


SCAPPOOSE BAY STATE OF THE WATERSHED

2014

Project supported by a grant from the BLM






Scappoose Bay WATERSHED COUNCIL

Table of Contents

List of Figures

Note: Most of the figures used in this document originally appeared in or were modified from the following sources: “A Comprehensive Assessment of Fish Passage Barriers in the Scappoose Bay Watershed,” “Duck Lake Wetland Restoration Baseline Data Collection & Restoration Alternatives Summary,” “Honeyman Creek Tidal Restoration Scappoose Bay Watershed Council Final Project Report Report,” “Limiting Factors Analysis and Restoration Plan - Scappoose Creek Watershed,” “Limiting Factors Analysis and Restoration Plan - Milton Creek 6th Field of Scappoose Bay,” “Results of Vegetation Community Composition Monitoring on Hogan Ranch,” “Scappoose Bay Bottomlands Restoration Plan,” “Scappoose Bay Watershed Assessment,” “Scappoose Bay Watershed Water Quality Monitoring Report 2008–2010,” “Water Chemistry and Depth Monitoring of Hogan Ranch Restoration Sites,” “South Scappoose Creek Restoration Plan,” and Scappoose Bay Watershed Council LiDAR and other files.

List of Tables

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List of Acronyms

BLM	Bureau of Land Management
BPA	Bonneville Power Administration
CCET	Columbia County Economic Team
CRYC	Columbia River Youth Corps
DEA	David Evans and Associates, Inc.
DEM	Digital Elevation Model
DEQ	Oregon Department of Environmental Quality
DLGs	Digital Line Graphs
DO	dissolved oxygen
EPA	Environmental Protection Agency
HUC	hydrologic unit code
GIS	geographic information system
LCEP	Lower Columbia Estuary Partnership
LFA	Limiting Factors Analysis
LiDAR	Light Detection and Ranging
LWD	large woody debris
MPN	most probable number
NTU	nephelometric turbidity units
ODFW	Oregon Department of Fish and Wildlife
OPRD	Oregon Parks and Recreation Department
OWEB	Oregon Watershed Enhancement Board
PLSS	Public Land Survey System
RBA	Rapid Bio-Assessment
RC	reed canary grass
SBWA	Scappoose Bay Watershed Assessment
SBWC	Scappoose Bay Watershed Council
SIWA	Sauvie Island Wildlife Area
TIN	triangulated irregular network

Executive Summary

This report follows from the Scappoose Bay Watershed Assessment (SBWA) (David Evans and Associates, 2000). It describes the current state of the watershed based on the past 14 years of restoration and data collection efforts, and reviews what has been done with respect to the SBWA. This report can be used as a reference to understand current watershed conditions and is a foundation for supporting the Scappoose Bay Watershed Council (SBWC) in developing new priorities and establishing appropriate directions for project development.

The major pieces of the SBWA are reviewed in Section 1 and include the following:

- Baseline, historical, and physical information
- Assessments of fisheries, watershed processes, habitat, and water quality conditions
- Recommendations for addressing data gaps and establishing priorities

The SBWA also contains a number of maps and tables that present data and analysis of key watershed characteristics; some of those are included is this report to provide context.

Section 2 describes the major studies that have been completed since the SBWA was published, as well as significant monitoring and natural resource data that have been collected. An assessment of the fish passage barriers in the watershed was completed in 2001. This assessment reviewed over 100 barriers, prioritizing them according to whether they were complete or partial, and then prioritizing by both sub-watershed and a habitat index to account for total stream length above the passage that would be opened, fish distribution, and upstream refugia. Restoration plans for the Scappoose Bay Bottomlands and South Scappoose Creek present conservation strategies for two significant natural areas in the lower reaches of the watershed. Limiting Factor Analyses were done for both Scappoose and Milton Creeks. These studies provide significant details on stream processes and habitat conditions, as well as a prioritized list of restoration activities. Lack of instream wood and reduced channel complexity were two of the major limiting factors for salmon recovery in these streams.

Monitoring and natural resources data are discussed in **Error! Unknown switch argument.**. Water quality monitoring data is available from nine stations sampled in 1998 and from 27 sites sampled in 2008 and 2009. Data from five stations sampled during both periods were compared; the results show a slight reduction in both maximum temperature and number of days exceeding 64°F. Rapid Bio-Assessments done by the Oregon Department of Fish and Wildlife profiled spawning destinations, barriers, and site-specific information along 12 streams covering a total of 57.6 miles. Additional monitoring conducted in the watershed includes vegetation surveys on a major restoration project at Hogan Ranch in Scappoose Bay

Bottomlands, LiDAR data collection that created detailed surface maps, fish monitoring at Bonnie Falls, and a 2011 amphibian survey.

The SBWC has completed a significant number of in-field projects since the SBWA was conducted in 2000. These are organized and described by project type in Section 4, with a few of the major ones highlighted with images and greater detail. Forty-six fish passage barriers were corrected through dam and culvert removals, and other barrier improvements. All but two of the barriers that ranked in the top 20 have been corrected, and 29 of the barriers that ranked in the top 40 have been corrected.

Major instream process improvement projects were done at the confluence of North and South Scappoose Creeks, on Gourlay Creek, and along South Scappoose Creek. A significant project to install large wood on 3.2 miles of Milton Creek has been designed and submitted as a proposal for funding in 2015 from the Oregon Watershed Enhancement Board. The number of riparian enhancement and native plant restoration projects has increased significantly in recent years and is supported by a native plant nursery that the SBWC runs.

Section 5 discusses the accomplishments and challenges of SBWC's work since the publication of the SBWA, with respect to the document's recommendations. The SBWA identified data on fish passage barriers as a major gap. In response, the SBWC produced a major study of the barriers in 2001 and has corrected 46 of the most significant barriers. Water quality and other monitoring have increased the understanding of habitat conditions, and riparian restoration or "low risk" projects have been implemented as recommended by the SBWA.

The challenges are still significant, primarily with protection issues and specifically with protection of the highest priority refugia areas, including Scappoose Bay Bottomlands. The Hogan Ranch protection and restoration project demonstrates a success in this area, but a large number of acres need additional attention. In-use flow, erosion potential from county and private roads, and additional restoration project activity all require additional efforts, based on the SBWA recommendations.

Potential future priorities of the SBWC are addressed in Section 6. Unmet needs are reviewed, along with considerations for local and regional conservation plans, population and development pressures, and the larger watershed that includes Sauvie Island and Multnomah Channel. These elements provide information and opportunities the SBWC can use to help direct its efforts now and in the future.

Finally, current proposals that the SBWC has either completed or that are nearing completion are described, and additional funding directions are discussed.

SECTION 1

Scappoose Bay Watershed Assessment Review

This section describes the key elements of the “Scappoose Bay Watershed Assessment” (SBWA), produced in 2000 by David Evans and Associates, Inc. (DEA), as contracted by the Scappoose Bay Watershed Council (SBWC). The goal of the study was to develop a broad foundation for effective restoration activities within the watershed, following the guidelines of the Oregon Watershed Enhancement Manual (WPN 1999).

Background: Baseline, Historical, and Physical Information

The SBWA created and compiled a significant body of information serving as a baseline for future restoration projects. This information included:

- Geographic information system (GIS) data detailing the watershed area and stream miles, using the analysis of multiple digital elements such as DEMs (Digital Elevation Models), DLGs, (Digital Line Graphs) U.S. Geological Survey 7.5-minute quadrangles, PLSS (Public Land Survey System), and others. Four distinct base maps were produced: (1) a large scale (1:24,000) topographic map, (2) a large scale (1:24,000) orthophotographic map (black-and-white aerial photo coverage), (3) a summary base map at 11”x17” for use in the report, and (4) a summary base map with five sub-watersheds shown. Figure 1-1 shows the summary base map.
- Historic habitat conditions and an environmental history detailing changes that have occurred in the three major ecological communities: lowland floodplain, prairie, and forest.
- Classification of channels by geomorphic type using features such as gradient, flow size, confinement, and estuarine influence. Figure 1-2 shows the watershed, which consists of five major sub-basins, with the following features:
  - The upper watershed dominated by high gradient, confined, and small streams
  - The main stem reaches in the valleys with low gradients and both unconfined and confined reaches
  - The lower watershed with low gradient, unconfined estuarine channels

- Channel modification and stream alterations: A channel modification map delineates major diked areas, and the effect of log drives and splash dams in Milton Creek was described (see Figure 1-3). The largest channel modification appears to be the routing of Jackson Creek into Joy Creek south of Scappoose. Although most stream systems in the upper valleys have not been modified, clearing the valley floodplains and channels of large wood jams has greatly reduced habitat functions.

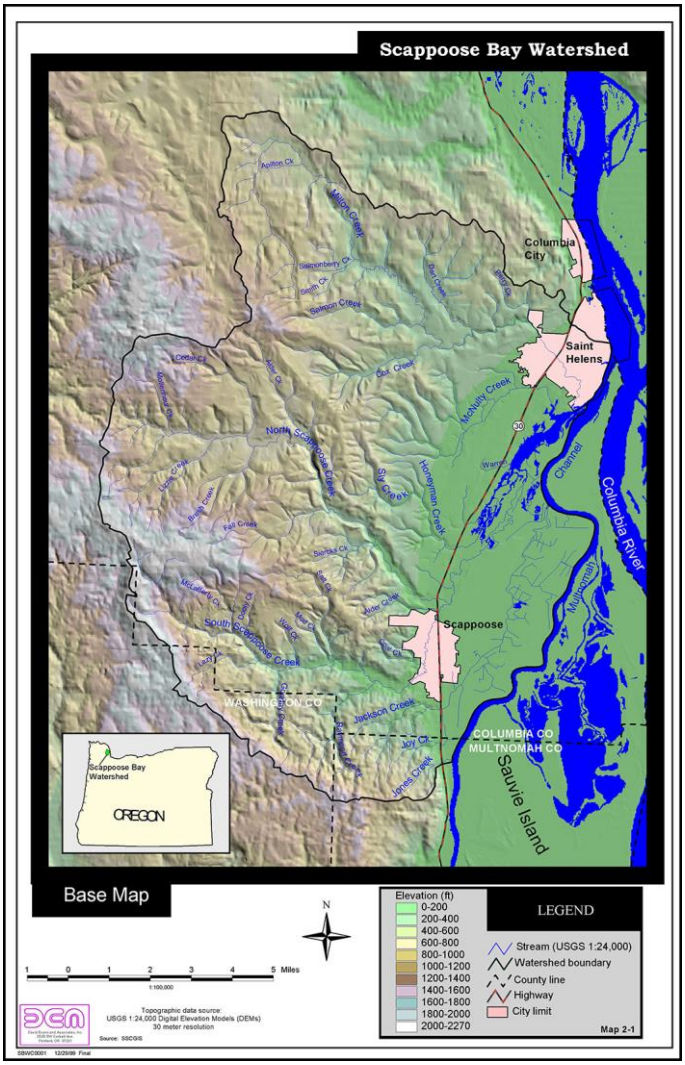

Figure 1-1. Base map of the Scappoose Bay watershed.

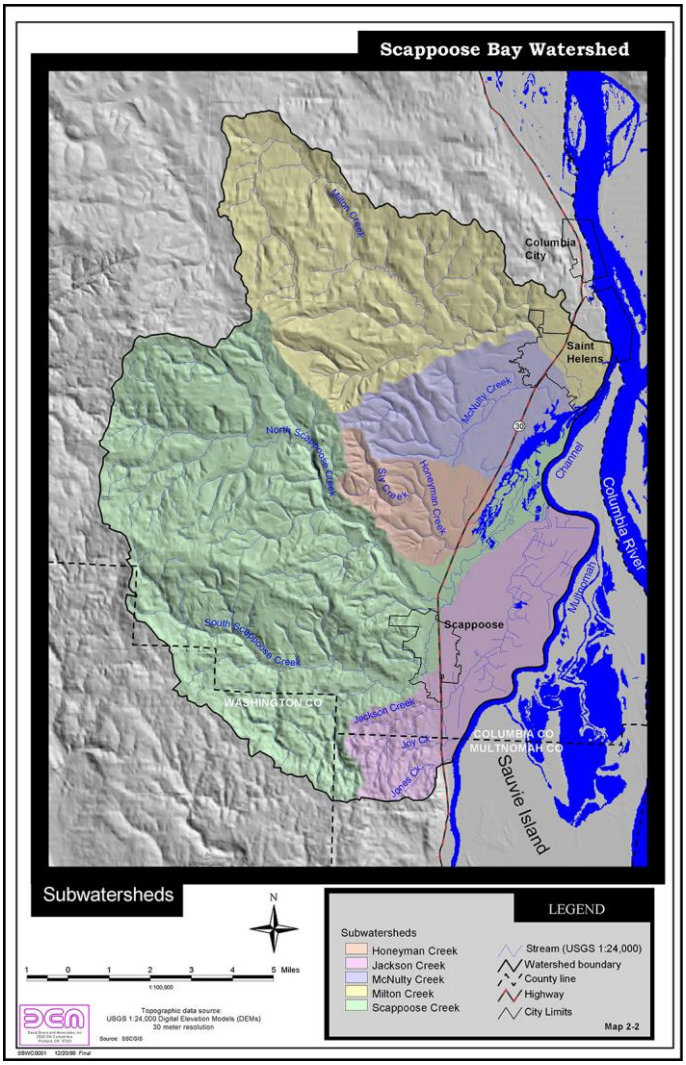

Figure 1-2. Sub-watersheds of the Scappoose Bay watershed.

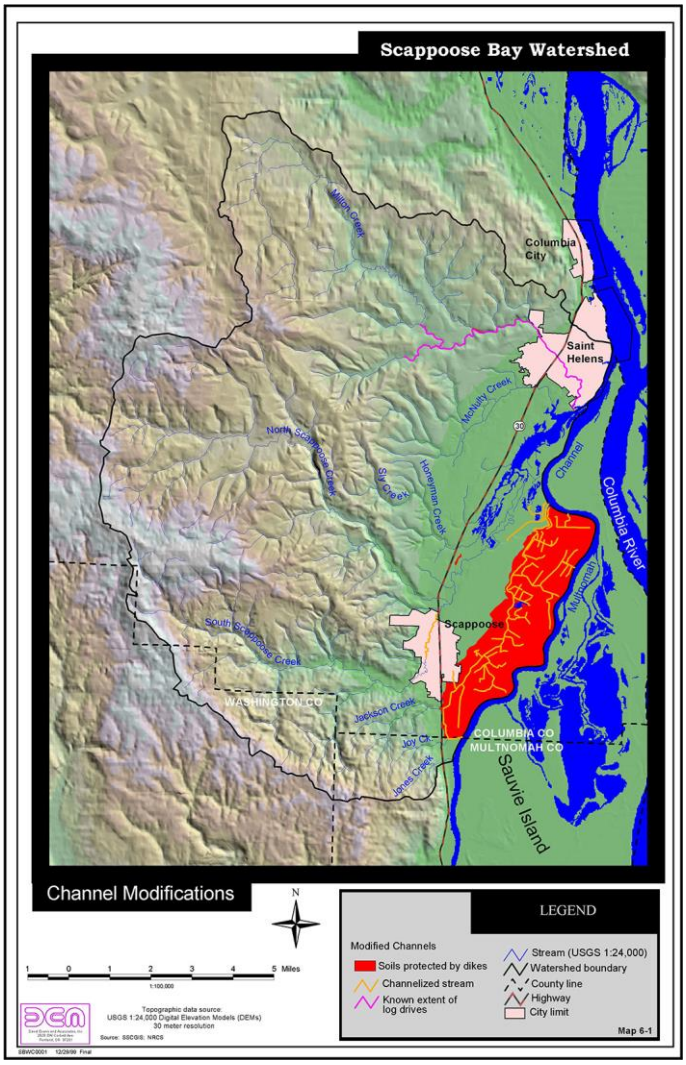

Figure 1-3. Channel modifications of the Scappoose Bay watershed.

Summary

- Scappoose Bay watershed encompasses 85,000 acres with 276 stream miles. A majority of the stream miles are confined or moderately confined, with low to moderate gradients (see Table 1-1).
- European settlement and exploitation in the watershed, including trapping, logging, gravel mining, dairy and small farming, residential and commercial development, and water withdrawal, have greatly altered the natural landscape.
- Significant channelization and diking have reduced the natural flooded area, and large woody debris (LWD) and sediment have been drastically reduced in the upper valleys. A highlight is a relatively intact and important area at the south end of Scappoose Bay.

Table 1-1. Acreage, Stream Miles, and Channel Characteristics for Sub-Basins of the Scappoose Bay Watershed

Sub-Basin Acres and Stream Miles

	ACRES	MILES	TOTAL MILES
Milton Creek	21,561	60	22%
McNulty Creek	7,696	20	7%
Honeyman Creek	4,573	12	5%
Scappoose Creek	40,663	141	51%
Jackson Creek	10,592	43	15%
TOTAL	85,085	276	100

Channel Confinement

	MILES	TOTAL MILES
Confined	157	57%
Moderately Confined	91	33%
Unconfined	28	10%

Channel Gradient

	MILES	TOTAL MILES
Low (0 to <4%)	157	57%
Moderate (4 to <16%)	103	37%
High (>16%)	16	6%

Impact Assessments: Fisheries, Watershed Processes, Habitat, Water Quality, and Watershed Condition

Assessments were done for fisheries resources, sediments, riparian and wetland conditions, water quality, and water use. Additionally, major salmonid refugia were identified, and four major stream classification types were determined from geomorphic type and potential fish use characteristics.

Historic and existing salmonid species distribution was mapped using several sources, including interviews with local residents (see Figure 1-4). In addition to a significant reduction in species diversity, a major change from historical is the loss of fall chum occurring in Milton Creek and possibly other streams. Potential species distribution based on species' stream habitat use, and natural and artificial fish barriers (limited information available), was also mapped.

Potential surface erosion areas, potential unstable slopes, and potential and actual bank erosion areas were classified and identified based on GIS soils, slope, and erosion hazard maps and other methods. The western two-thirds portion of the watershed contains a significant portion of slopes with a moderate or high potential for surface erosion when disturbed, and when combined with a high density of roads, these areas may be a significant source of sediment.

Aerial photographs were used to assess the riparian zone condition for mapped streams, and reaches were classified as grass/forb cover, shrub/partial forest, or forest. Shrubs or scattered trees along the streambanks dominate the current riparian vegetation—a significant change from the historical forested conditions, particularly in the upper watershed (see Figure 1-5).

A review of the limited available water quality monitoring data suggests potential water quality problems from excessive temperatures in the tributaries, and dissolved oxygen and waste concentration in Scappoose Bay. No significant stream flow data has been collected, but water rights by use were mapped indicating potential over-allocation for natural stream flow (see Figure 1-6).

Milton and Scappoose Creeks were identified as key sub-watersheds for potential refugia, because they are used by coho, steelhead, and cutthroat trout and have the largest amount of intact habitat (see Figure 1-7).

Although relatively small, the Scappoose Bay watershed has previously supported five Pacific Northwest salmonid species and contained a diversity of habitats. Watershed degradation has resulted from a complexity of sources, including agriculture, forestry, and development. Salmonid decline due to habitat loss, hatchery introductions, and harvest has also been compounded by factors beyond the local watershed, including shifting ocean conditions.

To document habitat factors, an assessment of the amount of change from historic to existing conditions was done for both stream habitat types and habitat productivity by species' life history per stream type (see Table 1-2 and Table 1-3). The SBWA discusses stream types, historic fish habitat value, impacts, and loss of habitat. The major stream types include the following:

- **Tributaries—primarily small headwater stream segments**. Have low summer flows and high gradients, and support cutthroat trout but likely provide little salmon habitat.
- **Larger tributaries and main stem streams**. Generally confined within ravines with low or moderate gradients. They are considered transport reaches and have been impacted by loss of LWD, forested riparian zones, and water withdrawals.
- **Valley floodplain streams**. Have historically provided the bulk of salmon habitat for coho, steelhead, chum, cutthroat, and chinook. They are highly sensitive to changes in wood, water, and sediment supply and have had major impacts through the loss of LWD, bed scour and bank erosion, and pools filling with sediment.
- **Estuarine channels**. Located less than 20 feet above sea level, these channels were influenced by annual flooding and were sinuous, with low gradients. Most critical as rearing and habitat for Chinook and chum, these channels have been impacted by conversion from wetlands to agriculture with increased diking, channelization, and flow diversions.

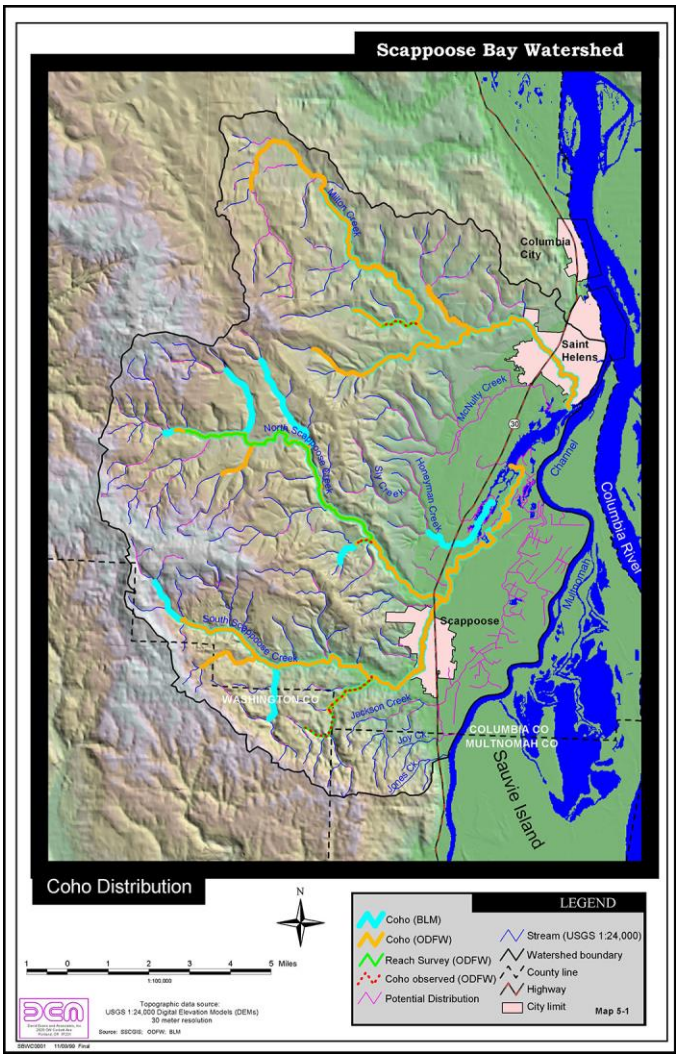

Figure 1-4. Coho distribution.

