planting/Invasive removals
Fox Creek	2	M30/C50	85	ST/MT	Hardwood conversion/planting
Goble Creek	1	D15/G	55	ST	Hardwood conversion/planting
Goble Creek	2	M30/M15	59	ST	Hardwood conversion/planting
Graham Creek	1	D15/G	44	LG/EX	Conifer planting
Green Creek	1	M30/C50	69	ST/MT	Conifer planting
McBride Creek	1	D15/S	60	ST/RR	Hardwood conversion/planting
McBride Creek	2	D30/S	51	ST	Hardwood conversion/planting
Merril Creek -Deer Is	1	S/D30	54	ST/RR	Planting/Invasive removals
Merril Creek -Deer Is	2	M15/S	40	RR	Planting/Invasive removals
Merril Creek -Deer Is	3	M30/M15	64	RR/ST	Hardwood conversion/planting
Murder Canyon Creek	1	M15/D15	56	RR/ST	Planting/Invasive removals
Nice Creek	1	M15/M15	81	UR/ST	Planting/Invasive removals
Olsen Creek	1	M15	44	RR	Planting/Invasive removals
Plympton Creek	1	D15/G	60	RR/ST	Planting/Invasive removals
Ross Creek	1	D15/D30	40	RR/ST	Hardwood conversion/planting
SF Stewart Creek	1	D30/G	85	ST/GN	Hardwood conversion/planting
Stewart Creek	1	G/D15	55	RR	Planting/Invasive removals
Tandy Creek	1	LG/RR	35	LG/RR	Planting/Invasive removals
Tandy Creek	2	ST	57	ST	Hardwood conversion/planting
Tank Creek	1	D30/M15	64	ST/RR	Hardwood conversion/planting
Tide Creek	1	D30/G	28	HG	Planting/Invasive removals
Tide Creek	2	D30/S	62	RR	Hardwood conversion/planting
Unnamed Trib-Trojan	1	G/D15	51	IN/WL	Planting/Invasive removals
West Creek	1	D15/D30	21	RR	Planting/Invasive removals
West Creek	2	D30/S	38	RR	Planting/Invasive removals

Table 5 lists the 13 stream reaches that met our criteria for Riparian Enhancement priority during the previous ODFW habitat surveys.

Table 5
Riparian Enhancement Priorities
Previous ODFW surveys

<u>Stream</u>	<u>Reach</u>	<u>Veg</u>	<u>Land Use</u>	<u>Recommended Action</u>	<u>Comments</u>
Carcus Creek	1	D30	ST	Hardwood conversion	Potential to increase recruitment
Carcus Creek	2	D30	ST	Hardwood conversion	Potential to increase recruitment
Carcus Creek	3	D30	ST	Hardwood conversion	Potential to increase recruitment
Conyers Creek	1	D30/G	RR	Conifer planting	Needs shade cover & more Conifers
Conyers Creek	2	G/D15	RR	Conifer planting	Needs shade cover & more Conifers
Conyers Creek	3	D15	RR/ST	Conifer planting	Needs shade cover & more Conifers
Conyers Creek	4	D30	RR/ST	Conifer planting	Needs shade cover & more Conifers
Conyers Creek	5	D30	ST	Conifer planting	Needs shade cover & more Conifers
Goble Creek	3	D30/M30	ST/RR	Hardwood conversion	Potential to increase recruitment
Goble Creek	4	G/D15	RR/AG	Conifer planting	Needs shade cover & more Conifers
Goble Creek	5	D30/G	RR/AG	Conifer planting	Needs shade cover & more Conifers
SF Goble Creek	1	S/D30	RR	Hardwood conversion	Needs shade cover & more Conifers
SF Goble Creek	2	D30	RR	Hardwood conversion	Needs shade cover & more Conifers

Artificial Fish Passage Barriers

There are three types of artificial barriers that were identified during the habitat surveys. These included: culverts, fish ladders, and earthen dikes. The twenty-two (22) metal/plastic culverts, six (6) concrete boxed culverts, one (1) dirt filled dike, and one (1) fish ladder listed below are at least partially restricting fish access to valuable stream habitat.

Table 6 shows the completed fish passage priorities identified during the 2009/2010 Lower Columbia River Watershed Council Habitat Assessment project. The information will allow the LCRWC (Lower Columbia River Watershed Council) and ODFW to use the detailed information on Coho habitat to guide future fish passage improvement projects.