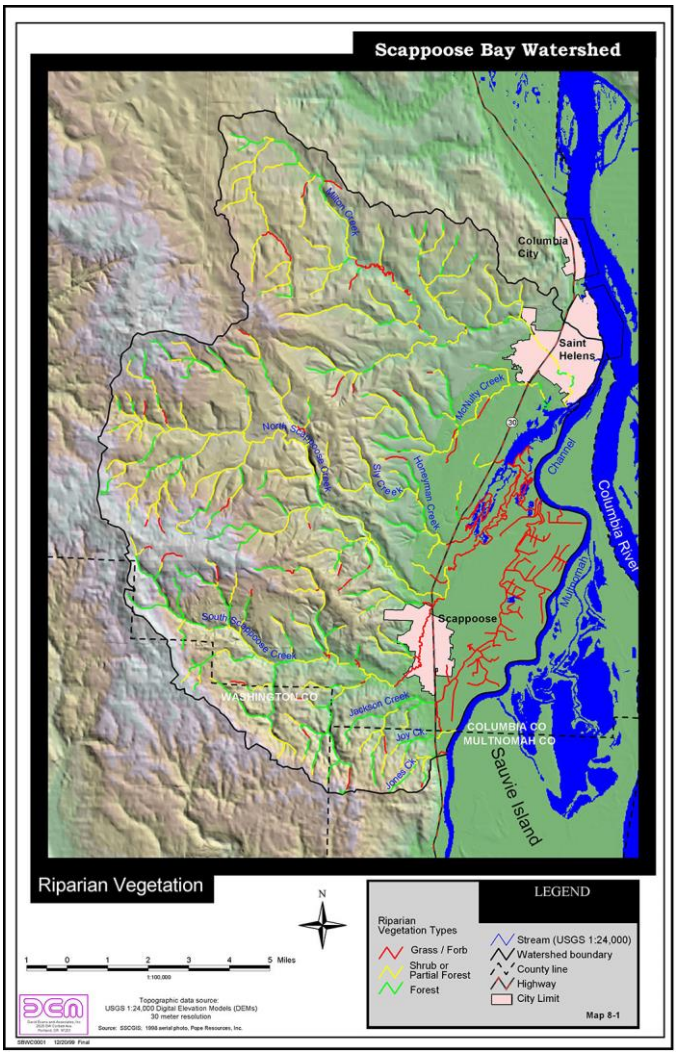

Figure 1-5. Riparian vegetation.

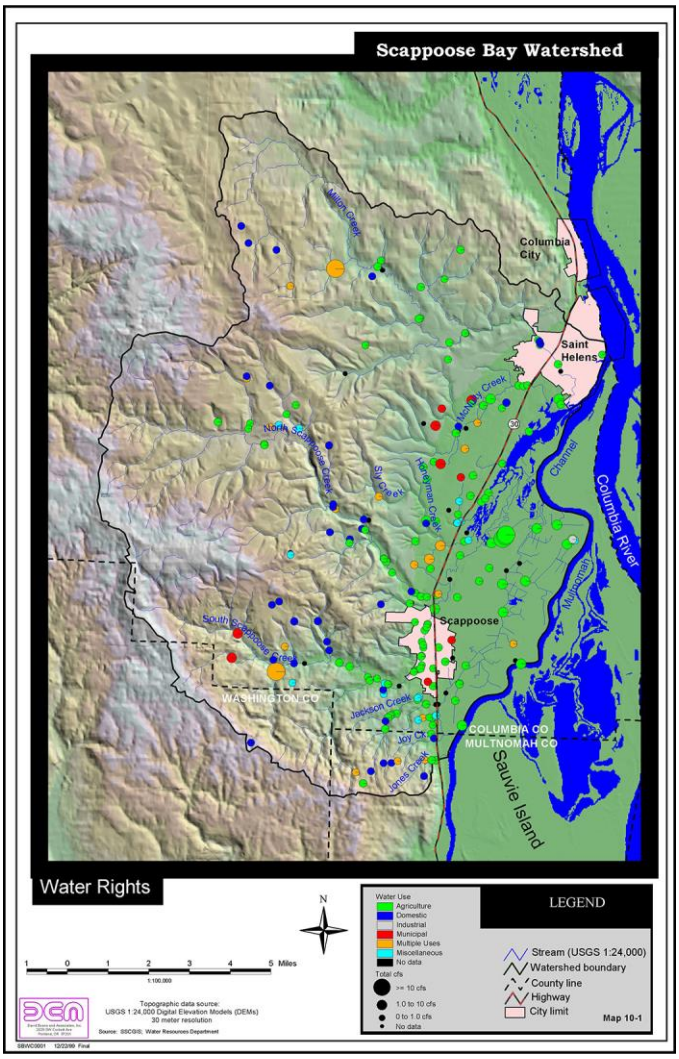

Figure 1-6. Water rights and instream use.

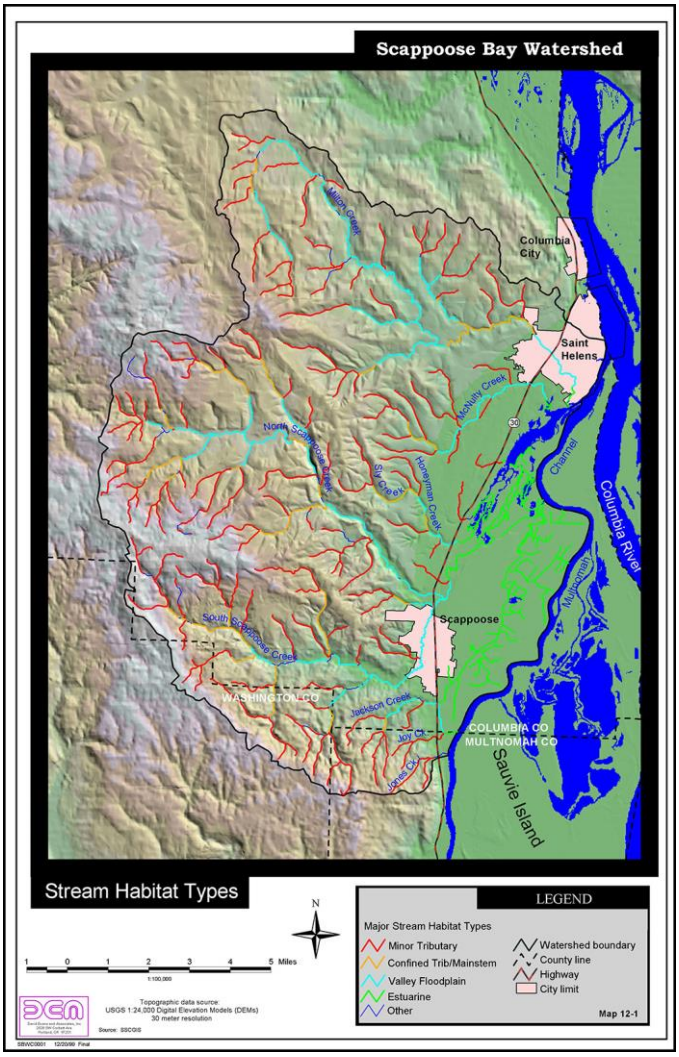

Figure 1-7. Stream habitat types.

Table 1-2. An Assessment of the Amount of Change from Historic to Existing Conditions for Selected Habitat Parameters for Each Stream Habitat Type in the Scappoose Bay Watershed

Darker shaded ratings indicate a greater change from historic to current conditions and potential limiting habitats

Habitat Parameter	Minor Tributary	Confined Trib/ Main Stem	Valley Floodplain	Estuarine
Fish passage barriers	Moderate	High	Moderate	High
Channel modifications	Low	Low	Moderate	High
Large woody debris	High	High	High	High
Sediment	Low	Moderate	High	Moderate
Riparian conditions	High	High	High	Moderate
Floodplain/wetland	Low	Low	High	High
Water temperature	Low	Moderate	Moderate	High
Dissolved oxygen	Low	Low	Low	High
Peak flow	Low	Moderate	High	High
Low flow	Low	Moderate	High	High

Table 1-3. An Assessment of the Change in Relative Habitat Productivity from Historic to Existing Conditions (Historic Productivity/Current Productivity) for Each Species' Life History Stages and for Each Stream Type.

Darker shaded ratings indicate a greater change from historic to current conditions and potential limiting habitats

		Stream Habitat Types							
		Minor Tributary		Confined Trib/ Main Stem		Valley Floodplain		Estuarine	
Species	Life Stage	HISTORIC	CURRENT	HISTORIC	CURRENT	HISTORIC	CURRENT	HISTORIC	CURRENT
Coho	Spawn	Mod	Low	Mod	Low	High	Low	Mod	Low
	Summer rear	Low	Low	Mod	Low	High	Low	Mod	Low
	Winter rear	Mod	Low	Mod	Low	High	Low	Mod	Low
Steelhead	Spawn	Mod	Low	Mod	Low	High	Low	Low	Low
	Summer rear	Low	Low	Mod	Low	High	Low	Low	Low
	Winter rear	Mod	Low	Mod	Low	High	Low	Low	Low
Chinook	Spawn	None	None	Mod	Low	High	Low	High	Low
	Summer rear	None	None	Mod	Low	High	Low	High	Low
	Winter rear	None	None	Mod	Low	High	Low	High	Low
Chum	Spawn	None	None	Mod	Low	High	Low	High	Low
	Summer rear	None	None	Mod	Low	High	Low	High	Low
	Winter rear	None	None	Mod	Low	High	Low	High	Low
Cutthroat	Spawn	Mod	Low	Mod	Low	High	Low	High	Low
	Summer rear	Mod	Low	Mod	Low	High	Low	High	Low
	Winter rear	Mod	Low	Mod	Low	High	Low	High	Low

Summary

- In recent decades, there has been a drastic decline in the abundance of coho, steelhead, and sea-run cutthroat trout; the current status of fall Chinook is unknown, although they spawned in large numbers below the north and south forks of Scappoose Creek in the 1950s.
- Recommendations were made for additional fish distribution, stream habitat, and fish passage barrier surveys, as well as an expanded water quality monitoring program.
- Instream flow information is one of the largest data gaps in the watershed assessment.
- The highest priority refugium in the watershed is the estuarine channels and wetlands at the south end of Scappoose Bay.
- The watershed contains four major stream types: small upper tributaries, larger tributaries and main stems, floodplain streams, and estuarine channels.

Recommendations: Data Gaps, Priorities, and Opportunities

The major data gaps for the watershed were listed and prioritized by evaluating how essential each type of data would be for the SBWC to use in conducting the most effective actions to restore salmon in the watershed. The first four data gaps in this priority are:

- Comprehensive data on juvenile and adult salmonid distribution and abundance
- Comprehensive data on fish passage barriers
- Instream flow and water use monitoring
- Comprehensive aquatic habitat surveys

Others data gaps include road conditions for erosion, slope hazards, feasibility of a Jackson Creek diversion, and stream temperature data.

A number of policies and regulations pertinent to five Scappoose Bay watershed land uses (forestry, agriculture, surface mining, and residential and commercial development) were evaluated for their effectiveness in protecting and restoring fish habitat parameters (see Table 1-4). “Protected” (or not protected) ratings were assigned for both new and proposed actions, as well as for historic or ongoing actions. For example, the habitat parameter “fish passage barriers” is protected for new practices for all land uses, but is not protected for historic or ongoing land uses. Floodplain/wetlands are not protected for new or historic uses.

Although agriculture is a major activity in this watershed, regulations protecting riparian zones and preventing water quality do not apply to agriculture lands. The local Soil and Water Conservation District works with willing landowners to develop farm plans to address these issues, but this may be the largest ongoing hole in the regulatory net.

Opportunities for conservation in the Scappoose Bay watershed should be prioritized, first by protection projects and second by restoration (see Table 1-5). Salmon refugia areas, especially in the high-priority focal watersheds and nodal habitats of Salmon and Milton Creeks, should be emphasized for both protection and restoration projects. Additionally, projects with high potential for success, such as riparian plantings and fish passage barriers, should be pursued.

Potential protection opportunities to address the first priority include the south end of Scappoose Bay and land owned by the Bureau of Land Management (BLM) in headwater refugia. Recommendations were also made to obtain funding to address the first four high-priority data gaps: survey of salmon, stream flow and water use monitoring, and aquatic habitat survey (funding had already been obtained for a fish passage survey). It was noted that fish habitat is poorly protected under current government policies and regulations but should be emphasized in restoration activities.

Table 1-4. Evaluation of Habitat Parameters Protected (X) or Not Adequately Protected (–) under Existing Regulations for Each Land Use

	Forestry Land Use		Agriculture Land Use		Surface Mining Land Use		Residential/Comm. Development Land Use		Industrial Development Land Use	
Habitat Parameter	NEW	HISTORIC/ ONGOING	NEW	HISTORIC/ ONGOING	NEW	HISTORIC/ ONGOING	NEW	HISTORIC/ ONGOING	NEW	HISTORIC/ ONGOING
Fish passage barriers	X	–	X	–	X	–	X	–	X	–
Channel modifications	X	–	X	–	X	–	X	–	X	–
Large woody debris	–	–	–	–	–	–	–	–	–	–
Sediment	–	–	–	–	–	–	–	–	–	–
Riparian conditions	–	–	–	–	–	–	–	–	–	–
Floodplain/wetland	–	–	–	–	–	–	–	–	–	–
Water temperature	–	–	–	–	–	–	–	–	–	–
Dissolved oxygen	–	–	–	–	–	–	–	–	–	–
Contaminants	NA	NA	–	–	–	–	–	–	–	–
Peak flow	–	–	–	–	–	–	–	–	–	–
Low flow	NA	NA	–	–	–	–	–	–	–	–

Table 1-5. Prioritized List of Protection and Restoration Opportunities for Scappoose Bay Watershed

	Protection/Restoration Opportunity	Location	Comp. Study Needed	Field Recon. Needed
1	**Protect Scappoose estuary**	Nodal refugia #18SC, 19JA, 20JA, 21JA		X
2	**Protect South Scappoose Ck headwaters**	Headwater refugium #9SC		X
3	**Protect North Scappoose Ck headwaters**	Headwater refugium #8SC		X
4	**Protect Gourlay Creek**	Refugium #11SC		X
5	**Address 5 top priority data gaps**		X	
6	**Fish passage barrier correction projects**	Undefined areas throughout watershed	X	
7	**Road maintenance/removal projects**	Undefined areas throughout watershed	X	
8	**Riparian planting**	Adjunct refugia –grass/forb riparian vegetation type		X
9	**LWD placement**	Adjunct refugia		X
10	**Floodplain restoration**	Adjunct refugia		X

Summary

- Data gaps for the watershed were listed and prioritized. Data on salmonid abundance and distribution, fish passage barriers, instream flow, and comprehensive aquatic habitat were the first four data gaps in the list.
- Policies and regulations relative to land uses were reviewed with respect to protecting and restoring fish habitat.
- Future projects should be prioritized by protection first, followed by restoration. High-priority focal watersheds should be emphasized for both protection and restoration projects.

SECTION 2

Major Studies

This section describes several major studies that have been completed since the SBWA was published in 2000. Each study is an assessment or analysis of conditions in an important portion of the Scappoose Bay watershed and includes priority sections or restoration plans. Four of the studies were produced for the SBWC while the fifth was produced for the Lower Columbia River Estuary Partnership.

The studies include the following:

- "A Comprehensive Assessment of Fish Passage Barriers in the Scappoose Bay Watershed," May 2001
- "Scappoose Bay Bottomlands Conservation and Restoration Plan," September 2004
- "South Scappoose Creek Restoration Plan," March 2009
- "Limiting Factors Analysis and Restoration Plan, Scappoose Creek Watershed," May 2012
- "Limiting Factors Analysis and Restoration Plan, Milton Creek 6th Field of Scappoose Bay," May 2012

A Comprehensive Assessment of Fish Passage Barriers in the Scappoose Bay Watershed

SBWC contracted with DEA in 2000 to "obtain the information most useful for expediting the correction of numerous barriers in…the SB Watershed." This project directly addressed one of the four top data gap priorities of the SBWA: to determine the number and extent of fish passage barriers in the watershed. The project was done in two stages: (1) field surveys in the summer of 2000, followed by (2) an analysis and prioritization. A final report was released in May 2001.

DEA personnel surveyed 293 crossings or potential obstructions of known fish-bearing streams. Of these, 131 did not meet Oregon Department of Fish and Wildlife (ODFW) design criteria for passage of juvenile and adult salmonids. More detailed surveys were done on 107 of these passages, including fish surveys and upstream and downstream conditions. Comparison of the Fish Passage Barrier map from the SBWA

(see Figure 2-1) and a similar map from this study (see Figure 2-2) show the comprehensiveness and detail obtained from the on-the-ground surveys.

The second stage of the project used the detailed surveys to develop hydrologic and hydraulic analyses and to determine the severity of the barriers. This work included summarizing hydraulic analysis for depth, velocity, and leap barriers. Figure 2-3 shows the results of the depth barrier assessment.

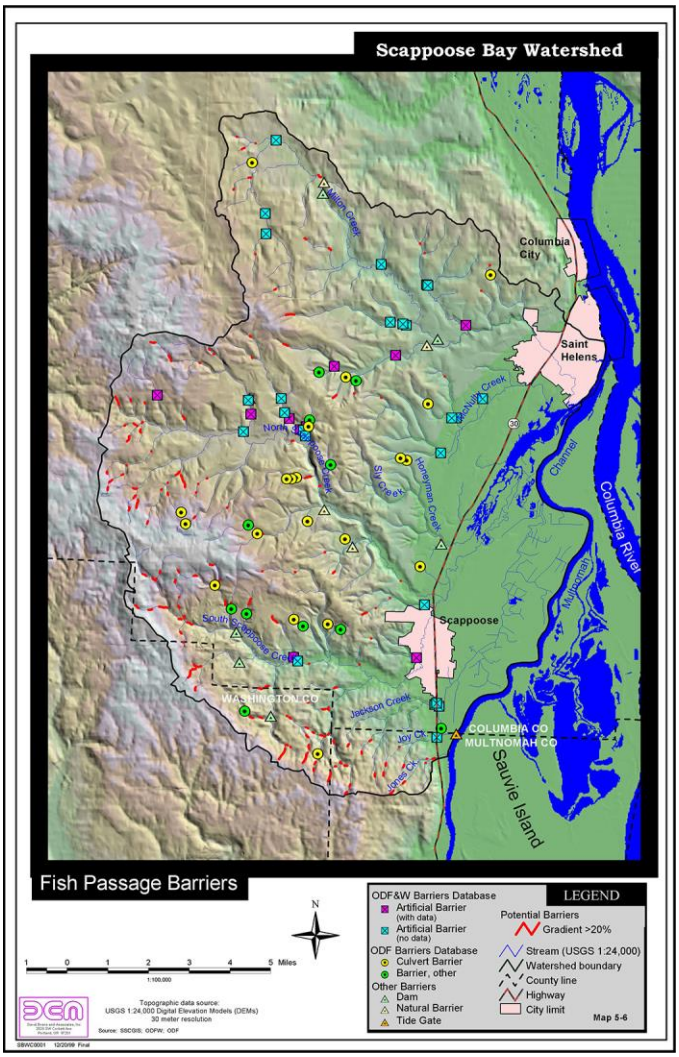

Figure 2-1. Fish passage barriers in the Scappoose Bay watershed identified in the SBWA.

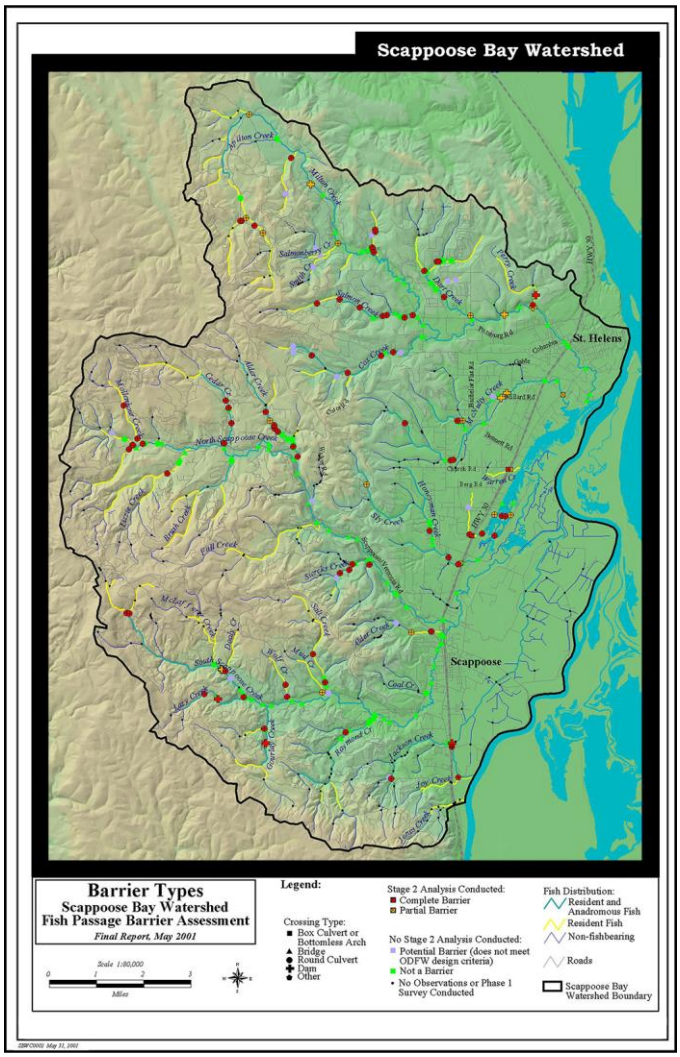

Figure 2-2. Types of barriers in the Scappoose Bay watershed identified in “A Comprehensive Assessment of Fish Passage Barriers in the Scappoose Bay Watershed.”

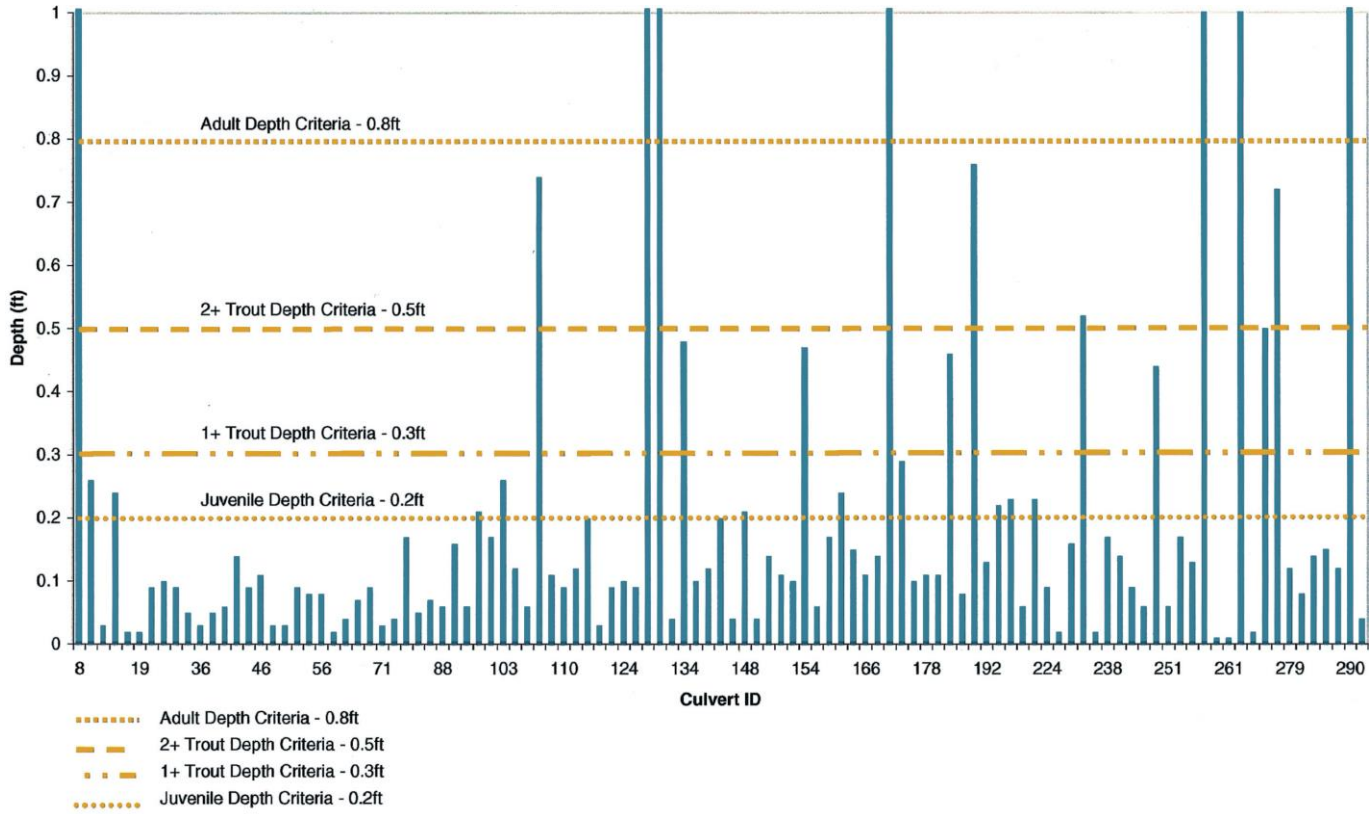

Figure 2-3. Results of the depth barrier assessment.

Significant products from this study were preliminary cost estimates and barrier correction prioritization. Cost estimates were made using materials, labor, and excavation/earth removal costs and others factors developed from a number of sources. These estimates were prepared for guidance in the evaluation and implementation of the proposed construction.

To prioritize barrier correction, a review was done of the methods used by multiple agencies in Oregon, Washington, and California, and then established and new methods were combined for one specific to this watershed. Barriers were prioritized according to whether they were complete (a barrier to all fish species and sizes) or partial. They were then prioritized by both sub-watershed and a habitat index score that accounted for total stream length above the passage that would be opened, fish distribution, and upstream refugia.

A second prioritization method was used on a watershed-wide basis, again accounting for complete or partial barrier type and habitat index. The prioritizations did not consider the cost of correction, ownership, or groups of barriers within a tributary (a smaller unit than the sub-watershed).

Table 1-2 (in the previous section) notes a high level of change from historic conditions in the number of fish passage barriers within both the estuarine and main stem tributaries. Therefore, it is worth noting that fish passage surveys were not done on portions of Jackson, Joy, and Jones Creeks—three significant estuarine corridors.

The results from this survey include the following:

Stage 1. Field surveys – June through October 2000

- Surveyed 293 crossings/potential barriers; 131 did not meet ODFW fish passage design; 107 of these were surveyed in greater detail.

Stage 2. Analysis and prioritization

- One hundred seven barriers were used in hydrologic and hydraulic analyses; 77 percent were found to be "complete barriers," and the remaining barriers were partial.
- Conceptual designs and preliminary cost estimates were done for 107 barriers, and then prioritized by sub-watershed.
- Identified as the highest priority for correction were:
  - Barriers located in key sub-watersheds
  - Complete barriers
  - Barriers that provided access to refugia
  - Barriers that opened the greatest length of upstream fish habitat

Table 2-1 and Table 2-2 show the sub-watershed barrier prioritization summaries for Scappoose and Milton Creeks. The tables include ranking, crossing ID number, habitat index, and new design types.

Table 2-1. Scappoose Sub-Watershed Barrier Prioritization Summary

Rank	Crossing ID No.	Habitat Index	Stream	Road	Scappoose Sub-Watershed Barrier				New Design Type	Total Cost
					Owner	Type	Condition	Summary		
1	210	22.94	Raymond Cr	Unknown	Unknown	Round culvert	Poor	Complete	Aluminum box culvert #21A	$24,599.27
2	101	21.61	Lizzie Cr	Unknown	Unknown	Round culvert	Fair-Poor	Complete	Corrugated metal arch	$51,883.49
3	102	19.90	Cedar Cr	Vernonia Hwy	County	Round culvert	Fair-Poor	Complete	Corrugated metal arch	$88,558.07
4	103	19.90	Cedar Cr	Crown Z Logging Rd	Unknown	Round culvert	Fair-Poor	Complete	Culvert removal	$19,360.00
5	264	19.17	Alder Cr	Crown Z Logging Rd	Hancock	Round culvert	Good-Fair	Complete	Culvert removal	$140,360.00
6	79	18.23	Alder Cr	Cater Rd	County	Round culvert	Fair-Poor	Complete	Corrugated metal arch	$89,597.08
7	116	17.79	Cedar Cr	Cedar Cr Rd	County	Round culvert	Fair-Poor	Complete	Multiplate pipe arch	$58,418.61
8	118	16.30	Cedar Cr	Cedar Cr Rd	County	Round culvert	Good-Fair	Complete	Corrugated metal arch	$110,322.30
9	283	15.60	Cedar Cr	Unknown	Unknown	Round culvert	Fair-Poor	Complete	Railspan bridge	$19,797.17
10	85	13.55	Alder Cr	Unknown	Unknown	Round culvert	Fair-Poor	Complete	Multiplate pipe arch	$38,396.22
11	91	13.10	Alder Cr	Unknown	Unknown	Round culvert	Poor	Complete	Corrugated metal arch	$72,134.38
12	86	13.03	Alder Cr	Alder Cr Rd	County	Round culvert	Good-Fair	Complete	Aluminum box culvert #30E	$52,936.31
13	87	12.71	Alder Cr	Unknown	Unknown	Round culvert	Fair-Poor	Complete	Corrugated metal arch	$43,822.31
14	36	11.52	Gourlay Cr	Unknown	City-Scap.	Dam	Good-Fair	Complete	Fish ladder	$105,550.00
15	108	11.50	N. Scappoose Cr	Chapman Rd	County	Round culvert	Good-Fair	Complete	Multiplate pipe arch	$31,542.50
16	107	11.45	N. Scappoose Cr	Chapman Rd	County	Round culvert	Fair-Poor	Complete	Corrugated metal arch	$41,638.21
17	89	11.30	Alder Cr	Unknown	Unknown	Round culvert	Fair-Poor	Complete	Corrugated metal arch	$77,298.33

Rank	Crossing ID No.	Habitat Index	Stream	Road	Scappoose Sub-Watershed Barrier				New Design Type	Total Cost
					Owner	Type	Condition	Summary		
18	11	10.09	Lacey Cr	Unknown	Hancock	Round culvert	Good-Fair	Complete	Railspan bridge	$26,160.75
19	105	9.79	Mollenhour Cr	Chapman Rd	County	Round culvert	Good-Fair	Complete	Corrugated metal arch	$68,067.18
20	109	9.33	Unknown	Unknown	Unknown	Round culvert	Poor	Complete	Corrugated metal arch	$45,638.79
21	286	9.04	Mollenhour Cr	Crown Z Logging Rd	Hancock	Round culvert	Good-Fair	Complete	Culvert removal	$598,950.00
22	238	7.45	Salt Cr	Mckay Rd	County	Round culvert	Good-Fair	Complete	Corrugated metal arch	$25,909.70
23	25	7.03	Lacey Cr	Layton Rd	City-Scap.	Dam	Good-Fair	Complete	Fish ladder	$290,000.00
24	55	6.08	S. Scappoose Cr	Unknown	Unknown	Round culvert	Good-Fair	Complete	Corrugated metal arch	$66,381.27
25	110	5.78	Mollenhour Cr	Vernonia Hwy	County	Round culvert	Good-Fair	Complete	Corrugated metal arch	$548,308.10
26	28	5.63	Lacey Cr	Unknown	Hancock	Round culvert	Good-Fair	Complete	Corrugated metal arch	$76,046.73
27	240	5.41	Salt Cr	R 072	Hancock	Round culvert	Good-Fair	Complete	Corrugated metal arch	$134,582.33
28	56	4.25	S. Scappoose Cr	Unknown	Unknown	Round culvert	Good-Fair	Complete	Corrugated metal arch	$36,792.27
29	51	4.19	Dooly Cr	Unknown	Unknown	Round culvert	Good-Fair	Complete	Aluminum box culvert #34C	$60,122.60
30	49	3.54	Alder Cr	Crown Z Logging Rd	Unknown	Round culvert	Poor	Complete	Culvert removal	$4,477.00
31	48	3.53	Alder Cr	Vernonia Hwy	County	Round culvert	Good-Fair	Complete	Corrugated metal arch	$79,093.14
32	38	3.52	WF Gourlay Cr	Unknown	Unknown	Round culvert	Good-Fair	Complete	Corrugated metal arch	$40,709.87
33	70	2.99	Siercks Cr	Unknown	Unknown	Round culvert	Good-Fair	Complete	Aluminum box culvert #15B	$26,941.86
34	71	2.73	Siercks Cr	Unknown	Unknown	Round culvert	Good-Fair	Complete	Corrugated metal arch	$48,561.86
31	48	3.53	Alder Cr	Vernonia Hwy	County	Round culvert	Good-Fair	Complete	Corrugated metal arch	$79,093.14
32	38	3.52	WF Gourlay Cr	Unknown	Unknown	Round culvert	Good-Fair	Complete	Corrugated metal arch	$40,709.87
33	70	2.99	Siercks Cr	Unknown	Unknown	Round culvert	Good-Fair	Complete	Aluminum box culvert #15B	$26,941.86
34	71	2.73	Siercks Cr	Unknown	Unknown	Round culvert	Good-Fair	Complete	Corrugated metal arch	$48,561.86
35	290	2.64	Unknown	Unknown	Unknown	Round culvert	Good-Fair	Complete	Railspan bridge	$38,035.62
36	10	2.20	Wolf Cr	Dutch Canyon Rd	County	Round culvert	Good-Fair	Complete	Corrugated metal arch	$51,537.65
37	241	1.69	Wolf Cr	Unknown	Unknown	Round culvert	Fair-Poor	Complete	Corrugated metal arch	$46,134.85
38	66	1.67	Siercks Cr	Reid Rd	Unknown	Round culvert	Good-Fair	Complete	Corrugated metal arch	$36,423.04
39	69	1.11	Siercks Cr	Unknown	Unknown	Round culvert	Good-Fair	Complete	Corrugated metal arch	$77,850.60
40	40	41.13	S. Scappoose Cr	Unknown	City-Scap.	Dam	Good-Fair	Partial	Fish ladder	$84,440.00
41	41	41.09	S. Scappoose Cr	Unknown	City-Scap.	Dam	Good-Fair	Partial	Weir notch	$500.00
42	88	12.16	Alder Cr	Alder Cr Rd	County	Round culvert	Fair-Poor	Partial	Bridge	$193,151.03
43	37	11.40	Gourlay Cr	Unknown	City-Scap.	Dam	Good-Fair	Partial	Weir notch	$500.00
44	46	2.59	Alder Cr	NW Smith Rd	County	Round culvert	Poor	Partial	Corrugated metal arch	$50,498.38
45	261	2.47	Unknown	Unknown	Unknown	Round culvert	Poor	Partial	Railspan bridge	$22,196.70
46	8	2.30	Mud Cr	Dutch Canyon Rd	County	Round culvert	Fair-Poor	Partial	Corrugated metal arch	$56,037.41
47	68	1.05	Siercks Cr	Armstrong Rd	County	Round culvert	Good-Fair	Partial	Corrugated metal arch	$34,592.63

Table 2-2. Milton Sub-Watershed Barrier Prioritization Summary

Rank	ID No.	Habitat Index	Stream	Road	Milton Sub-Watershed Barrier				New Design Type	Total Cost
					Owner	Type	Condition	Summary		
1	155	18.87	Cox Cr	Brooks Rd	County	Round culvert	Poor	Complete	Corrugated metal arch	$72,497.70
2	160	17.59	Cox Cr	Unknown	Unknown	Round culvert	Poor	Complete	Railspan bridge	$19,155.55
3	148	15.62	Salmon Cr	Unknown	Unknown	Round culvert	Fair-Poor	Complete	Corrugated metal arch	$71,548.27
4	147	14.79	Salmon Cr	Brinn Rd	County	Round culvert	Good-Fair	Complete	Corrugated metal arch	$82,149.16
5	156	12.41	Cox Cr	Unknown	Unknown	Round culvert	Poor	Complete	Multiplate pipe arch	$51,868.82
6	197	12.08	Dart Cr	Unknown	Unknown	Round culvert	Fair-Poor	Complete	Corrugated metal arch	$43,870.90
7	150	11.15	Salmon Cr	Brinn Rd	County	Round culvert	Fair-Poor	Complete	Multiplate pipe arch	$45,292.12
8	154	10.59	Salmon Cr	Unknown	Unknown	Round culvert	Fair-Poor	Complete	Corrugated metal arch	$96,442.43
9	151	8.08	Salmon Cr	Unknown	Unknown	Round culvert	Fair-Poor	Complete	Corrugated metal arch	$94,229.61
10	152	6.28	Salmon Cr	Unknown	Hancock	Round culvert	Good-Fair	Complete	Corrugated metal arch	$69,523.76
11	176	6.23	Milton Cr	Pittsburg Rd	County	Round culvert	Good-Fair	Complete	Corrugated metal arch	$21,117.37
12	271	4.85	Cox Cr	Brooks Rd	County	Round culvert	Good-Fair	Complete	Corrugated metal arch	$41,257.63
13	191	4.34	Dart Cr	Barger Rd	County	Round culvert	Good-Fair	Complete	Bridge	$119,070.03
14	139	4.33	Perry Cr	Hanky Rd	County	Round culvert	Good-Fair	Complete	Corrugated metal arch	$138,855.14
15	153	4.10	Salmon Cr	Unknown	Hancock	Round culvert	Good-Fair	Complete	Corrugated metal arch	$29,333.06
16	249	3.93	Perry Cr	Unknown	City-St. Helen	Dam	Fair-Poor	Complete	Dam removal	$13,500.00
17	193	3.68	Dart Cr	Unknown	Unknown	Round culvert	Poor	Complete	Bridge	$55,725.91
18	192	3.66	Dart Cr	Unknown	Unknown	Round culvert	Fair-Poor	Complete	Corrugated metal arch	$64,742.14
19	187	3.03	Milton Cr	Unknown	Unknown	Round culvert	Poor	Complete	Corrugated metal arch	$42,278.86
20	178	2.70	Milton Cr	Pittsburg Rd	County	Round culvert	Good-Fair	Complete	Railspan bridge	$19,136.59
21	179	2.64	Milton Cr	Unknown	Unknown	Round culvert	Good-Fair	Complete	Railspan bridge	$19,083.86
22	281	1.99	Unknown	Unknown	Unknown	Round culvert	Good-Fair	Complete	Bridge	$55,934.18
23	165	1.87	Unknown	Pittsburg Rd	County	Round culvert	Good-Fair	Complete	Railspan bridge	$19,041.41
24	166	1.80	Unknown	Unknown	County	Round culvert	Good-Fair	Complete	Corrugated metal arch	$22,733.42
25	279	1.10	Unknown	Unknown	Unknown	Round culvert	Good-Fair	Complete	Corrugated metal arch	$33,829.45
26	280	1.00	Unknown	Unknown	Unknown	Round culvert	Good-Fair	Complete	Corrugated metal arch	$54,756.84
27	277	197.20	Milton Cr	N/A	City-St. Helen	Dam	Fair-Poor	Partial	Dam removal	$13,500.00
28	250	185.70	Milton Cr	Unknown	Unknown	Dam	Poor	Partial	Dam removal	$13,500.00
29	253	31.37	Milton Cr	Unknown	City-St. Helen	Dam	Poor	Partial	Dam removal	$13,500.00
30	181	21.74	Milton Cr	Canaan Rd	County	Round culvert	Good-Fair	Partial	Corrugated metal arch	$77,643.06
31	141	13.84	Dart Cr	Robinette Rd	County	Round culvert	Good-Fair	Partial	Corrugated metal arch	$122,175.34
32	177	6.80	Milton Cr	Unknown	Unknown	Round culvert	Fair-Poor	Partial	Railspan bridge	$19,198.98
33	175	5.68	Milton Cr	Unknown	Unknown	Round culvert	Good-Fair	Partial	Corrugated metal arch	$59,597.83
34	171	5.40	Salmonberry Cr	Unknown	Unknown	Round culvert	Fair-Poor	Partial	Railspan bridge	$19,298.57

Significant Study Results

- Field surveys and analysis were used extensively to produce a significant body of information on the location and condition of fish passage barriers in the Scappoose Bay watershed.
- This completes one of the major data gaps identified in the SBWA 2000 and can act as guidance for the SBWC and other entities in continued project design and implementation for watershed-wide fish passage improvements.

Scappoose Bay Bottomlands Conservation and Restoration Plan

This plan described the Scappoose Bay Bottomlands area in terms of historic conditions, ecologic processes, current plant communities, fish and wildlife use, and wetland values. It also summarizes the natural resource and open space components of the Columbia County Comprehensive Land Use Plan and identifies the major economic conditions, potential opportunities and conflicts for conserving and enhancing sociological and ecological values, and threats to local conservation.

Three reference sites within the bottomlands are described; these are sites that are in relatively good ecological condition, primarily because they lie in areas where diking was never done or drainage was ineffective.

Seven privately owned parcels and three publicly owned areas were identified as having the highest priority for conservation and restoration. These areas included the Malarkey and Hogan ranches, Oregon State Parks/Greenland in St. Helens, and the Sauvie Island Wildlife Area (SIWA). The private sites were the main focus of field surveys, and land value appraisals were conducted on four of these sites, where landowners were willing to consider protection easements.

Significant Study Results

- The characteristic habitats, including plant, wildlife, and fish species, for the Scappoose Bay Bottomlands were described.
- Field surveys were conducted of seven bottomland parcels that have the potential to be some of the best remaining habitats in the Lower Columbia River system.
- Conservation strategies were determined for the seven properties, detailing prescriptions for native plantings, crop conversions, reconnections, and managing control structures.

Figure 2-4 shows the sites where conservation strategies were determined (proposed conservation sites) in relation to the reference sites and existing wildlife areas.