Table 6
Artificial Barriers that impede or block Coho passage
2009/2010 LCRWC surveys

<u>Stream</u>	<u>Reach</u>	<u>Barrier</u>	<u>Comments</u>
Adams Creek	1	Metal Culvert	Small unnamed paved County rd
Adams Creek	1	Metal Culvert	Hwy 30, partially blocks fish passage
Clats Trib-Merrill Cr	2	Dirt Fill on farm rd	Poor condition with water spilling over rd
Clatskanie River	15	Metal Culvert	Culvert on small trib w/ off-channel habitat above
Clatskanie River	16	Metal Culvert	Velocity during high flows
Clatskanie River	18	Metal Culvert	Poor condition; undersized and may wash out in coming yrs
Conyers Trib A	1	Metal Culvert	2m drop with at least 110m habitat above on rt trib
Conyers-West A	1	Plastic	Small & undersized w/.5m drop; Good off-channel potential
Flume Creek	1	Metal Culvert	Undersized with water backing up during high flow
Fox Creek	1	Open box-Concrete	Hwy 30 road/stream crossing; Very long (>300m)
Fox Creek	2	Open box-Concrete	Private Drive; flows over shallow concrete chute
Graham	1	Open box-Concrete	1/2 buried with gravel;believe this causes back-up
McBride Creek	1	Open box-Concrete	Hwy 30 and rail rd crossing; Long (>80m)
McBride Creek	1	Metal Culvert	Poor condition, undersized w/ a 1.1m drop
McBride Creek	1	Metal Culvert	Poor condition, undersized w/ a .5m drop
Merrill Cr-Deer Is	1	Metal Culvert	Undersized with water backing up during high flow
Nice Creek	1	Metal Culvert	Long (>200m) and goes under park & tennis courts
Nice Creek	1	Open box-Concrete	Hwy 30 road/stream crossing; H2O backing up w/ blackberries
Olsen Creek	1	Double shotgun	Hwy 30 road/stream crossing; Undersized
Olsen Creek	1	Open box-Concrete	Undersized with water backing up during high flow
Ross Creek	1	Metal Culvert	Hwy 30 road/stream crossing; Undersized
Stewart Trib-NF	1	Metal Culvert	Undersized w/ .5m drop
Tandy Creek	1	Metal Culvert	Buried with silt/brush, backs up water
Tank Creek	1	Double shotgun	Mayger road; Undersized & high velocity during high flows
Tank Creek	1	Metal Culvert	Old abandoned road; Undersized & high velocity
Tank Creek	1	Metal Culvert	County road; No jump pool
Tide Creek	1	Metal Culvert	Farm rd #1-Plugged-Debris/Algae bloom/Historic Channel
Tide Creek	1	Metal Culvert	Farm rd #2-Plugged-Debris/Algae bloom/Historic Channel
Tide Creek	1	Dirt Fill on farm rd	Completely buried/Water being diverted east along Hwy 30
Unnamed-Trojan	1	Double shotgun	Entrance rd Trojan/Poor condition & undersized/Plugged
Beaver Creek	3	Bedrock Falls	20m drop w/large plunge pool below
Tide Creek	3	Bedrock Falls	Large 7.5m drop w/ two large deep pools below
Green Creek	2	Bedrock Falls	2.5m drop w/gradient increase
Goble Creek	2	Falls/Fish Ladder	Fish ladder was passable, but plugged with debris

Discussion and Recommendations

Large Wood Placement

The findings from this study focus our concern on 60 stream reaches. There are 45 stream reaches identified in small and medium sized streams and 15 stream reaches identified for potential off-channel LWD placement in larger streams (>12m ACW). In addition, 18 stream reaches were identified for LWD placement from previous ODFW habitat surveys.

There is one map included for LWD priorities. The first map (Appendix A) lists recommended large wood placement sites for the 60 reaches identified during the 2009/2010 winter habitat surveys and the 18 reaches from previous ODFW habitat surveys. These priorities were generated from a previous ODFW surveying effort. In addition, the map identifies areas not recommended for large wood placement within the areas surveyed by the watershed council or ODFW.