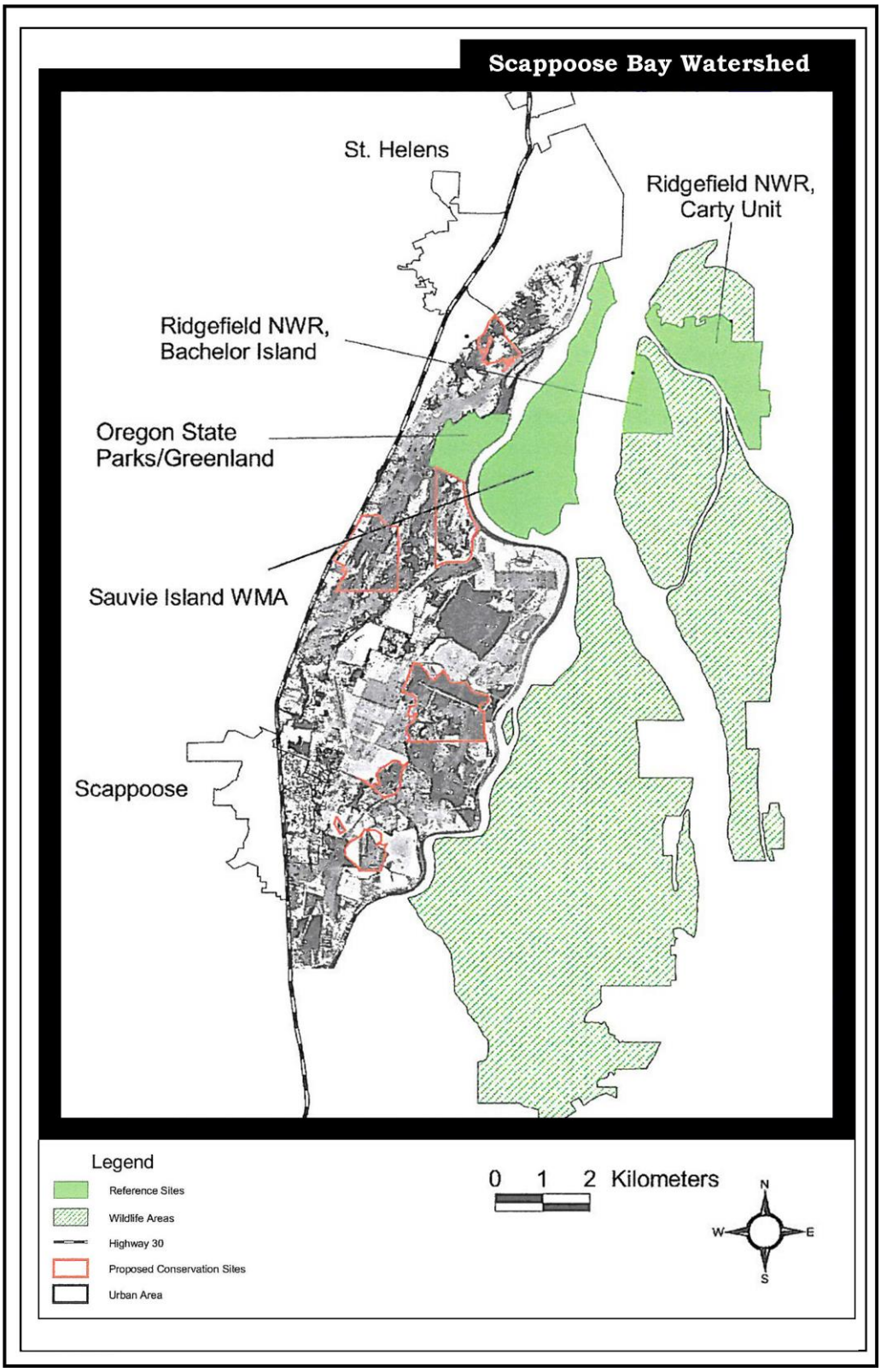

Figure 2-4. Scappoose wetlands proposed conservation sites, existing wildlife areas, and reference sites.

South Scappoose Creek Restoration Plan

This study focused on the five-mile stretch of the South Scappoose Creek that runs within the city of Scappoose. It evaluated historic and current hydrologic and geomorphic conditions, and identified a strategy to address habitat loss, bank erosion, and chronic flooding.

The area is at the lower end of the South Scappoose Creek watershed, an area characterized by a low-gradient meandering channel that has been severely incised. Eight reaches were delineated, based on channel morphology and geomorphic conditions, and tributary inputs.

Significant channel changes over the past 150 years of development have occurred, including an increase in the stream grade along the valley and a loss of remnant channels, backwaters, wetlands, and downed logs. Channel constriction and reduction of the floodplain area has reduced the range of physical habitats and focused flood flows into an entrenched primary channel, resulting in higher flow velocities. These changes have led to a significant channel incision.

A bank and channel stability analysis found that a majority of the study area banks had a moderate risk of erosion, and a critical portion of the channel was characterized as having a moderate to high risk of erosion (see Figure 2-5). The existing functional value of the creek is limited due to the incision, narrow riparian corridors, and being disconnected from the floodplain.

Through a series of public meetings and stakeholder workshops, 18 Management Zones were developed along the study area (see Figure 2-6). Management strategies were prioritized in five-year increments, for the following 15 years. Strategies include restoration and enhancement activities such as riparian and floodplain enhancements, reactivating floodplain channels, and public access.

Prioritization steps included workshops with stakeholders and technical advisors, as well as an internal prioritization that evaluated site accessibility, ecological benefit, degree of landowner cooperation, community benefit, and relative cost of proposed actions. The final proposed prioritization of Management Zones was based on the combined scores from both of these processes (see Table 2-3).

Potential projects were identified within each Management Area based on field assessments and discussions with landowners, although specific projects sites would need to be evaluated in greater detail.

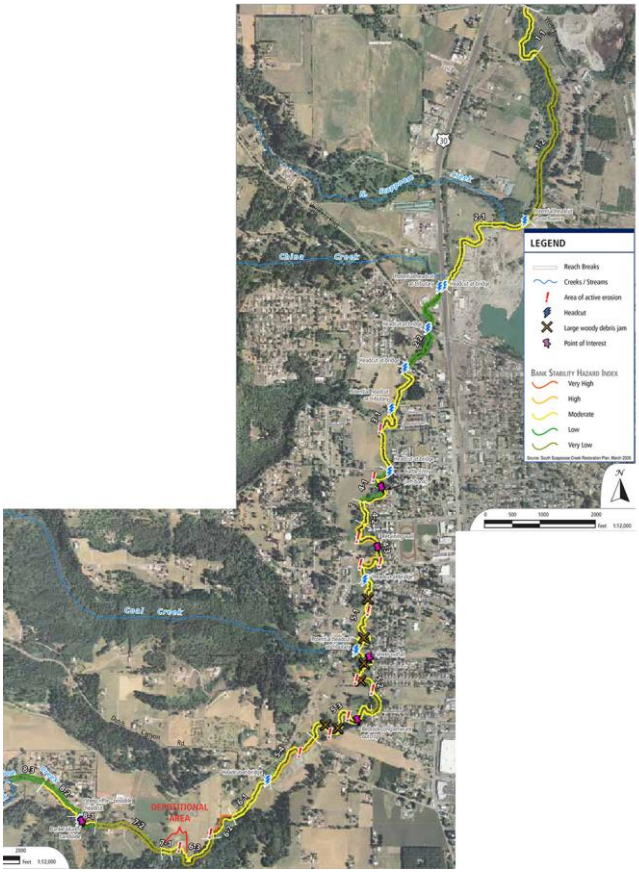

Figure 2-5. Bank and channel stability survey (Hazard Index), South Scappoose Creek.

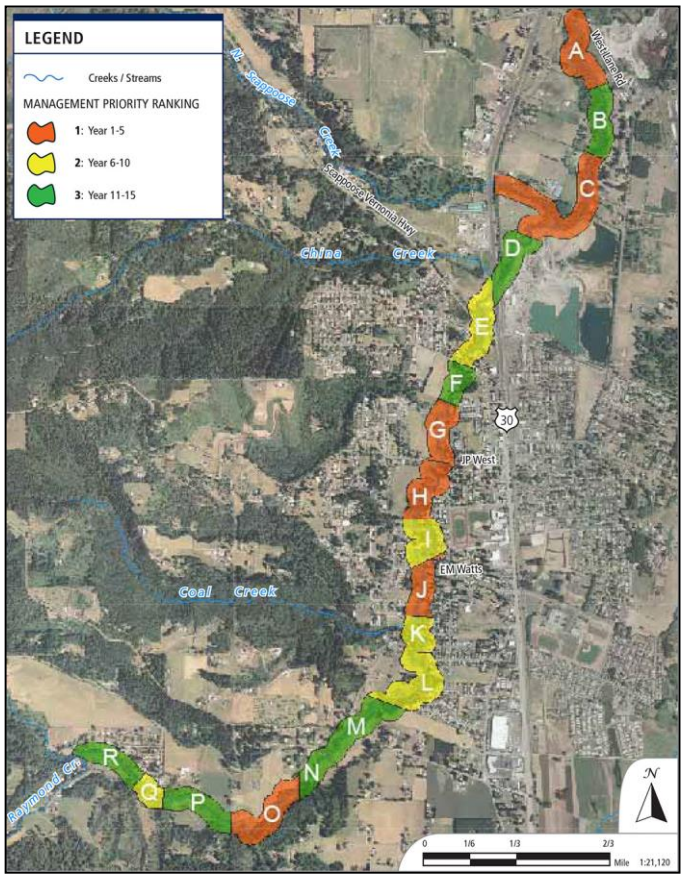

Figure 2-6. Proposed final prioritizations for Management Zones A–R, South Scappoose Creek.

Table 2-3. Summary of the Proposed Final Prioritization of Management Zones in the South Scappoose Project Area

Management Area	Project Team		Technical Advisory Committee		Final Prioritization	
	SCORE	RANKING	SCORE	RANKING	SCORE	RANKING
A	15	Year 1-5	16	Year 1-5	15.5	Year 1-5
B	9	Year 11-15	0	Year 11-15	4.5	Year 11-15
C	11	Year 6-10	21	Year 1-5	16	Year 1-5
D	9	Year 11-15	0	Year 11-15	4.5	Year 11-15
E	11	Year 6-10	3	Year 11-15	7	Year 6-10
F	9	Year 11-15	1	Year 11-15	5	Year 11-15
G	13	Year 1-5	31	Year 1-5	22	Year 1-5
H	15	Year 1-5	24	Year 1-5	19.5	Year 1-5
I	11	Year 6-10	8	Year 6-10	9.5	Year 6-10
J	13	Year 1-5	18	Year 1-5	15.5	Year 1-5
K	12	Year 6-10	10	Year 6-10	11	Year 6-10
L	12	Year 6-10	13	Year 6-10	12.5	Year 6-10
M	10	Year 11-15	1	Year 11-15	5.5	Year 11-15
N	10	Year 11-15	0	Year 11-15	5	Year 11-15
O	13	Year 1-5	16	Year 1-5	14.5	Year 1-5
P	10	Year 11-15	0	Year 11-15	5	Year 11-15
Q	13	Year 1-5	14	Year 6-10	13.5	Year 6-10
R	9	Year 11-15	0	Year 11-15	4.5	Year 11-15

Significant Study Results

- An analysis of bank and channel stability along this five-mile stretch of South Scappoose Creek concluded that there is a significant risk of erosion on most segments.
- A hydraulic model suggests frequent flooding inundates the valley floor at the lower end of the project area and that bridges along the reach will be inundated and overtopped with 25-year, 50-year, and 100-year events. High flow velocities that accompany these events can exacerbate bank erosion.
- Eighteen management zones were defined in the project area, and a prioritization of management strategies was prepared.

Limiting Factors Analysis and Restoration Plan, Scappoose Creek Watershed

This plan identified the dominant processes and habitat characteristics limiting the production of coho salmon smolts in the Scappoose Creek watershed. The scope was limited to a single target species (coho) within two adjacent 6th field HUC (hydrologic unit code) sub-watersheds: North and South Scappoose Creeks. Attributes evaluated were fish distribution, aquatic habitat abundance and distribution, thermal water quality differences along reaches, and historical management activities.

This study summarized destructive influences over the past 150 years:

- By 1950, timber harvest using splash damming and extensive logging had exhausted timber resources.
- Aggressive fire suppression eliminated tree-toppled trees from being delivered to streams.
- Flood control measures for agriculture, residential, and industrial development resulted in a consequent loss of floodplains, complex channels, and lowland estuary habitat.
- Dam construction and the federal management practice of removing large wood from streams to allow upstream access by adult salmon.

The cumulative effects of these destructive influences have created “over-heated, confined, silt-laden, simplified stream corridors.”

The status of coho in the watershed was determined to be consistently low, with a range of between 12 in 2005 and 139 in 2010. There is a low spawner density (average number of female coho per kilometer of spawning/rearing habitat), and no clear trends. The watershed is severely “under-seeded,” and adult escapement appears to be the primary factor limiting development of a self-sustaining coho population.

Basin-wide limiting factors were found to include the following:

- Severely high temperatures in the lower reaches of both North and South Scappoose Creeks and in varying levels in other main stems and tributaries
- Low numbers of beaver populations, reduced pool surface area, and low nutrient and gravel storage
- Significant reduction in large wood complexity, resulting in channel simplification, incision, and floodplain isolation

Even with the habitat restrictions listed above, adult escapement is so low that viable salmonid habitats are underutilized.

Site-specific limiting factors were noted for Cedar Creek, a tributary of North Scappoose Creek: here, low spawning gravels suggest restoration should focus on trapping and sorting activities to retain gravels.

The study produced a prioritized list of prescriptions (needs and actions) that include a mix of strategies such as recovering riparian canopies, removing culverts, or securing headwater wood and substrate recruitment corridors. The prescriptions are prioritized according to their potential effectiveness to address seasonal habitat limitation and boost life history stage survival, and urgency and practicality.

Key pieces of the basin, called “anchor sites,” were identified. These sites have some level of a normal functional system and have high potential as effective restoration locations. Finally, a prescription map for restoration activities was produced for each sub-basin, along with a prioritized list of prescriptions. Figure 2-7 shows the prescription map for South Scappoose Creek.

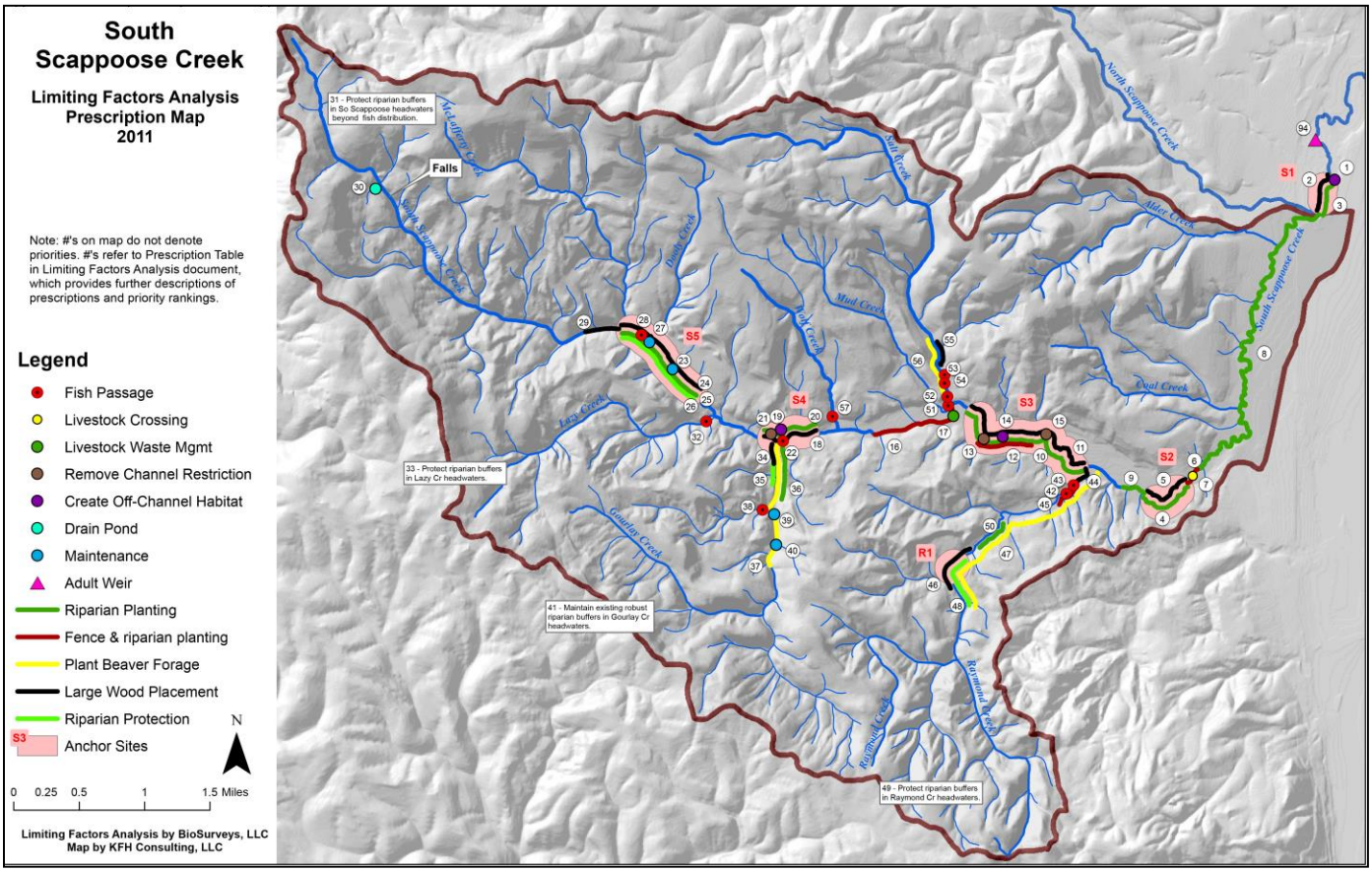

Figure 2-7. Limiting factors analysis prescription map for South Scappoose Creek.

Limiting Factors Analysis and Restoration Plan, Milton Creek 6th Field of Scappoose Bay

Similar to the “Limiting Factors Analysis and Restoration Plan” for the Scappoose Creek watershed, this study reviewed the habitat conditions restricting the success of coho in Milton Creek. This sub-basin contains 21,561 acres and 17.8 miles of main stem stream corridor, plus 6.6 miles within the five tributary corridors that coho utilize. Milton Creek was once a direct tributary to the Columbia River and now drains into the north end of Scappoose Bay.

Similar to Scappoose Creek, management activities since the mid-1800s have altered the natural condition of Milton Creek. Particularly significant was the reduction of LWD due to splash damming and flumes used to remove timber from the upper reaches, as well as the practice in the 1970s of removing log jams to improve access for adult salmonids.

The most significant basin-wide limiting factor for Milton Creek is the lack of functional summer pool habitat. This is primarily due to excessive temperatures in the lower seven miles of the main stem but is also a result of low levels of instream wood that would reduce stream power, extend late season winter flows, and increase gravels.

Important site-specific limiting factors include a low volume of spawning gravels in the upper main stem of Milton Creek and the high temperatures in the lower main stem.

Estimates of adult coho were done using a 2008 summer pool density survey of juvenile coho, resulting in an estimate of a 2007 escapement of 55–69 brood year adult fish for the basin. Comparing this to a review of the amount, quality, and distribution of spawning gravels and summer habitat clearly shows that the sub-basin is underutilized.

Similar to Scappoose Creek, the study produced a prioritized list of prescriptions that include large wood placement, fence and riparian plantings, and channel reconnections. Nine anchor sites were identified: four in the main stem, four in Cox Creek, and one in Smith Creek. Figure 2-8 and Table 2-4 lists the locations and priorities of the prescriptions given in the “Limiting Factors Analysis and Restoration Plan.”

Significant Study Results

- The cumulative effects of historic practices and level of change from historic conditions were well documented.
- The study produced a prioritized prescription list of restoration activities within each sub-basin.

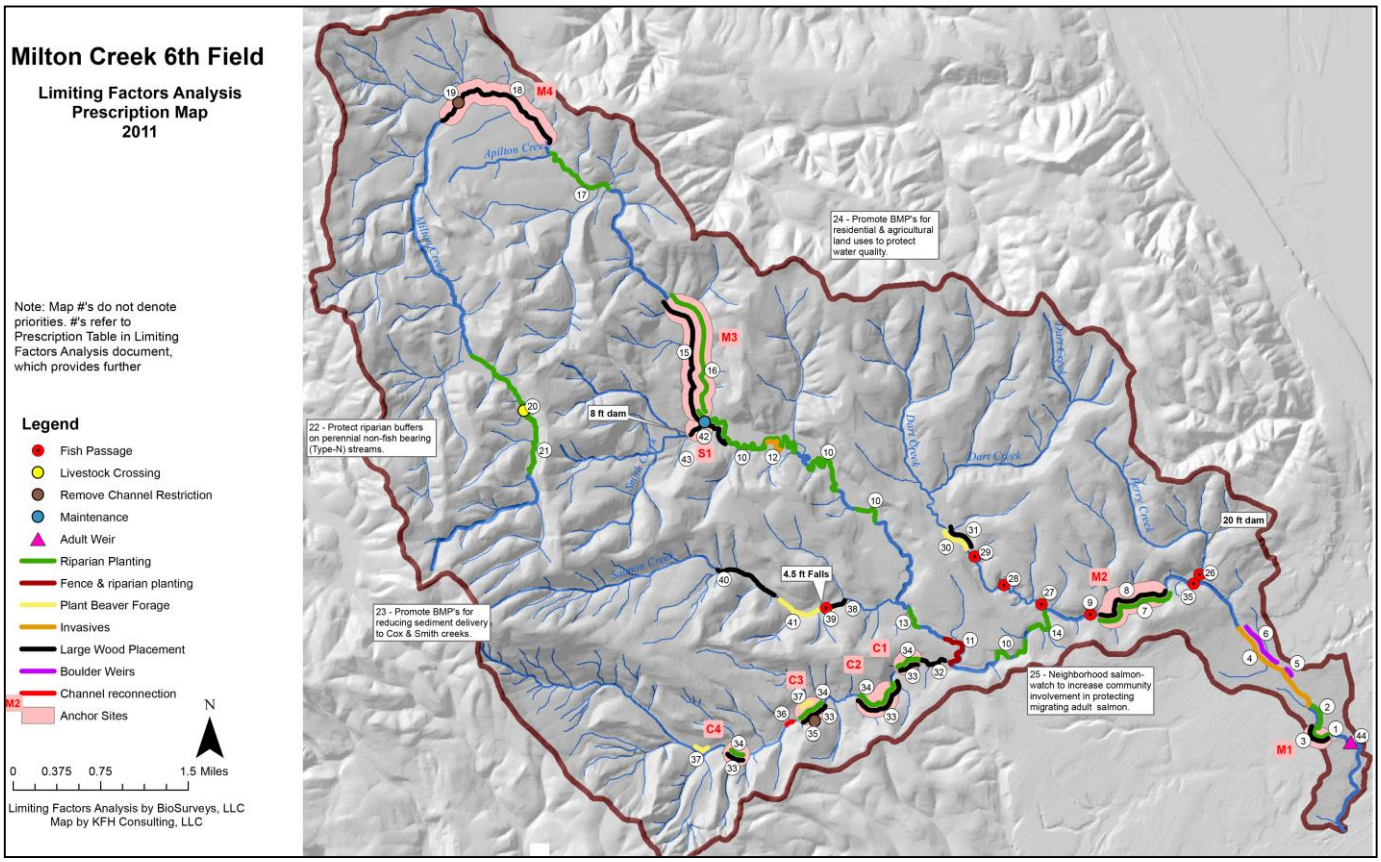

Figure 2-8. Limiting factors analysis prescription map of Milton Creek.

Table 2-4. Level 1 Limiting Factors Analysis Priority Prescriptions for Milton Creek

Stream	Anchor Site	Category	Action	Comment
Milton		Riparian Planting	Riparian planting along 6 miles of main stem Milton Cr from upstream of Dart Cr to Smith Cr.	To reduce solar exposure and mitigate for temperature limitations. Planting will require protection from beaver browse. Prioritize upper 2 miles for summer habitat closest to spawning.
Milton	3	LWD Full	Place full spanning large wood structures in anchor site 3 and extending 2,000 ft. downstream.	To trap and sort gravels and to increase channel complexity and floodplain interaction. Note that it will be difficult to add LWD downstream of the anchor site with the residential interface.
Milton	3	Plant	Riparian conifer planting within anchor site 3.	For future source of LWD, particularly in lower end of anchor site.
Milton	3	Plant	Riparian planting for shade along low gradient reach above anchor site 3.	Reed canary grass currently dominates.
Milton	4	LWD Full	Place full spanning large wood structures in anchor site 4.	To trap and sort gravels and to increase channel complexity and floodplain interaction, including channel shifts on low terraces. This site is lower priority for wood placement due to lower gravel sorting potential demonstrated by existing wood-old roadbed exists on right for access for LWD placement.
Milton		Plant	Riparian planting for shade along 7,500 ft. of upper headwaters reach above Canaan Rd. crossing.	To reduce solar exposure.
All	1	Spawner Protection	Develop neighborhood salmon watch program to increase community involvement in protecting migrating adult salmon.	Monitoring activity along the wide shallow channels of the lower mainstream is the highest priority, where visibility of spawning adults and potential for illegal take is highest.
Cox	4	LWD Full	Place full spanning large wood structures in Cox Cr anchor sites.	To trap and sort gravels, provide scour to reduce gravel embedded in fine sediment and to increase channel complexity and floodplain interaction for winter habitat.
Cox	4	Riparian Planting	Plant riparian conifer for future source of large woody debris.	Opportunistically select open sites or thin existing alder canopy along Cox Cr corridor particularly within anchor sites where shade-tolerant conifers, such as western red cedar, can establish. Protect from beaver browse.
Smith	1	Maintenance	Maintain grade control currently provided by undersized culvert on farm crossing near the mouth of Smith Cr.	This culvert is currently not a passage barrier, but may be providing the grade control that is retaining floodplain interaction upstream. When this culvert is replaced for maintenance purposes, assure grade control is maintained.
Smith	1	LWD Edge	Place multiple edge-oriented large wood structures in anchor site 1.	To create summer pool scour for juveniles moving out of main stem, avoid full span wood that could create juvenile barriers.
Milton		Adult Weir	Construct a weir in the lower main stem to remove all adult hatchery coho with clipped adipose fin.	To eliminate interaction between hatchery genetics and wild stock.

SECTION 3

Monitoring and Natural Resources Data

The SBWC has monitored water quality and other natural resource data since 1998, a year after its inception. Several major projects focused on watershed-wide sampling efforts to gain a larger picture of the watershed condition, including a three-year project completed in 2011. Many other smaller efforts occurred in conjunction with restoration projects or project designs, and offer insight into conditions on a localized or topic-specific scale. Data available to characterize the watershed includes water quality and quantity parameters, habitat condition, plant communities, and invertebrate counts.

Water Quality Monitoring, Scappoose Bay Watershed, 1998

This project began in 1998 and continued in 1999 with support from the Oregon Department of Environmental Quality (DEQ). The work focused on water temperature, which is a critical factor for habitat health in the Scappoose Bay watershed. Additional parameters included stream flow and dissolved oxygen (DO).

The DEQ provided automated temperature sensors that were installed in nine locations on South Scappoose, North Scappoose, and Milton Creeks. Installation occurred in mid-June, and measurements were taken approximately every 30 minutes, with sensors deployed for over 5 months. The locations are shown in Figure 3-1.

Results from the 1998 summer season show maximum stream temperatures greater than 80°F at two locations and above 70°F at all but two of the other stations. As would be expected, peak temperatures occurred in late July and August and were greatest at the lower end of the creeks. Table 3-1 shows the station location and name, the maximum, minimum and 7-day average temperatures for May through October 1998, and the number of days over both 64°F and 70°F.

Figure 3-2 shows the stream temperature seasonal variability for five of the stations in Scappoose Creek.

Table 3-1. 1998 Monitoring Results

Creek Location	ID	Seasonal (May–Oct)		7-Day Averages		Number of Days	
		MAX °F	MIN °F	MAX °F	MIN °F	>64°F	>70°F
Lower South Scappoose Cr	V5500	76.1	53.8	73.1	67.2	67	20
South Scappoose Cr - Lacey Cr	V5501	61.7	50.4	59.4	55.6	0	0
South Scappoose Cr - Gourley Cr	V5502	61.9	50.9	59.8	56.5	0	0
Mid-South Scappoose Cr	V5503	75.9	54.3	72.2	63.6	63	13
Upper Milton Cr	V5504	70.0	51.1	66.4	60.9	22	0
Lower Milton Cr	V5506	81.1	57.2	76.7	68.1	71	30
North Scappoose Cr - Bonnie Falls	V5507	73.2	54.1	69.9	63.7	41	3
South Scappoose Cr - Hwy 30	V5508	78.1	58.1	74.9	70.4	74	30
North Scappoose Cr - Hwy 30	V5509	80.2	55.4	76.2	64.9	65	37

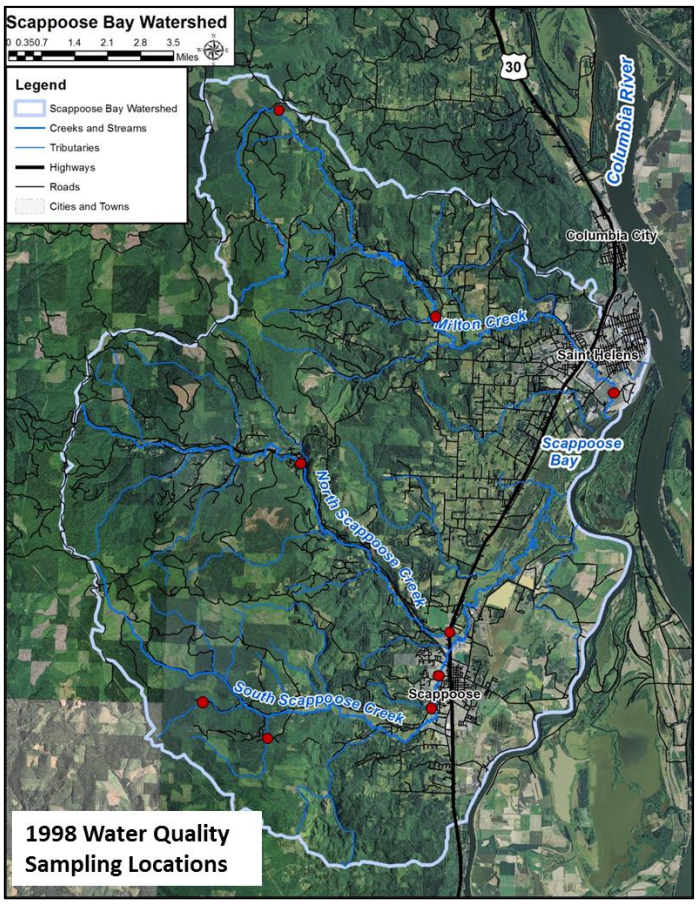

Figure 3-1. Map of water quality sampling locations.

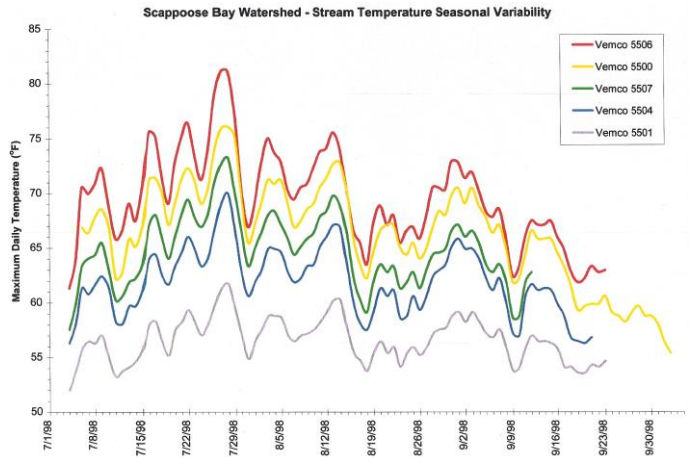

Figure 3-2. 1998 stream temperatures at five stations in Scappoose Creek.

Scappoose Bay Watershed Water Quality Monitoring, 2008-2010

This program involved volunteers who worked with SBWC staff to collect data to establish baseline water quality within the watershed and to identify areas of concern. The DEQ also supported this project. Twenty-seven monitoring sites were established throughout the watershed and were monitored for three years. Figure 3-3 shows the distribution of the stations in the watershed.

Parameters sampled for included DO, pH, turbidity, conductivity, temperature, and site conditions such as vegetative community compositions and instream conditions. Basic macroinvertebrate and E. coli bacteria samples were also taken at selected sites.

Water chemistry monitoring was conducted monthly at each station, and continuous temperature data loggers were deployed during the warmer months, May through October. Water quality data was summarized and compared to standard parameter ranges for ideal salmon habitat, as defined by the DEQ (2003), Oregon Watershed Enhancement Board (OWEB) (2001), and EPA (2001). Station locations were also reviewed with respect to land cover classification and creek geomorphologic conditions.

The results of this work show the following:

- Temperature is an issue in all sub-basins, particularly in the lower potions of North and South Scappoose Creeks. Milton Creek had elevated temperatures in both the main stem and in the lower portions of tributaries that have the only high-quality salmonid habit in the sub-basin.
- Average DO levels fall below the ideal DO range of ≥11 ppm but not below the salmon lethal level of <6 ppm. Stream DO levels tended to increase from upper to lower sub-basin, with seasonal DO levels lowest in the summer months—a consistent pattern through the watershed.
- Turbidity levels in Milton Creek tended to increase from upper to lower locations, with seasonal turbidity levels lowest in February through April and highest in May. The station highest in the sub-basin (MIL025) had average turbidity levels for 2008 through 2010 above the 10 NTU salmon habitat threshold, while the remaining portions of Milton Creek experienced some significant punctuated turbidity events.
- Turbidity in the other sub-basins showed seasonal and spatial differences but all were within the ideal turbidity level for salmon of <10 NTU.
- Due to the small sample size, there was uncertainty with the E. coli bacteria results, but those available showed levels of concern. In the South Scappoose sub-basin, concentrations were consistently over the EPA threshold levels of <235 MPN/100 ml at three sites and over the DEQ levels of <406 MPN/100 ml at two sites.

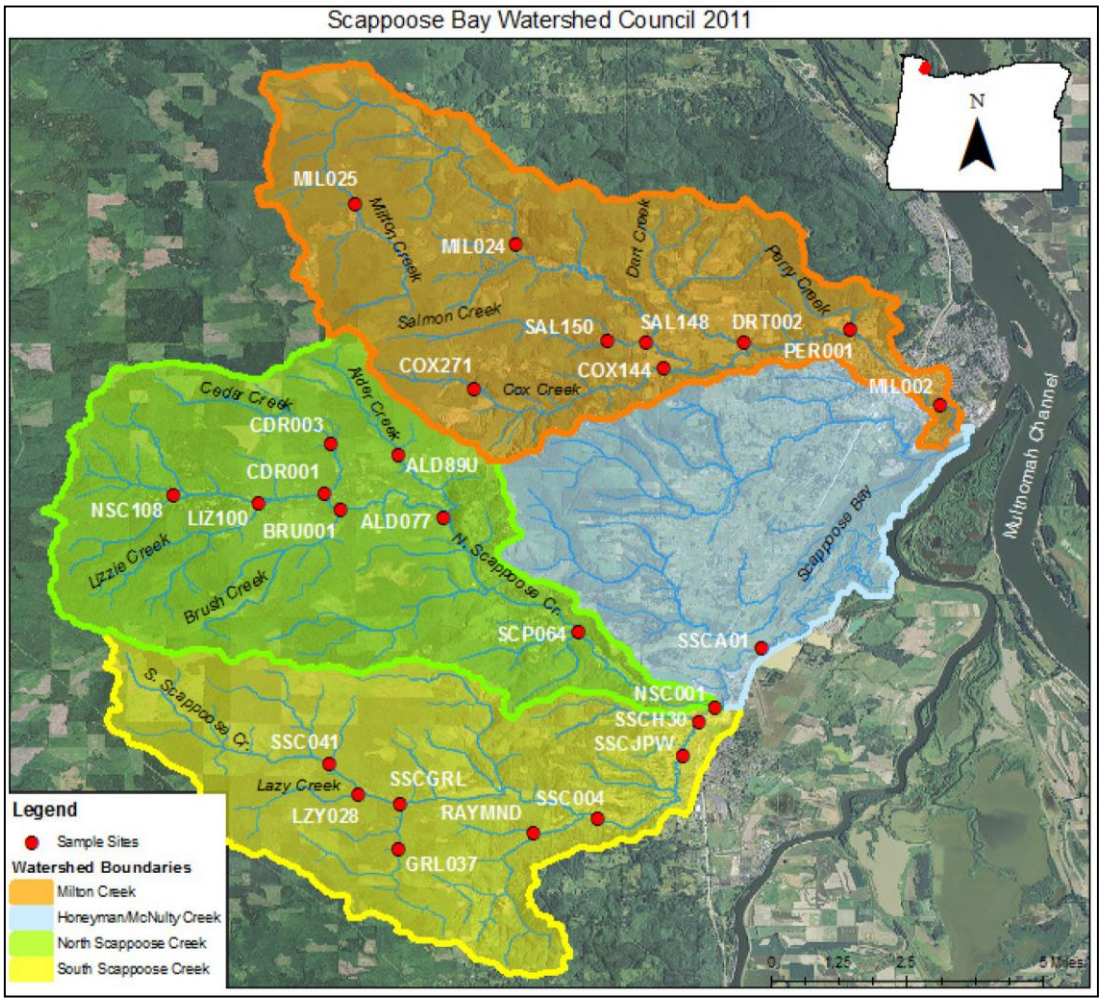

Figure 3-3. Distribution of the monitoring stations in the Scappoose Bay Watershed.

Comparisons of 1998 to 2008 through 2010 Sampling Projects

Comparisons can be made between the 1998 temperature data and data collected from 2008 through 2010 on five of the stations:

- In South Scappoose Creek the 1998 stations on Gourley and Lacey Creeks are in locations similar to two of those used in 2008 and 2009.
- Just above the confluence of North and South Scappoose Creeks are two comparable locations from both studies.
- An upper Milton Creek station is also relatively close in both sample projects.

Table 3-2 shows the comparisons that can be made at these stations for the following measurements:

- Maximum temperature - Data in 1998 was collected from May through October; data in 2008 and 2009 was collected year-round. However, comparisons can be made with these data sets because maximum temperatures for all data would have occurred in July and August.
- Number of days over 64°F

In general, the results from comparable stations show similar temperatures at the Lacey and Gourley Creek stations for both periods, although the maximum temperature at Lacey Creek in 2009 was slightly greater. At Milton Creek the maximum temperatures are similar, but the number of days above 64°F decreased considerably. This was also the case for the North and South Scappoose Creek locations near Hwy 30. These two locations also showed a slight decrease in maximum temperature.

Table 3-2. Comparisons between the 1998 Temperature Data and Data Collected from 2008 through 2010

	1988			2008			2009		
Creek/Location	ID	MAX °F	DAYS >64°F	ID	MAX °F	DAYS >64°F	ID	MAX °F	DAYS >64°F
South Scappoose Cr - Lacey Cr	V5501	61.7	0	LZY028	63.7	3	LZY028	66.6	0
South Scappoose Cr - Gourley Cr	V5502	61.9	0	GRL037	59.7	0	GRL037	62.8	0
Upper Milton Cr	V5504	70.0	22	MIL024	67.8	4	MIL024	71.6	11
North Scappoose Cr - Hwy 30	V5508	78.1	74	NSC001	75.2	53	NSC001	NA	NA
South Scappoose Cr - Hwy 30	V5509	80.2	65	SSCH30	74.7	58	SSCH30	70.3	27

Hogan Ranch

Hogan Ranch lies north of the city of Scappoose, between Scappoose Creek (to the east) and Multnomah Channel (to the west). The property contains three tidal freshwater ponds (see Figure 3-4). In 2004 the Natural Resources Conservation Service acquired a conservation easement for the property through the Wetlands Reserve Program. Restoration activities since that time have included adding fencing to exclude livestock, structural improvements for water control, enhancements to wetlands, and planting of native trees and shrubs. Specific projects are detailed in the “Riparian Enhancement and Native Plant Restoration” subsection.

The SBWC conducted water quality and depth monitoring on the ponds from June 2007 through August 2010, and late summer vegetation monitoring from 2004 through 2005 and 2008 through 2010.

Figure 3-4. Water quality and restoration sites at Hogan Ranch.

Hogan Ranch Water Quality Monitoring

The purpose of the water quality monitoring was to describe the seasonal and yearly changes in water chemistry and water depth at the three Hogan Ranch ponds. Continuous temperature and depth data was recorded for two contributing tributaries: Teal Creek, which flows into Pond 3, and Crooked Creek, which flows into Ponds 1 and 2.

According to the Cowardin estuarine wetland classification system (Cowardin et al., 1979), Pond 1 is classified as a seasonally flooded forested and emergent wetland. Pond 2 is considered a partial seasonal and partial permanently flooded wetland, and Pond 3 is classified as a subtidal, semi-permanently flooded emergent wetland.

Water quality monitoring was conducted following the methods and protocols of the DEQ and OWEB for water temperature, specific conductance, pH, DO, bacteria, depth, and turbidity. Monthly water chemistry was conducted, and continuous temperature and depth recordings were made year round. Water quality

data was summarized and compared to standard parameter ranges for ideal salmonid habitat as defined by the DEQ (2003), OWEB (2001), and EPA (2001).

Results over the four-year study period showed no large changes in the local seasonal or inter-annual water chemistry. The greatest parameter change was a decrease in E. coli levels in all ponds from an average range of 121.2 to 395 MPN/100 mL in 2009 to an average range of 5.6 to 46.6 MPN/100 mL in 2010. This change can be attributed to the livestock exclusion that occurred on all sites in 2007. For the entire study period, water temperature, DO, and turbidity levels fell within the “poor” water quality standard levels.

These findings suggest that “the ponds and creeks on Hogan Ranch do not provide ideal habitat for salmonids, however these wetlands and streams are rich in wildlife and highly valued as waterfowl habitat.”

Hogan Ranch Vegetation Community Composition

This project described the changes in vegetation community composition as a result of ecological restoration on the ponds at Hogan Ranch, specifically changes due to livestock exclusion and other restoration treatments. The monitoring focused on changes to the wetland plant community.

Vegetation transects were permanently established through each pond in 2004, three years prior to restoration (see Figure 3-5). The vegetation communities change abruptly along the hydrologic gradient across the ponds, going from a mix of upland grasses to wetland grass with a sparse willow overstory, to a wetland marsh edge community, and finally to submerged and floating vegetation in the pond. The width of each community along each transect was recorded in 2004 and from 2008 through 2011. Within each community, plant species were identified within plots that were randomly established. The total number of plots sampled varied by vegetation community and year, with a range of from 0 to 44 (large wetted area).

Data was analyzed by comparing plant species cover and diversity in each community at each pond and by comparing community widths. Plots were produced showing changes to vegetation community widths, community species richness, and dominant plant species. Figure 3-6 and Figure 3-7 show two of these plots at Pond 2.

Conclusions from the monitoring indicate that Hogan Ranch continues to show signs of recovery after four years of cattle exclusion. A major change to the plant composition in Pond 3 was from the emergent-dominated to a wapato-dominated wetland. This change enhances native food resources for waterfowl and other wildlife in the wetland area. An unintended consequence of cattle exclusion has been an increase in the dominance of reed canary grass (RC), an invasive plant, but its numbers may be reduced as the native trees and shrub plantings mature on the site.

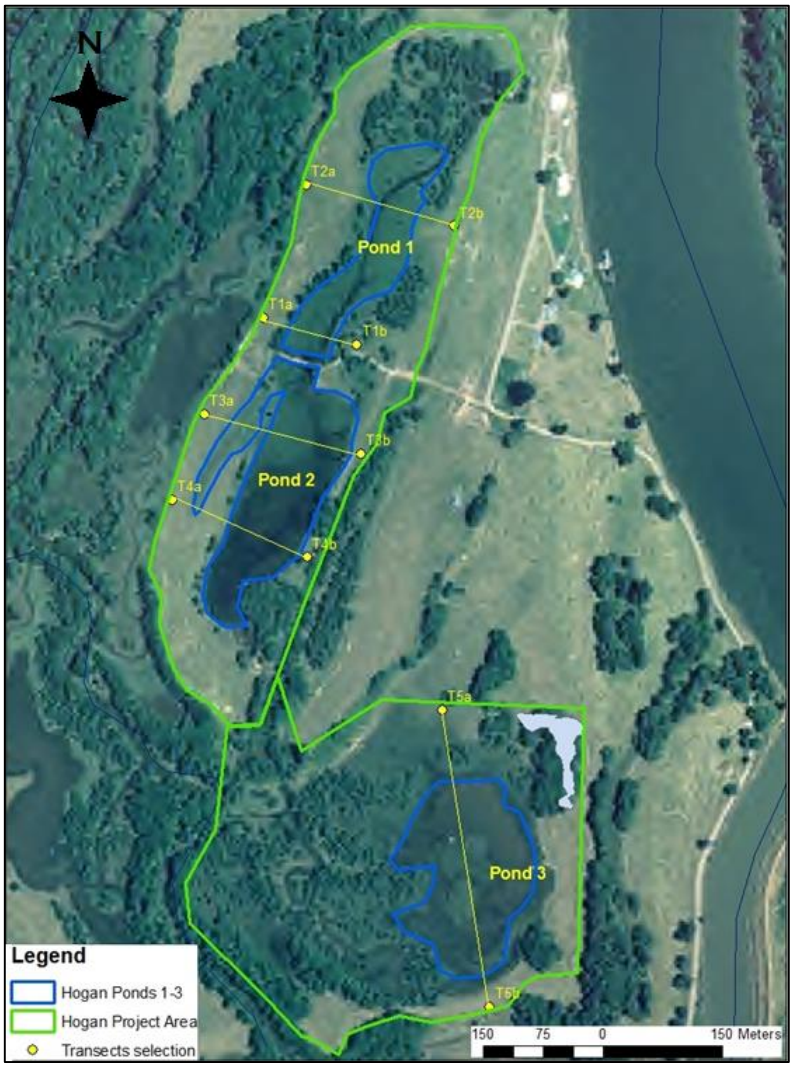

Figure 3-5. Hogan Ranch vegetation transects 2004–2011.