During the next few years Watershed Council staff should visit all 78 stream reaches with ODFW biologists and landowners to determine the feasibility of a LWD placement project. 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. Consequently, stream reaches where artificial barriers are blocking access should not receive an LWD project until downstream barriers are improved.

LCRWC should begin discussions with the Oregon Department of Forestry, Evenson, Longview fibre, and other landowners with the intent of developing OWEB grant proposals for LWD placement in priority stream segments on their land.

Riparian Enhancement Priorities

The 2009/2010 LCRWC surveys identified 51 stream reaches that have good riparian enhancement potential. In addition, using previous ODFW survey data we identified thirteen (13) reaches for potential riparian opportunities. There was one map included for Riparian priorities with two types of riparian projects identified (Appendix B). These included: hardwood conversion and conifer planting. Hardwood conversion projects would help establish conifers in hardwood dominated riparian areas. The objective for the potential project would be to increase large wood recruitment in future years. Secondly, the conifer planting projects would be in riparian areas lacking shade cover. The poor shade cover has usually occurred where the land use is from rural residential, agriculture, or urban. Both types of riparian improvements recommended here, are important for the restoration of the Lower Columbia River Watershed Council boundaries. The degraded riparian areas identified are all located on freshwater Coho bearing streams. The lack of large wood recruitment is a significant limiting factor to improving winter rearing habitat for juvenile Coho.

During the next few years LCRWC, Oregon Department of Forestry (ODF), and ODFW staff should visit the recommended reaches with riparian enhancement potential to determine the feasibility to conduct a project.

Artificial Fish Passage Barriers

The 2009/2010 LCRWC surveys identified thirty (30) artificial structures that are at least partial fish passage barriers. Each structure varies on the amount of available habitat above the barrier. However, all have some valuable habitat which is currently inaccessible to Coho. Impassable stream crossings at the end of the habitat surveys were not included in table 4, if the habitat above the culvert was not suitable for at least resident cutthroat trout.

During the next few years LCRWC and ODFW staff should visit the twenty-two (22) culverts, six (6) concrete boxed culverts, one (1) dike, and (1) fish ladder to determine the feasibility to conduct a project. There is one map included for artificial barriers for the 2009/2010 surveys (Appendix D).

Past and Future Lower Columbia River Habitat Surveys

The authors for this report have made significant progress at understanding the current habitat conditions and restoration priorities through conducting surveys within the Lower Columbia Basin from 2005 to 2010. Through multiple OWEB grants and Columbia Estuary Study Task Force (CREST) contracts we have surveyed over 211.443 km (131 miles). The information has helped planners implement many stream restoration projects around the area.

The Youngs Bay Habitat Assessment Project was our first effort in the Lower Columbia basin. We focused on all small, medium, and large streams within the watershed council boundaries. During the 2005 season we surveyed 83 stream reaches in 33 streams totaling 87.112 kilometers of habitat. The completed surveys and priorities recommended have helped CREST and watershed council planners to implement several on-the ground restoration projects such as the Wallooskee River LWD placement project.

Our second effort was the 2008 Nicolai-Wickiup Habitat Assessment project. In this project, we completed fifty-one (51) stream reaches in twenty-seven (27) streams totaling 41.441 kilometers (25.7 miles) of habitat. This project allowed us to complete a habitat survey on all coho bearing freshwater streams that previously had no survey. In addition, this study took place immediately after the Great Coastal Gale storm of Dec. 2007. This storm event left enormous blow-down areas adding large woody debris to the landscape. Therefore, the 2008 surveys can be used as baseline data sets for monitoring the future changes to the stream environment in response to this remarkable storm.

During 2009/2010, we completed sixty-six (66) stream reaches in thirty-one (31) streams totaling 82.89 kilometers (51.39 miles) of habitat. We identified 30 fish impediment barriers on road/stream crossings and recommended other possible enhancement activities. This most recent project allowed us to complete habitat surveys on all remaining freshwater streams that previously had no survey.

The surveys can be used as baseline data sets for monitoring the future changes to the stream environment in response to this future adverse weather conditions. The ODFW Research Lab (Aquatic Inventories Project) will now begin working to incorporate all completed ODFW habitat surveys and all completed watershed council habitat surveys to summarize our knowledge of the habitat conditions for the entire Lower Columbia River basin.