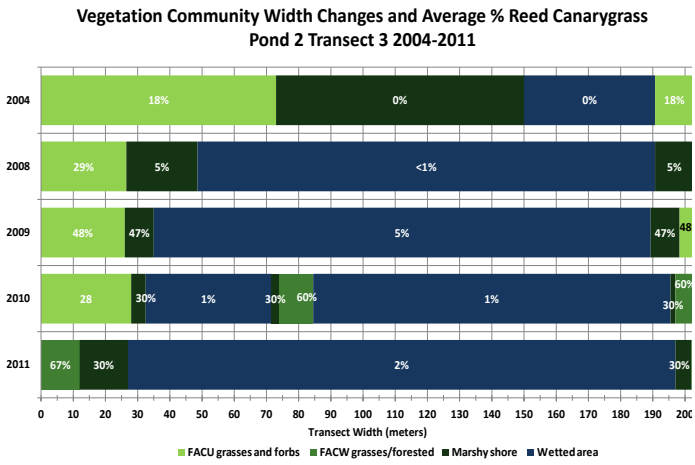

Figure 3-6. Plot showing changes to vegetation community widths at Pond 2.

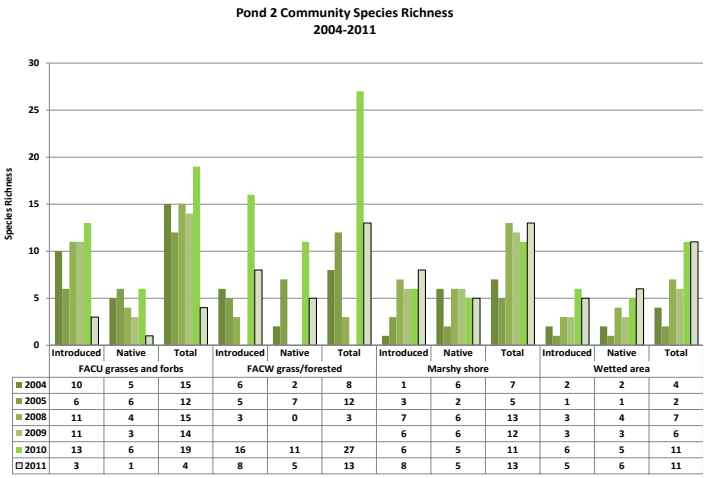

Figure 3-7. Plot showing community species richness at Pond 2.

LiDAR Remote-Sensing Data Collection

The SBWC contracted with Watershed Sciences in 2004 to collect Light Detection and Ranging (LiDAR) data for the Multnomah Channel floodplain from the town of St. Helens to the south of the city of Scappoose. This data has been used in planning and analysis of restoration projects within the floodplain.

Data from the over-flight produced first return and bare ground model maps. First returns represent the tallest surface encountered by each laser pulse, while the bare ground model is derived from the last return LiDAR laser points. The bare ground model represents the shortest (closest to the ground) surface measured; features such as rooftops, bridges, and other structures are removed, and the last return model is useful to determine vegetation.

Four original maps were produced, each of a LiDAR data type for the entire study area, based on the following:

- Spot point data
- TIN data
- DEM data
- Contour data

Additional LIDAR raw files, bare-earth files, and reflective-surface models were produced.

Figure 3-8 and Figure 3-9 show examples of the first return and bare ground models at Hogan Ranch.

Figure 3-8. First return model 1-meter Hillshade at Hogan Ranch.

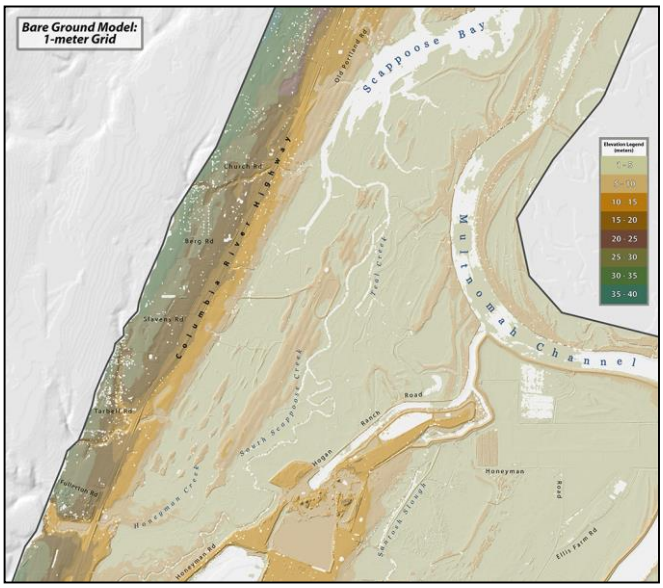

Figure 3-9. Hogan Ranch bare ground model.

Bonnie Falls Fish Monitoring

In 1997 the SBWC, ODFW, and local volunteers constructed a foundation to house a fish monitoring box at the Bonnie Falls fish ladder on North Scappoose Creek. All returning fish must pass through the fish ladder, so this was an excellent opportunity to gain monitoring information on anadromous salmonid returns to an important salmon and steelhead spawning and rearing stream in the Scappoose Bay watershed. The project goals also included validating the effectiveness of restoration projects in the watershed and giving local students hands-on education opportunities.

Highlights from the sampling period January 11 through April 9, 1999 include the following:

- Thirty-eight adult fish were counted; of these 33 were steelhead, 1 was rainbow trout, and 4 were recaptured steelhead.
- Twenty-two of the 33 steelhead were hatchery fish, and 11 were wild fish.
- The average length of the steelhead was 71.07 cm with 5 fish over 80 cm.
- In general, the hatchery-reared steelhead returned earlier than the wild steelhead.
- Fourteen steelhead had marks from seals (4), nets (2), gaffs, the falls, the trap, or migration.

Table 3-3 shows monitoring results for the period March 2 through June 21, 1999. The ODFW continued to monitor the fish ladder at Bonnie Falls at least through 2010. Figure 3-10 and Figure 3-11 show adult fish return counts for coho and steelhead from 1999 through 2010.

Table 3-3. Monitoring Results for the Period March 2–June 21, 1999

Species	Caught	Marked	Recaptured	Est. Migrants
Coho Fry	32	32	3	340
Coho Smolts	706	657	352	1,317
Trout Fry	784	531	48	8,311
Steelhead 60–119 mm	1	1	1	1
Steelhead ≥ 120 mm	95	95	22	409
Cutthroat 60–119 mm	30	30	14	64
Cutthroat 120–160 mm	163	159	54	488
Adult Brook Trout	49	n/a	n/a	n/a
Pacific Lamprey	24	24	5	115
Ammocoetes	156	n/a	n/a	n/a
Total Fish	**2,040**			**11,045**

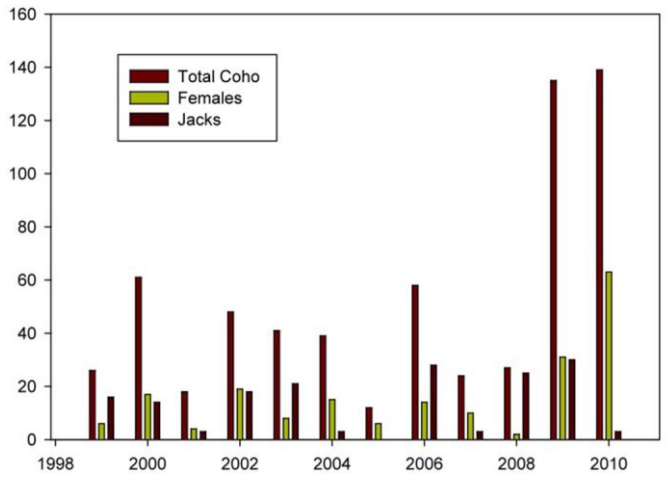

Figure 3-10. Adult fish return counts for coho from 1999 through 2010.

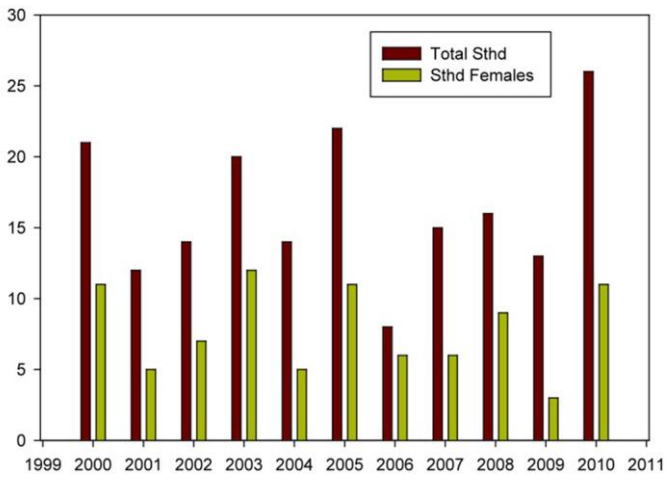

Figure 3-11. Adult fish return counts for steelhead from 1999 through 2010.

Cox Creek Habitat Survey

This project was an ODFW aquatic inventory, conducted in 2007. It began at the confluence of Cox Creek with Milton Creek and extended upstream 4,776 meters (15,669 feet). Information gained included dominant instream types (riffles and scour pools), substrate types, and riparian zone trees. Additional data for the three identified reaches along this stretch included percent shade, number of boulders, pool depths, and large wood characteristics. Habitat distributions and riparian zone vegetation summaries for each reach were also prepared.

Rapid Bio-Assessment

A Rapid Bio-Assessment (RBA) provides for multiple site investigations within a single field season and has become a standard method for gathering biological data. An RBA involves snorkeling in every fifth pool along a stream and recording counts of juvenile fish observed, resulting in a count along 20-percent of the reach sampled, which can be used for estimating fish within the watershed.

An RBA was done for North and South Scappoose Creeks and Milton Creek in 2008. Twelve streams within this entire watershed were surveyed along a total of 57.6 stream miles, including 15.4 stream miles in South Scappoose Creek sub-basin, 19.2 miles in North Scappoose Creek sub-basin, and 22.9 miles in Milton Creek.

The results of these surveys include the following:

- A total of 29,805 coho summer parr estimated over 47 stream miles; back-calculating estimated an escapement in 2007 of 198 to 225 adult coho.
- 43.7-percent escapement was in South Scappoose Creek, 27.4 percent in North Scappoose Creek, and 28.8 percent in Milton Creek.
- The most productive summer habitats were higher in the watershed where moderate stream gradients and higher wood complexity retained spawning gravel resources.

The RBA distribution profiles also included spawning destinations, barriers, and site-specific information.

An RBA was also done for Honeyman Creek, which drains directly into Scappoose Bay north of Scappoose. This survey was conducted in June 2011, extending 2.6 miles up Honeyman Creek and 2.4 miles up Sly Creek. Only five coho parr were estimated from the 20-percent sample of pool habitats and were likely upstream migrants from Scappoose Bay. No steelhead or chinook were observed, but both Honeyman and Sly Creeks contained cutthroat.

Multiple passage barriers affected access on main stem Honeyman Creek, including perched culverts and a full spanning concrete dam. Additional information was available on silt accumulations and underlying morphology.

Amphibian Survey

During spring 2011, 11 wetland sites were surveyed for the presence of pond-breeding amphibians. Survey sites included beaver ponds, farm ponds, floodplain lakes, and creek channels. Target species included the long-toed salamander *(Ambystoma macrodactylum)*, northern red-legged frog *(Rana aurora)*, northwestern salamander *(Ambystoma gracile)*, Pacific tree frog *(Hyla regilla)*, and rough-skinned newt (*Taricha granulosa)*. Because the purpose was to detect breeding amphibians, site visits were timed to detect the greatest number of egg masses of target species; surveys were done between February 22 and March 15, 2011.

Table 3-4 shows the results of the survey for each location visited. The report also provided a detailed description of each site, site visits, species found at each site, and numerous images of locations and amphibians observed.

Table 3-4. Results from the Amphibian Survey for Each Location Visited.

Location	Red-Legged Frog		Pacific Tree Frog		Long-Toed Salamander		Northwestern Salamander		Rough-Skinned Newt	
	PRESENT	BREEDING OBSERVED	PRESENT	BREEDING OBSERVED	PRESENT	BREEDING OBSERVED	PRESENT	BREEDING OBSERVED	PRESENT	BREEDING OBSERVED
Snook	X	–	X	X	–	–	–	–	–	–
Brown	X	X	X	X	–	–	–	–	X	X
Alder Creek	X	X	X	X	–	–	X	X	X	X
Stanek	X	X	X	–	–	–	X	X	X	X
Powers	X	–	X	–	X	–	–	–	X	–
Wilson	X	X	X	X	–	–	–	–	–	–
Bernet	–	–	X	X	X	X	X	X	–	–
Jenkerson	–	–	X	X	–	–	X	X	X	X
Beebe	X	X	X	X	X	X	–	–	X	–
Port	X	X	X	X	X	X	–	–	–	–
Scappoose Bay	X	X	X	X	X	X	–	–	–	–

Duck Lake Baseline Data

Duck Lake Wetlands is a restoration project currently being designed for a floodplain depressional wetland located along Multnomah Channel (see Figure 3-12). The landowners—Oregon Parks and Recreation Department (OPRD) and Rivers Bend Marina—have both expressed a desire to restore and enhance the area for multiple species, including waterfowl, fishes, beaver, amphibians, and reptiles.

The SBWC is working with Lower Columbia Estuary Partnership (LCEP) and Lower Columbia Engineering to collect and analyze water level, water temperature, elevation, and vegetation data for the site to support restoration alternative development.

Data collected includes the following:

- Site reconnaissance and a historical review were done to assess the riparian buffer, fluvial morphology, and habitat conditions. Historical aerial photos that date to 1929 were compared with current conditions and show extensive changes in river flow and vegetation type.
- Fish and wildlife populations were researched through both literature reviews and field surveys. An emphasis was placed on collecting existing data on salmonids due to the project's proximity to the Multnomah Channel. The property has excellent potential to provide feeding and resting habitat for migrating waterfowl, herons, rails, and cranes. An egg mass survey provided a qualitative assessment to determine the potential abundance of amphibians.
- Temperature and water level data was collected with seven pressure transducers and three temperature monitors. Figure 3-13 shows a LiDAR map with the locations of the pressure transducers in the

wetlands. This data revealed the extent of water exchange between Multnomah Channel and Duck Lake, the variability due to river flow and tides, and the ability (or inability) of the water control structures to allow water transport. Temperature data indicates that the dominant water source is groundwater, and there is a distinct hydraulic gradient running from west to east when Multnomah Channel has receded in early summer and is not inflowing to Duck Lake.

- Vegetation communities were determined through an initial review of LiDAR, orthophotographs, and color infrared imagery, and then followed by field surveys. Plants were identified to the species level and a percent cover was determined. Seven distinct associations were classified: beggarticks/RC, wapato, RC, and ash/Pacific willow/RC.

In addition to the baseline monitoring data, hydrologic modeling was conducted, five restoration alternatives were determined, and a decision matrix comparing the benefits and risks between design alternatives was created. These studies are discussed in Section 4.

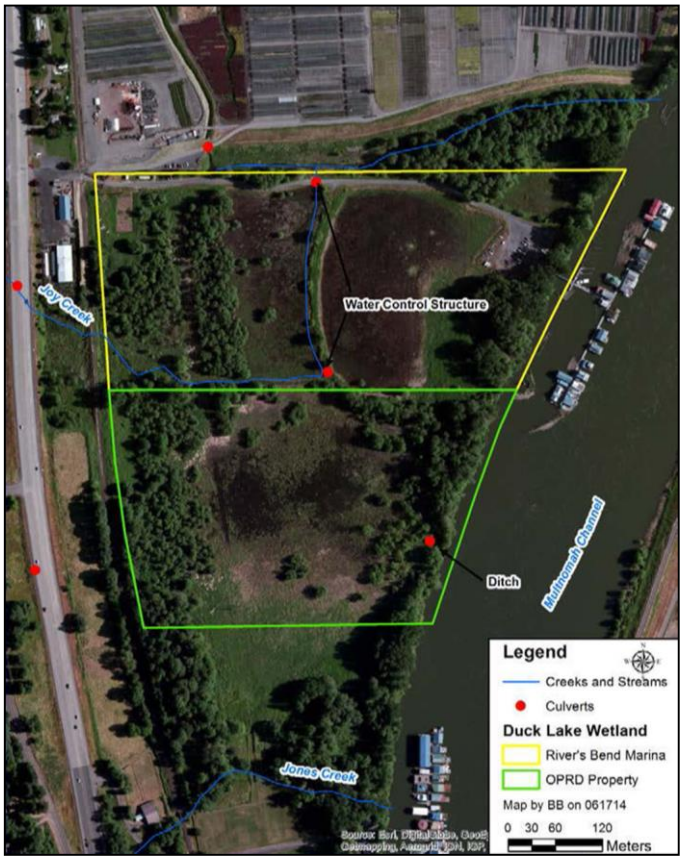

Figure 3-12. Duck Pond restoration project.

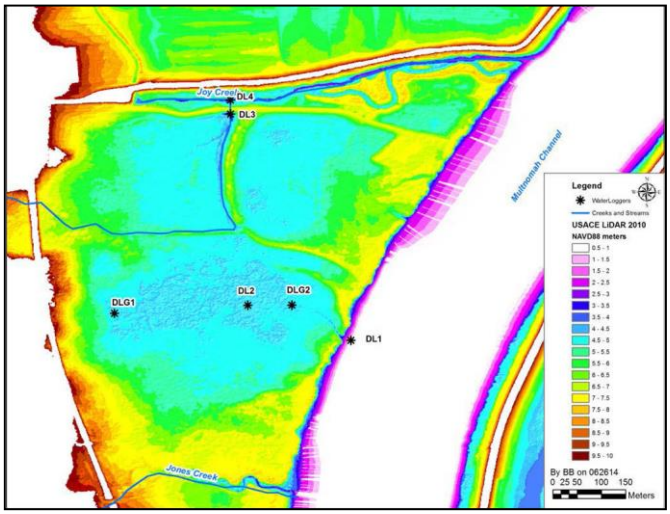

Figure 3-13. LiDAR map showing the locations of the pressure transducers in the wetlands.

SECTION 4

SBWC Projects

This section describes the significant projects that the SBWC has completed since the SBWA was conducted in 2000. The SBWC has been involved with projects that range from major culvert replacements to numerous small riparian plantings, and outreach programs such as establishing a native nursery. The following pages outline the project types and funders, provide tables listing project information and location, and highlight several of the projects through description and images.

Major Project Types

Most of the SBWC projects fall into one of the following types, although many of the projects overlap in their full extent.

- **Connectivity and fish passage.** Projects that repair, replace, or remove fish passage barriers, reopening streams and sub-basins of the watershed to their natural connection with either the main Multnomah Channel (and thus the Columbia River) or Scappoose Bay. Many of these projects have also directly addressed the fish passage priorities documented in “A Comprehensive Assessment of Fish Passage Barriers in the Scappoose Bay Watershed” (2001).
- **Instream processes.** Projects that are hydraulic enhancements to the stream and surrounding banks, such as placement of LWD, bank stabilization, and other channel improvements.
- **Riparian enhancement and native plant restoration.** Projects that generally include a nonnative vegetation control element followed by plantings of native trees, shrubs, and other plants that protect stream-side conditions or provide habitat for wildlife.
- **Wetland enhancement.** Projects that restore or improve wetland conditions; these may be in the tidal wetlands of Scappoose Bay Bottomlands or freshwater wetlands of the upper sub-basins.
- **Education and outreach.** Projects focused on working with students and the community through educational programs, presentations, and community-based conservation. An example is the development of a native plant nursery.

Figure 4-1 shows the type of SWBC projects and their locations.

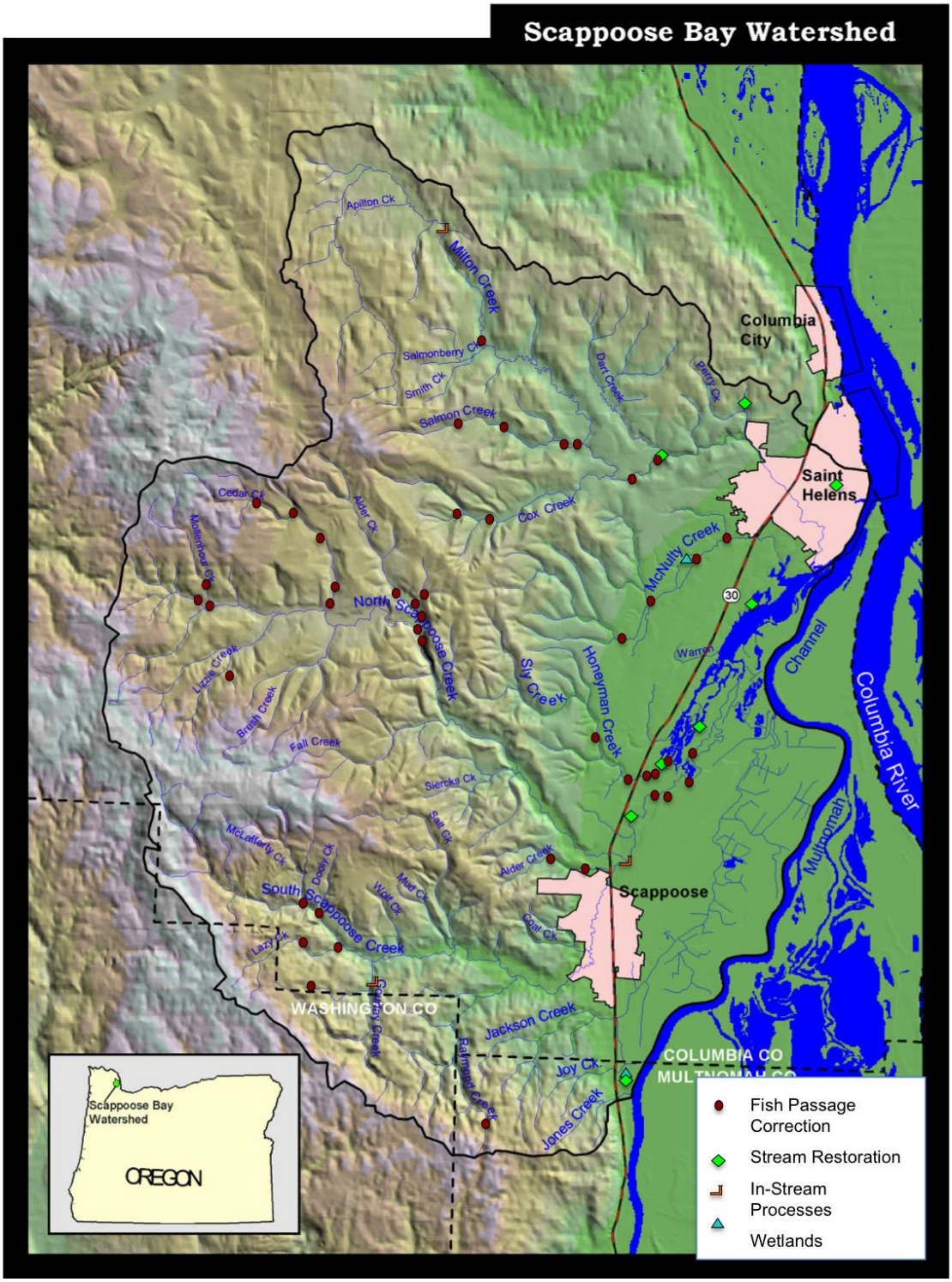

Figure 4-1. SWBC projects and their locations.

Project Supporters and Funders

A number of local, regional, and national entities support the SBWC. Major funding sources for projects include the following:

- Oregon Watershed Enhancement Board (OWEB)
- LCEP
- Columbia Soil and Water Conservation District
- ODFW
- BLM
- Bonneville Power Administration (BPA)
- U.S. Fish and Wildlife
- Local governments - the cities of St. Helens and Scappoose, and Columbia County
- Local landowners and community

Since 1997 the SBWC has been awarded over $3 million in grants, developed major projects with governments at the federal, state and local levels, worked directly with a large number of local landowners, and involved over 2500 students in projects and events. The following subsections discuss these projects and highlight several of them.

Connectivity and Fish Passage

Scappoose Bay drains into Multnomah Channel a few miles upstream of the channel's confluence with the Lower Columbia River. Although relatively small in size, the Scappoose Bay watershed once supported four of the six species of salmon found in the Pacific Northwest. Access from the bay and streams draining into Multnomah Channel provided salmonids with a diversity of habitats, ranging from small, steep mountain streams to extended low-gradient stream valleys to the lowland floodplain of the Columbia River estuary.

Connection to these areas has been cut off through a complexity of activities, including public and private roads, diking, and degraded culverts. Fish passage barrier corrections were one of the top priorities mentioned in the SBWA; the council has completed 46 of the recommended projects in the past 14 years.

The projects' results include significant tidal and wetland enhancements in the Scappoose Bay Bottomlands through barrier improvements in Honeyman Creek, complete dam removals on Gourlay, McNulty, and Milton Creeks, and the opening of many miles of upstream habitat from the removal of numerous small culverts within the watershed. Table 4-1 shows the number of fish passages corrected and the number of corrected passages per sub-watershed. Table 4-2 lists the corrected barriers' sub-watershed, habitat index, and ranking both within the sub-watershed and within the entire watershed. All but two of the barriers that ranked in the top 20 have been corrected, and 29 of the barriers that ranked in the top 40 have been corrected. Crossing ID, Upstream Refugia, Habitat Index, and Rank were taken from "A Comprehensive Assessment of Fish Passage Barriers in the Scappoose Bay Watershed" (DEA 2001).

Many of the fish passage corrections occurred between 2001 and 2006, with single SBWC projects correcting multiple crossings. For example, a $400,000 grant from OWEB in 2001–2003 was used to correct 14 high-priority fish passage barriers; another grant in 2004 was used to correct six passages.

Table 4-1. Number of Fish Passage Barriers Corrected by the SBWC; Total and by Sub-Watershed

Sub-Watershed	Passages
Scappoose Creek	23
Milton Creek	10
McNulty Creek	5
Honeyman Creek	8
Total Passages	**46**

Table 4-2. Fish Passage Barrier Corrected by the SBWC Since 2001

Crossing ID	Sub-Watershed	Stream	Upstream Refugia	Habitat Index	Rank: Sub-Watershed	Rank: Watershed
259	Honeyman	Honeyman Cr	Yes	39.85	1	1
210	Scappoose	Raymond Cr	Yes	22.94	1	3
101	Scappoose	Lizzie Cr	Yes	21.61	2	4
102	Scappoose	Cedar Cr	Yes	19.90	3	5
103	Scappoose	Cedar Cr	Yes	19.90	4	6
264	Scappoose	Alder Cr	Yes	19.17	5	7
155	Milton	Cox Cr	Yes	18.87	1	8
79	Scappoose	Alder Cr	Yes	18.23	6	9
116	Scappoose	Cedar Cr	Yes	17.79	7	10
160	Milton	Cox Cr	Yes	17.59	2	11
118	Scappoose	Cedar Cr	Yes	16.30	8	12
251	Honeyman	Honeyman Cr	No	15.72	3	13
148	Milton	Salmon Cr	Yes	15.62	3	14
283	Scappoose	Cedar Cr	Yes	15.60	9	15
85	Scappoose	Alder Cr	Yes	13.55	10	18
91	Scappoose	Alder Cr	Yes	13.10	11	19
86	Scappoose	Alder Cr	Yes	13.03	12	20
87	Scappoose	Alder Cr	Yes	12.71	13	21
36	Scappoose	Gourlay Cr (Dam)	Yes	11.52	14	24
108	Scappoose	N. Scappoose Cr	Yes	11.50	15	25
107	Scappoose	N. Scappoose Cr	Yes	11.45	16	27
89	Scappoose	Alder Cr	Yes	11.30	17	28
150	Milton	Salmon Cr	Yes	11.15	7	29
154	Milton	Salmon Cr	Yes	10.59	8	31
11	Scappoose	Lacey Cr	Yes	10.09	18	32
109	Scappoose	Unknown	Yes	9.33	20	38
286	Scappoose	Mollenhour Cr	Yes	9.04	21	39
151	Milton	Salmon Cr	Yes	8.08	9	40

Crossing ID	Sub-Watershed	Stream	Upstream Refugia	Habitat Index	Rank: Sub-Watershed	Rank: Watershed
51	Scappoose	Dooly Cr	Yes	4.19	29	53
153	Milton	Salmon Cr	Yes	4.10	15	54
49	Scappoose	Alder Cr	No	3.54	30	58
260	Honeyman	Unknown	Yes	2.95	6	63
136	McNulty	McNulty Cr	No	2.61	3	69
250	Milton	Milton Cr (Dam)	Yes	185.70	28	84
253	Milton	Milton Cr (Dam)	No	31.37	29	87
122	McNulty	McNulty Cr	No	25.78	6	88
113	McNulty	McNulty Cr (Dam)	No	20.47	7	90
124	McNulty	McNulty Cr (Dam)	No	20.13	8	91
258	Honeyman	Unknown	Yes	8.55	10	96
261	Scappoose	Unknown	Yes	2.47	45	103
271	Milton	Cox Cr	Yes	4.85	12	49
294	Honeyman	Honeyman Cr	Yes	NA	NA	NA
262	Honeyman	Honeyman Cr	Yes	38.02	2	2
295	Honeyman	Honeyman Cr	Yes	NA	NA	NA
296	Honeyman	Honeyman Cr	Yes	NA	NA	NA
229	McNulty	Warren Cr	No	1.41	11	106

Highlighted Project: Honeyman Creek

The **Honeyman Creek Project** corrected four passages and significantly enhanced a large parcel in the Scappoose Bay Bottomlands.

Honeyman Creek flows through the Malarkey Ranch and out into the Scappoose Bay Bottomlands, near Warren, Oregon. This project addressed four unimproved road crossings that cut across slough and stream channels blocking fish passage and impairing hydrologic processes. Bridges were constructed to replace culverts on three of these crossings and to replace road fill across a slough on the fourth crossing.

The completed bridge at Barrier #262. (SBWC photo)

A significant achievement of this project was increasing the tidal fluctuations and frequency on the property, thereby improving the natural hydrogeomorphic processes to 54 acres of wetland habitat. This improvement also provided salmonids with access to these acres of freshwater tidal rearing habitat, as well as stream habitat in Honeyman Creek. Figure 4-2 shows a map of the fish passage barrier locations in the Scappoose Bay Bottomlands.

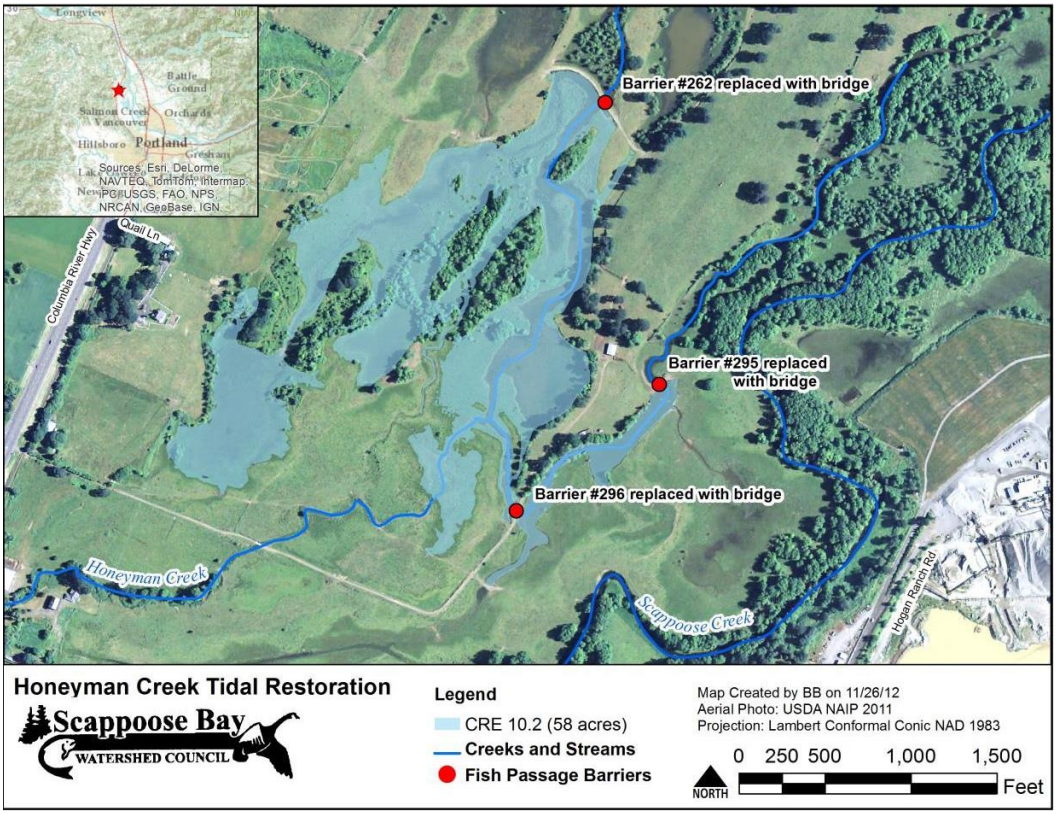

Figure 4-2. Location of the fish passage barriers in the Honeyman Creek project.

Instream Processes

Channel incision and simplification issues have occurred in the Scappoose Bay watershed as a result of logging, agriculture, and development practices along the stream banks. Multiple SBWC projects have addressed these issues by adding complexity and habitat improvements with the placement of LWD. After LWD placement, pool changes and vegetation growth are monitored for several years. These projects also focus on controlling nonnative weeds and planting native vegetation.

The SBWC has conducted and designed projects in several locations. Table 4-3 lists the LWD projects that the SBWC has conducted, along with the number of log structures and stream miles enhanced.

Table 4-3. SBWC Projects That Have Addressed Instream Processes

Project Name / Location	Start Year	End Year	No. Log Structures	No. Stream miles Opened or Enhanced
Gourlay Creek / South Scappoose Creek	2003	2005	5	0.1
Niemi Bank, Milton Creek	2006	2008	3	0.2
South Scappoose Creek	2009	2010	10	0.15
North and South Scappoose Confluence	2011	2012	6	0.5
Milton Creek (design stage)	2014	2016	120	3.5

Highlighted Projects: North and South Scappoose Confluence and Milton Creek

The **North and South Scappoose Confluence** project was a typical instream process enhancement project. The project was identified as a priority in the "South Scappoose Creek Restoration Plan" (2009) and was designed to restore the function of the alluvial fan and to improve habitat at the confluence of the two main stem channels of South and North Scappoose Creeks.

The project began in spring 2011 with pre-project weed control and vegetation monitoring. Construction and native planting occurred in summer and fall 2011. The project included the following elements (Figure 4-3):

- Six large wood structures along North Scappoose Creek were placed and partially buried and pinned to provide a long-term source of channel and floodplain complexity.
- The head of existing secondary channels was excavated to improve connectivity between the main streams and secondary channels.
- Ten large wood pieces were placed in the secondary channels to encourage pool formation.
- Large wood was placed to enhance backwater habitat.
- Four-and-a-quarter acres were replanted with native trees and shrubs to stabilize and enhance the existing riparian forest.

Monitoring and plant maintenance have continued for several years since the project was constructed.

SBWC has completed a design for the **Milton Creek Large Wood Enhancement Project.** Milton Creek has been degraded over the past 150 years from the practices of using splash dams for logging and removal of log dams to encourage adult salmonid access to upper stream reaches. The reduction of instream wood and connectivity to side channels has reduced the spawning and rearing habitat for coho, steelhead, and cutthroat.

The Milton Creek Limiting Factors Analysis and Restoration Plan for the Milton Creek Watershed (see the "Limiting Factors Analysis and Restoration Plan, Milton Creek 6th Field of Scappoose Bay" in Section 2) identified several anchor sites that have the potential to provide necessary habitat for coho life stages. A 2013 OWEB grant supported the development of designs for placement of logs and logjams into the main stem along a 3.2-mile stretch between anchor sites 3 and 4.

The Milton Creek Large Wood Enhancement Project includes an assessment of the area for accessibility, availability of nearby wood, and ideal locations for wood placement along 15 reaches within this area. The city of St. Helens owns most of the land bordering this section of Milton Creek and manages it for forest production. The SBWC is partnering with the city on a proposal to implement the placement of wood designs, using timber within no-cut zones bordering the stream. Figure 4-4 shows an example of the log placement for Reach 12. The implementation project is expected to be constructed in 2015.

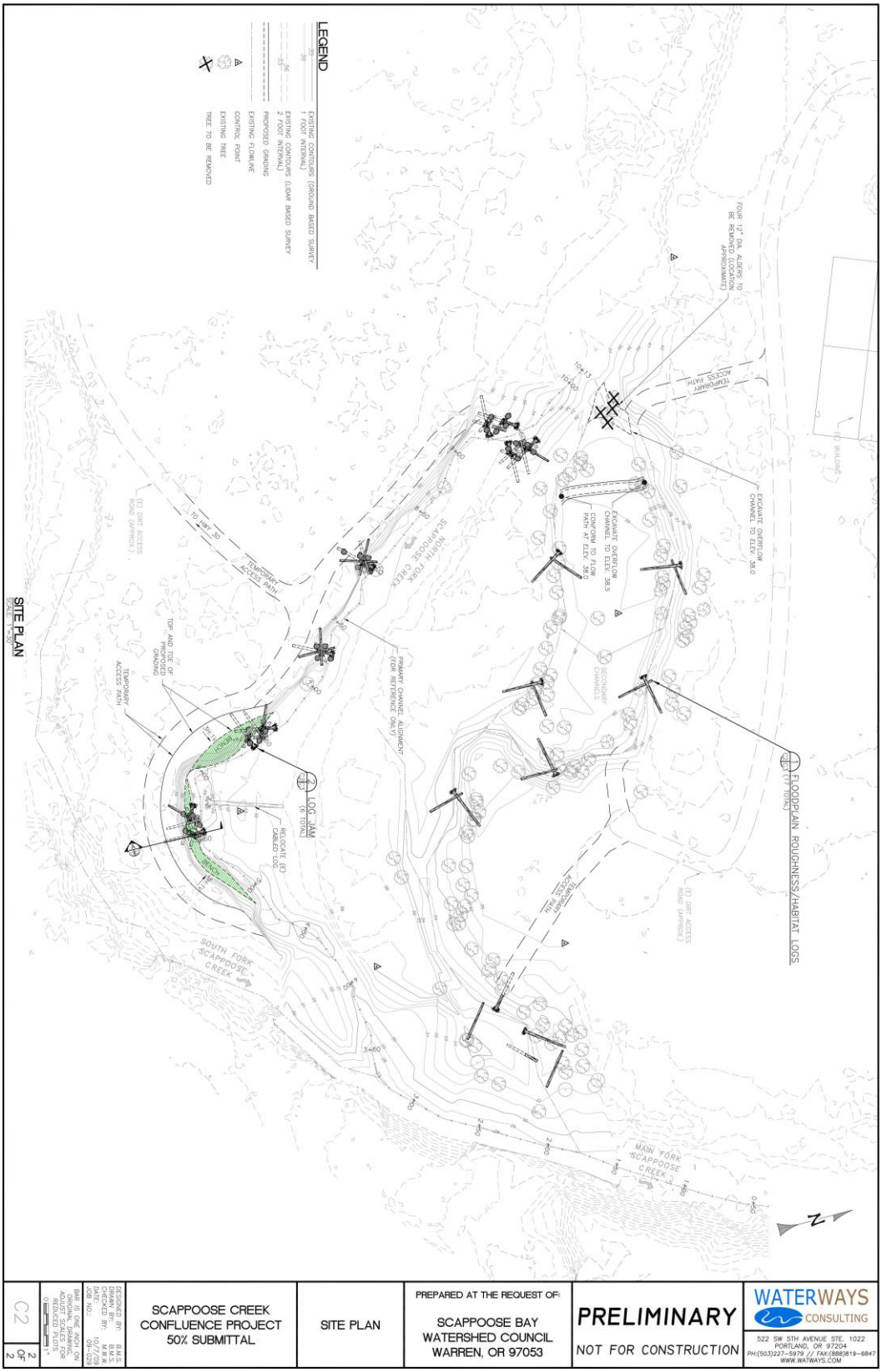

Figure 4-3. The site plan for North Scappoose Creek.

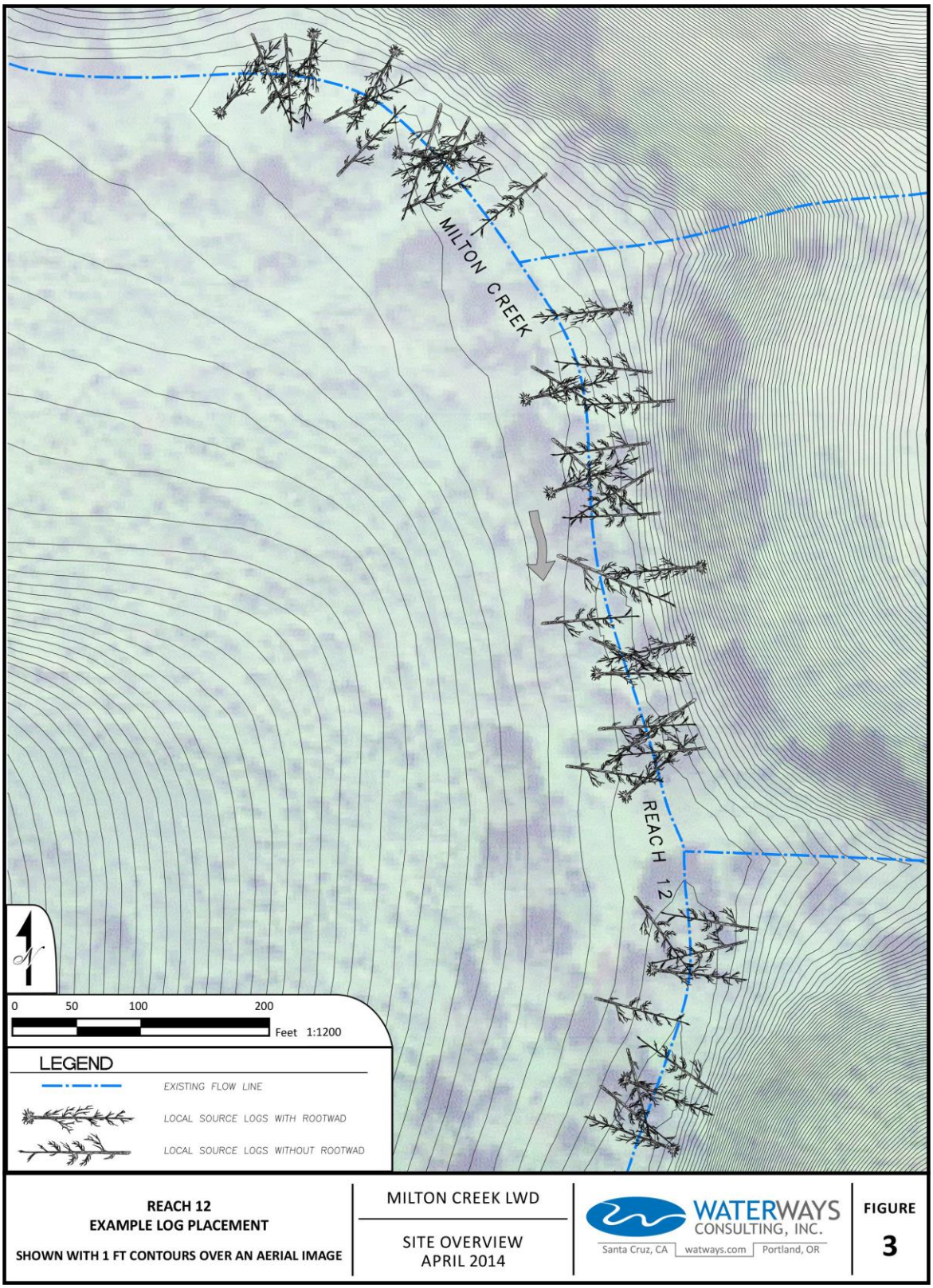

Figure 4-4. An example design for log placement for reaches of the Milton Creek Large Wood Enhancement Project.