Forestry Class-Knappa High School Participation

The Knappa High School Forestry Class was a successful community outreach project involving local students in watershed research within the Lower Columbia River Watershed Council watershed. The class teachers, Jeff Skirvin and Todd Boswell, helped incorporate this learning experience into a class where most students received science credit from the high school. The Principal was very supportive, providing school bus transportation to the survey areas, and helped with student recruitment for the class. The feedback from students was overwhelmingly positive, and all agreed that more such learning opportunities should be available.

Both Jeff and Todd concur that such a class should be continued in the future, and should be incorporated into future restoration project proposals within the Lower Columbia River Basin whenever possible. This will provide a great alternative learning experience in salmon recovery efforts for the high school students, which is lacking in many Oregon high schools. Additionally, the Astoria High School Applied Science Center could be used as a focal point for more involved student research, allowing kids to work with students from other area schools, as well as incorporate a variety of natural resource issues faced in Northwest Oregon.

Overall Habitat Conditions in the Lower Columbia River Watershed Council

Using both the previous ODFW habitat surveys and the 2009/2010 watershed council surveys we estimate there is a total of 102 kilometers (63.24 miles) of coho freshwater habitat within the study area. In conclusion, the 2009/2010 project has provided a baseline data set for the current habitat conditions for coho bearing streams within the Lower Columbia River Watershed Council Boundaries. This information provides an essential tool to guide future restoration work by a variety of interest groups including: city councils, watershed and other non-profit groups, state and federal agencies, and private landowners. All of which have a vested stake in local salmon recovery efforts.

The authors have used statewide benchmarks to establish priorities for guiding future restoration work in this report. From this process, we have identified 82% of mainstem habitat as falling below the desirable benchmarks for in-stream complexity and were, therefore, deemed as high priority areas for LWD placement and/or off-channel habitat enhancement activities.

Additionally, 74% of riparian habitat has also been identified as high priority areas for riparian enhancement activities. The percentages of surveyed habitat requiring improvement within the LCRWC basins illustrate the lack of critical stream characteristics needed for a healthy watershed ecosystem. The authors hope this report will provide an overview of the landscape and will allow planners to focus their restoration activities in the areas with the greatest potential for recovery.

Future Applications for the LCRWC Habitat Data

The habitat data collected for this report will help guide stream restoration activities including: LWD placement, riparian enhancement, and fish passage replacements. A variety of interest groups should be contacted and given the opportunity to acquire the habitat data generated from this project and previous ones. The authors plan to communicate with several agencies including: ODFW-Tillamook & Clackamas Districts, ODFW Corvallis Research Lab, ODF-Astoria District, Columbia Soil & Water Conservation District, and local timber companies. These

agencies and any other individuals reading this report should pass the information to any individuals or organizations seeking to implement projects within the priority areas.

There is a number of outreach activities that would help ensure the habitat information provided in this project is effectively used to plan for future projects. The watershed council should review the priority lists generated and place a highest priority designation to the areas recommended where good landowner relationships have already been developed. Secondly, identify the areas where council action plans have already started projects within the basin to develop an approach of connecting habitat restoration projects to increase overall habitat carrying capacity. Finally, all timberlands should incorporate any future timber sales with an in-stream component if the harvest is located near any recommended reach. The authors believe this type of proactive approach will aid in reducing the time it takes for on-the-ground projects to be implemented for the Lower Columbia watersheds.

There are also various research applications that the habitat data can be used for. Now incorporating all of the habitat data from the ODFW research lab, the 2005 Youngs Bay Habitat Project, 2008 Nicolai-Wickiup Habitat project, 2009/2010 Lower Columbia River Watershed Council Habitat Project could be used to apply various statistical models to gain additional information on habitat deficiencies within specific sub basins. For example, the ODFW Coho Smolt Carrying Capacity Model may be a useful tool to apply to this data set for the Lower Columbia River basin. From this, we may gain a better understanding on the amount of coho smolts the current habitat conditions can support.

Incorporate the findings from our current and past surveying efforts with the recently completed Lower Columbia River Recovery Plan. This recovery plan addresses several action plans and focuses that our habitat studies should aid in future project planning to implement the recovery plan priorities. We are excited that the recently completed plan will be another tool to be used in conjunction with the habitat assessments to improve fish habitat and fish populations with the Lower Columbia Basins.

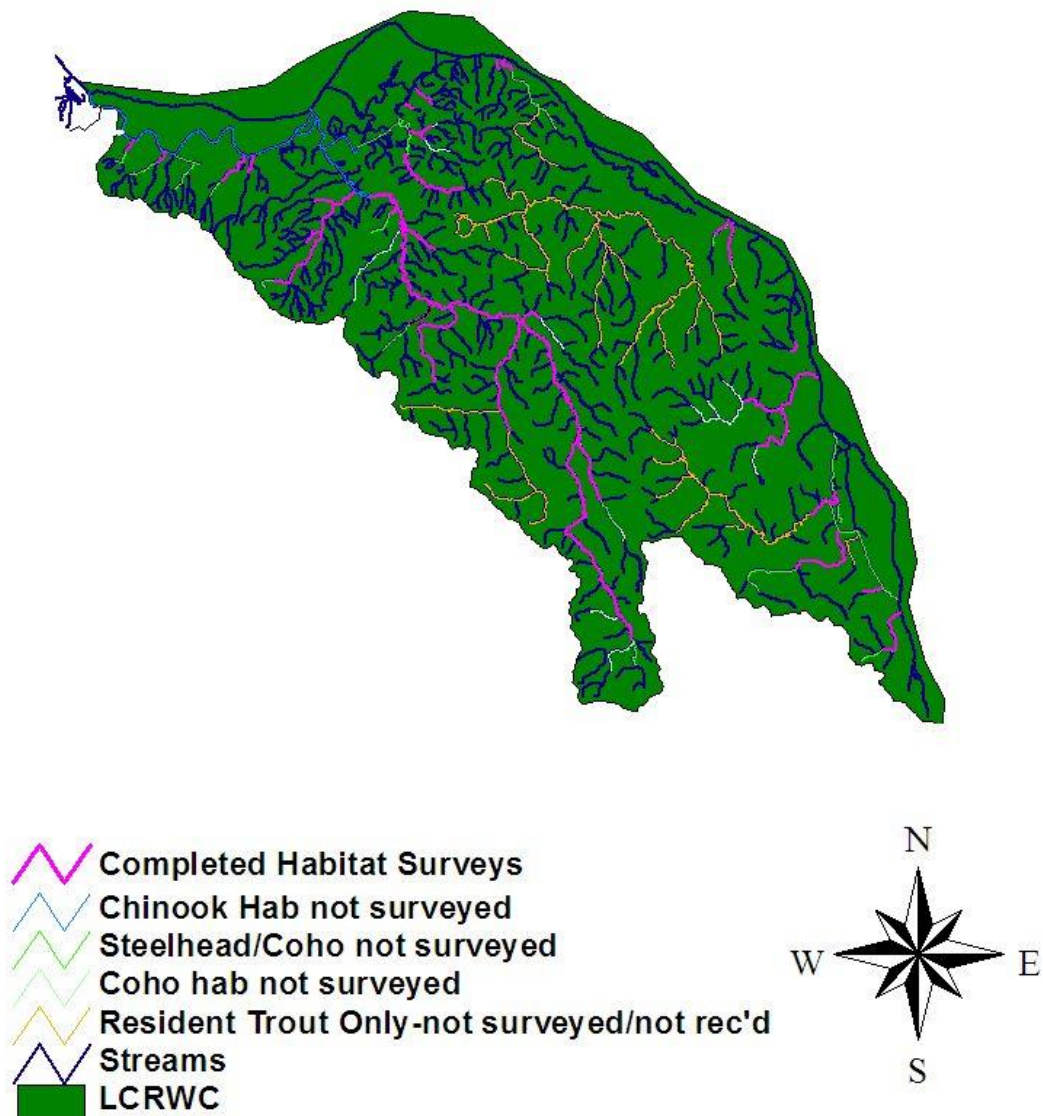
These projects described above are just a few examples of using a variety of planning and research techniques to further the knowledge gained from the recently completed habitat surveys. The authors now have completed a unique habitat data set for the entire Lower Columbia Watershed (Astoria to Deer Island). This information will not only help guide future restoration projects, but also provide additional research questions that can be explored.

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Appendix A

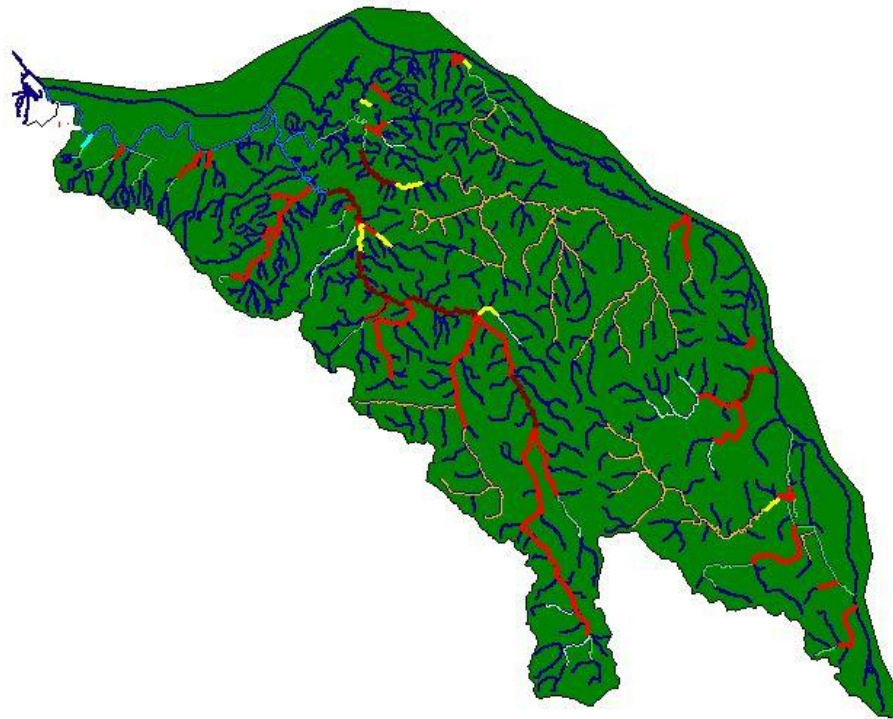
Lower Columbia River Watershed Council Coho Habitat Surveys



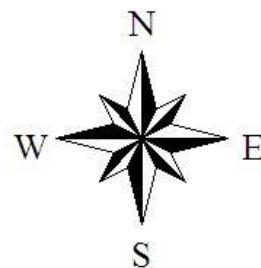
Appendix B

Lower Columbia River Watershed Council

Recommended LWD Priority Reaches

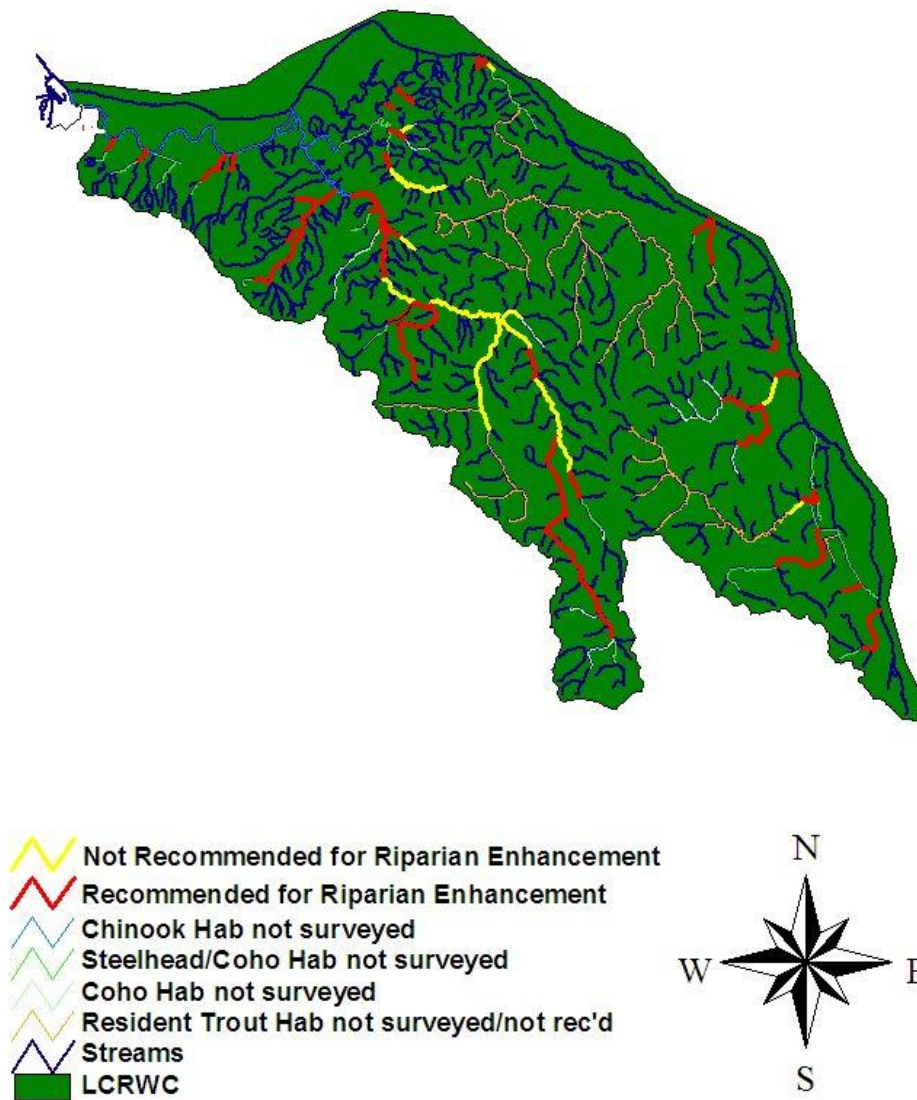


-  Not Recommended for LWD
-  Recommended for LWD small & medium streams
-  Recommended for LWD large streams >12m ACW
-  Chinook Hab not surveyed
-  Steelhead/Coho not surveyed
-  Coho hab not surveyed
-  Resident trout hab not surveyed/not rec'd
-  Streams
-  LCRWC

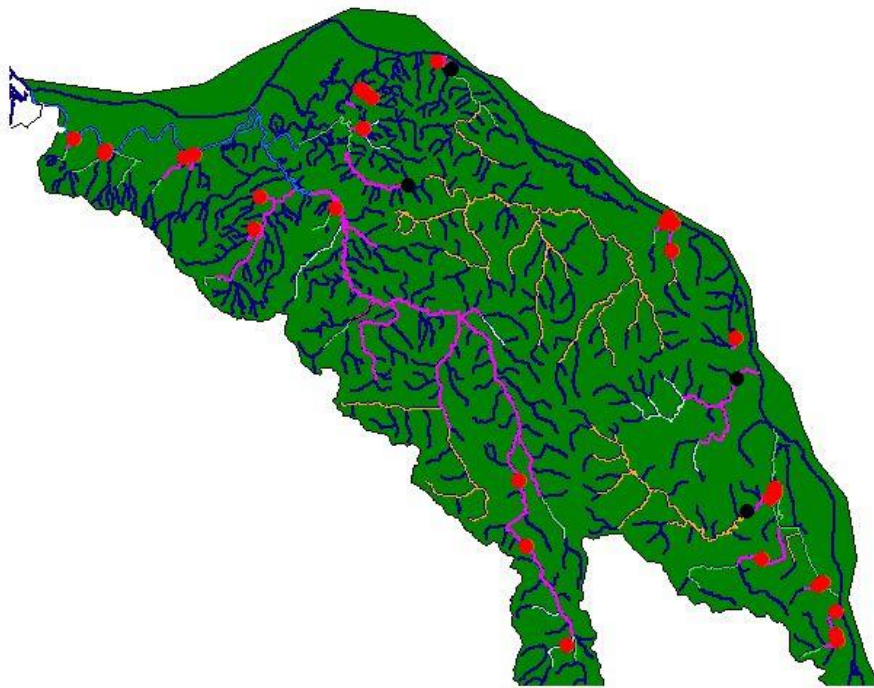


Lower Columbia River Watershed Council

Recommended Riparian Priority Reaches



Lower Columbia River Watershed Council Fish passage Barriers



- Natural Barrier
- Artificial Barrier
- Coho Habitat Surveyed Streams
- Chinook Hab not surveyed
- Steelhead/Coho Hab not surveyed
- Coho Hab not surveyed
- Resident Trout Only-not surveyed/not rec'd
- Streams
- LCRWC