Riparian Enhancement and Native Plant Restoration

The SBWC has conducted several large and small riparian restoration projects throughout the watershed over the past 10 years. These projects range in size from fencing and vegetation improvements on a steep slope of an unnamed tributary of Milton Creek, to a multiyear project on a 20-acre riparian area in the Scappoose Bay Bottomlands.

Typical projects include working with interested landowners to encourage participation and secure permission, assessing the site for suitable activities, weed eradication, planting with native vegetation, and follow-up monitoring. Table 4-4 lists many of these projects and shows the project focus, start and end years, and acres or stream miles restored.

Table 4-4. SBWC Riparian Enhancement and Native Plant Projects

Project / Location	Project Focus	Year Start	Year End	Acres	Stream Miles
Scappoose Bay Marina	Manage invasive weeds and replant with native vegetation	2006	2008	12	
Scappoose Creek Bank Stabilization	Manage invasive weeds and replant with native vegetation	2007	2009		0.1
Nob Hill / St. Helens	Oak woodland restoration (remove nonnatives and replant with natives)	2009	2011	5	
Fisher Park Creek / Scappoose Sub-Basin	Manage invasive weeds and replant with native vegetation	2009	2011	1	
Scappoose Creek Riparian Restoration	Manage invasive weeds and replant with native vegetation	2011	2012	4	1.1
Hogan Ranch / Scappoose Bay Bottomlands	Pond restoration - manage invasive weeds and replant with native vegetation	2005	2013	20	
City of Scappoose Floodplain	Design channel and riparian enhancement	2011	2013		0.5
Knotweed Treatment - Milton and Scappoose Sub-Basins	Treat invasive knotweed along riparian corridor	2010	2014		20
Milton Creek Restoration	Restore riparian corridor with native plants	2013	2014		0.9
Unnamed Tributary / Milton Creek	Protect streambank with fence and plant native plants	2013	2014	0.5	0.25
Garlic Mustard Treatment / Scappoose Sub-Basin	Treat invasive garlic mustard along riparian corridor	2012	2015	113	4
North and South Scappoose Confluence	Manage invasive weeds and replant with native vegetation	2011	2015	4.25	
Haderly - North Scappoose	Manage invasive weeds and replant with native vegetation	2013	2015		0.1
Duck Lake / Multnomah Channel	Enhance riparian and wetland areas with native plants	2014	2016	30	

Highlighted Projects: Hogan Ranch, the City of Scappoose Floodplain, Milton Creek, and Nob Hill Restorations

The **Hogan Ranch Restoration** began in 2004 when the Natural Resources Conservation Service acquired a conservation easement for 171 acres of this Scappoose Bay Bottomland property. The major elements of the restoration done over the next six years include the following:

- Topographic and vegetation surveys were done in 2005, and fencing was constructed to exclude most cattle.
- In 2007, weed control and planting were done on 5 acres around Pond 1 (see Figure 3-4. Water quality and restoration sites at Hogan Ranch.).
- Additional trees were planted along Pond 3 in 2008, and Ponds 1 and 2 were prepped for large plantings.
- In 2009, 15 acres were planted around Ponds 1 and 2, and supplemental plantings were done on Pond 3.
- In 2010 and subsequent years, plantings were monitored using photo points, and the site was mowed as needed to reduce the cover of nonnative vegetation, including reed canary grass.

Figure 4-5 and Figure 4-6 show the change in vegetation in Hogan Ranch in 2008 and 2014.

Figure 4-5. Photo point 9 on Hogan Ranch in 2008. (SBWC photo.)

Figure 4-6. Photo point 9 on Hogan Ranch in 2014 showing the change in vegetation. (SBWC photo.)

The **City of Scappoose Floodplain Restoration** (2013) project developed conceptual designs, an alternatives analysis, and cost estimate for the selected restoration alternative for four contiguous management reaches identified in the “South Scappoose Creek Restoration Plan” (2009) (see the review of the plan in the “South Scappoose Creek Restoration Plan” subsection). The limiting factors of the creek include loss of secondary channels, channel incision and bank erosion, channel realignment, and loss of riparian vegetation. Preliminary hydrologic and hydraulic analyses were used to develop proposed treatments that included laying back channel banks, creating floodplain benches within the channel, reconnecting remnant side channels, and adding large wood structures. Implementation of this work has been submitted for funding.

The **Milton Creek Restoration Project** worked with nine landowners in 2013 and 2014 to enhance approximately 0.9 miles of Milton Creek by managing nonnative vegetation and planting with appropriate native vegetation. Project activities also included the enhancement of a seasonal tributary to Milton Creek by fencing off and planting along 1,000 feet of creek to exclude cattle and reduce sedimentation and elevated temperatures in waters that flow directly into Milton Creek. The project activities enhanced acreage that includes about 11 acres of riparian habitat.

This project worked with the Columbia River Youth Corps (CRYC), who began planting sites in December 2012. By April 2014, 15,000 native trees and shrubs had been installed over the project area.

Nob Hill is a 6.6-acre oak woodland habitat that became a city of St. Helens park in 2008. A local group of volunteers have been holding semi-annual work parties there since 2004. The SBWC has supported these activities to remove invasive plants such as English ivy, holly, and blackberries, and replant the site with native vegetation. The park hosts a significant stand of native white oak, camas, trillium, fawn lilies, and numerous other shrubs and wildflowers.

CRYC hauling plants into place along Milton Creek. (SBWC photo.)

CRYC planting and marking plants within a weed barrier on Milton Creek. (SBWC photo.)

A significant stand of native white oak and camas in Nob Hill Nature Park. (SBWC photo.)

Wetland Enhancement

The Scappoose Bay watershed contains a number of areas where both small and large wetlands offer wildlife and native plant habitat. Many of these areas have been lost through stream simplification, agriculture, and development. Table 4-5 lists the wetland projects that the SBWC has been involved in.

Table 4-5. SBWC Wetland Enhancement Projects

Project	Focus	Year Start	Year End	Acres
Bernet Wetland Enhancement	Manage invasive weeds and replant with native vegetation	2008	2010	15
Landers Wetland Enhancement	Remove unlawful dumping and replant with native vegetation	2012	2014	2
Elliot Wetland	Enhance and enlarge existing wetland for mitigation	2009	2009	1.7

Highlighted Project: Landers Wetland

In 2014, the **Landers Wetland** project worked on a wetland located in an area of poor drainage that had been degraded by unlawful dumping. Approximately 100 cubic yards of fill was removed, improving the hydrologic function and matching the landscape to the surrounding elevation. Invasive Himalayan blackberries were grubbed out, native grass and forb seeds were sown, and 566 native trees, shrubs, and herbaceous plants were planted to increase plant diversity.

Education and Outreach

The SBWC has had an active education and outreach program since its inception in 1997. Community members are invited and encouraged to participate in many of the council's projects. Our website describes many of the programs and specific projects and also provides information on related conservation events and opportunities.

Highlighted Project: Native Plant Nursery

One of the largest educational programs of the SWBC is the **Native Plant Nursery**. The nursery was started in 2006 with an OWEB grant to help teachers at Scappoose High School develop field-based studies. The original grant supported construction of the nursery buildings and planting containers, which are located directly behind the school. The nursery currently can hold approximately 3,500 plants in gallon containers and 14-inch tree pots. The plants are grown out from seed or cuttings collected

The SBWC's native plant nursery. (SBWC photo)

locally, or from potted bare-root stock purchased from a native plant nursery.

The SBWC's native plant nursery. (SBWC photo)

Many volunteers help at the nursery and with related projects, including two annual public plant sales that support the operation of the nursery. Many of the plants grown in the nursery are used in native plant restoration projects throughout the watershed. In 2008 and 2009, approximately 2,200 containerized plants grown at the nursery were planted at four sites: along South Scappoose, North Scappoose, and Scappoose Creeks, and at a wetland enhancement project. Plants were also used for a senior project at Scappoose High School to create a native plant landscape. Plants that do not go to project sites are made available to creek-side landowners who partner with the council on weed management efforts and other activities along the creek.

The nursery is an excellent asset in providing local teachers and students with an outdoor classroom for classes and special projects. It also serves as a resource for private landowners to obtain native plants and as an outreach component by educating the community on the benefits of using native plants and planting along the creeks.

Duck Lake - A Combination of Project Types

The **Duck Lake Connectivity and Wetlands Project** combines many of the elements of all the projects discussed above. In 2014 SBWC partnered with the LCEP to determine the feasibility of restoring a tract of land named Duck Lake, a depressional wetland located along Multnomah Channel south of Scappoose. The two parcels making up this piece, owned by OPRD and Rivers Bend Marina, were once a seasonally wet prairie with pockets of scrub-shrub forest. A natural levee bordered it to the east along Multnomah Channel, and Jones Creek flowed through the area before entering Joy Creek to the north.

Road construction, agriculture activities, dike and drainage ditch construction, and significant vegetation changes occurred throughout the twentieth century. Jones Creek was shortened and rerouted to directly enter Multnomah Channel south of the property, and Joy Creek was rerouted to run along a constructed levee through the property. There is a small drainage ditch connecting a portion of the wetland with Multnomah Channel.

The SBWC conducted water quality and vegetation surveys at Duck Lake (see the "Duck Lake Baseline Data" subsection) and worked with Lower Columbia Engineering to produce five restoration alternatives. The first of these alternatives is a revegetation of the property with native trees, shrubs, and plants to encourage beaver activities and control nonnative plants. Building on the first alternative, alternatives 2, 3, and 4 create off-channel habitat by reconfiguring and enlarging the connection to Multnomah Channel. Each

of these has varying degrees of channel construction and routing. Alternative 5 (see Figure 4-7) reroutes Joy Creek to a more natural channel and repairs the natural levee connection with Multnomah Channel.

Hydrologic modeling of existing conditions and proposed changes was conducted, simulating flows from the two-year flood event. Analysis of this data assisted with determining potential wetland flooding and hydrologic conditions under different scenarios. Additionally, to help with the alternative selection process, a decision matrix was created to help quantify the different strengths and weaknesses associated with each restoration alternative. The decision matrix compares the benefits of elements such as potential of wetland function, improved habitat, and fish passage with costs and risks such as those associated with revegetation, maintenance, and permitting.

The landowners are currently considering the proposed alternatives. The next phase of the project will be to develop final design plans for the chosen restoration work. This phase is scheduled for 2015, with construction in 2016.

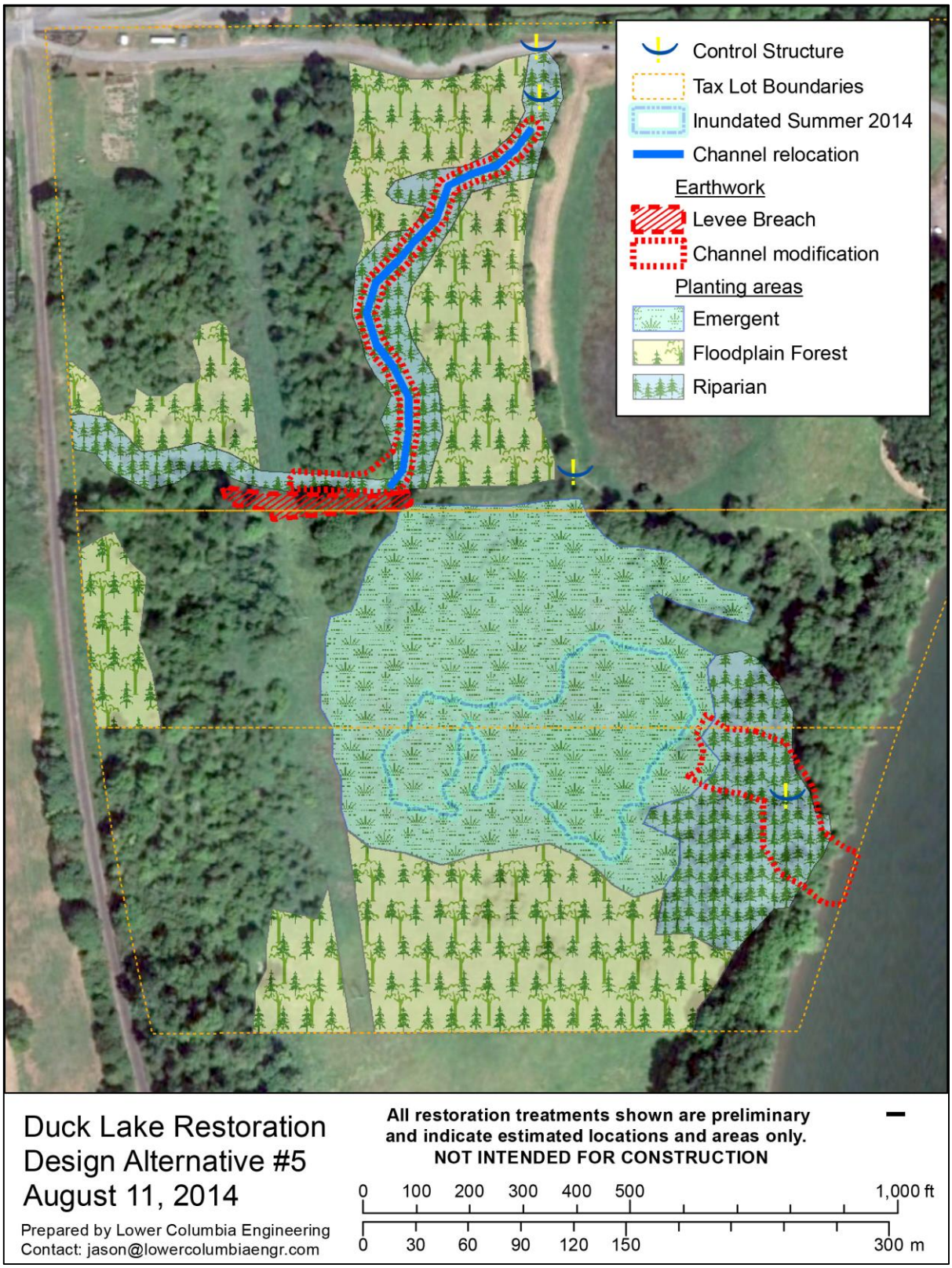

Figure 4-7. Map showing design alternative 5 at Duck Lake restoration.

SECTION 5

Project Results Based on SBWA Recommendations and Priorities

This section describes the accomplishments that have been made based on the SBWA's recommendations and priorities. It compares the results of the past 14 years of work to the major elements and conclusions of the 2000 assessment. The results reveal how well the presented watershed issues have been addressed through council projects and help determine what issues require additional attention.

The SBWA noted a significant historical change in the watershed, particularly through stream alterations, blockage, and reduction in LWD in stream channels. It also highlighted a drastic decline in salmonid species. The SBWA established the following major recommendations and priorities:

- Conduct additional surveys of fish distribution, stream habitat, and fish passage barriers.
- Develop expanded water quality and instream flow and water use monitoring programs.
- Prioritize the protection of existing high-quality habitat, particularly in the estuarine bottomlands, over restoration projects.
- Focus restoration projects in the high-priority watersheds of Scappoose and Milton Creeks.

Accomplishments

The SBWC addressed many of the SBWA recommendations through a significant number of successful projects.

Fish Passage Barriers

- The SBWC completed a comprehensive barrier assessment in 2001 that included a priority list of barriers for correction.

- Between 2001 and 2014, the SBWC completed projects that corrected 46 of these barriers; most of these were from the top one-third of the priority list.

Surveys of Fish Distribution and Habitat

- Limiting Factor Analyses and RBAs were completed in Scappoose and Milton Creeks and in some smaller sub-basins. These studies clarify the number of species decline and provide details about specific habitat degradations within the watershed.
- ODFW aquatic surveys were done in 2007–2009 in North Scappoose, South Scappoose, and Milton Creeks, including surveys in 10 tributaries; over 40 miles surveyed. These surveys included information on channel characteristics and riparian vegetation, and notes on land use.
- A habitat survey was included in the Scappoose Bay Bottomlands Restoration Plan (2004), produced for the Lower Columbia River Estuary Partnership. Significant land cover changes, particularly from wetland (historically) to non-wetland plant associations (currently), were identified.

Water Quality and Other Monitoring

- A watershed-wide monitoring program sampled 27 sites during 2008–2010. Data was collected for a number of water quality parameters, and sampling included macroinvertebrate and bacteria. A portion of this data can be compared to water quality sampling done in 1998 and 1999.
- Water quality sampling was also done on a 70-acre wetland near Jackson Creek south of Scappoose, as a pre-project assessment to a wetland enhancement project.
- A collection of LIDAR images was produced showing the landscape of the Scappoose Bay Bottomlands and has been used in planning and analysis of restoration projects within the floodplain.

Habitat Protection and Stream Restoration

- The NRCS acquired a conservation easement on 171 acres of Scappoose Bay Bottomlands in 2004. The SBWC conducted projects on this property from 2004 through 2013 that included fencing, weed control, native plantings, vegetation and water quality surveys, and post-project monitoring.
- Riparian restoration projects have primarily occurred in Scappoose and Milton Creeks with a few others along Scappoose Bay and plantings along Jackson Creek. A 2014 project restored native vegetation along a one-mile stretch in Milton Creek along a section that cattle had severely trampled; a similar project in Scappoose Creek covered 1.1 miles; many other projects have protected additional stream miles in smaller segments.

- Knotweed and garlic mustard are invasive species that are being controlled along more than 20 miles of Scappoose and Milton Creeks, through multiyear programs. A reduction in the need to spray and an increase in native vegetation along these streams indicate the success of these programs.

Challenges

Habitat Protection – Scappoose Bay Estuarine

The SBWA listed the protection of nodal refugia as the top protection and restoration priority. The Hogan Ranch protection and restoration project is a critical piece in these bottomlands. Unfortunately, it is one of the few estuarine areas that have been removed from potential development.

There are approximately 12,000 acres in the Scappoose Bay floodplain, with two major streams (Scappoose and Jackson) draining into the bay. Most of this land is privately owned, although the OPRD owns approximately 320 acres near the northeast corner of the bay. Land parcels near the bay itself vary in size from less than 2 acres (primarily between Hwy 30 and the west shore of the bay), to over 300 acres by a single owner at the south end of the bay. There are larger tracts in private farms (over 500 acres) along Jackson Creek and east to Multnomah Channel.

The potential for land development here is unknown, although the entire southern Columbia county area is experiencing development pressure due to its proximity to Portland. The council board or staff has approached a few of the landowners regarding their willingness to consider protection and restoration, with limited response. A more concerted effort is required to identify and work with landowners potentially interested in partnering on protection and restoration activities.

Habitat Protection – Headwaters

Protection of the North and South Scappoose Creek headwaters was the second protection and restoration priority. Property ownership here is a mix of BLM, private timber companies, and other individuals with small parcels. These areas contain a mix of mature evergreen forests, small and young trees, and small patches of grasslands.

Because these areas are somewhat protected from large development due to their remote location and accessibility, it may be more feasible to review and possibly improve land management along the stream corridors than to seek protection.

In-Use Flow and Water-Use Monitoring Programs

Water rights and use were discussed in Chapter 10 of the SWBA (see the appendix for the relevant maps). There are a large number of surface water withdrawals in the watershed, including municipal and multiple-use supply points on both Scappoose and Milton Creeks.

The lack of stream-flow data is a common problem throughout the watershed, and is a potential project area for the Council.

Salmonid Habitat Instream Restoration Projects

Although many restoration projects have been completed through the removal of non-native vegetation and plantings of native trees, shrubs, and other riparian plants, only a few projects have focused on enhancing channel complexity and stream processes. As identified in several studies (including the “South Scappoose Creek Restoration Plan” and the LFA), the lack of LWD and disconnection of the main channels from floodplains are significant issues limiting salmonid production. These issues require more complex solutions. The Milton Creek Large Wood Enhancement Project (see the “Instream Processes” subsection) that has been designed and is now being proposed for implementation is an example of what can be done.

Summary

Table 5-1 summarizes the results of projects that have taken place in response to the recommendations and priorities established by the SWBA.

Table 5-1. Project Results Based on SWBA 2000 Recommendations and Priorities

Protection of Four Biologically Highest Priority Refugia Areas

	ADDRESSED	PARTIALLY ADDRESSED	NOT ADDRESSED	COMMENT
Scappoose Estuary		X		Hogan Ranch
North Scappoose Creek Headwaters			X	
South Scappoose Creek Headwaters			X	
Gourlay Creek		X		

Data Gaps

	ADDRESSED	PARTIALLY ADDRESSED	NOT ADDRESSED	COMMENT
Salmonid distribution and abundance		X		LFAs and RBAs in Scappoose, Milton, and Honeyman Creeks
Fish passage barriers	X			
Instream flow and water use			X	
Aquatic habitat		X		Three main stems and 10 tributaries

Road condition for erosion			X	

Conduct Range of Restoration Projects

	ADDRESSED	PARTIALLY ADDRESSED	NOT ADDRESSED	COMMENT
Fish passage barrier corrections		X		46 completed
Road maintenance/removal			X	
Riparian plantings		X		
LWD placement		X		
Floodplain restoration		X		

SECTION 6

Future Focus and Direction

This section considers the future focus and direction of the SBWC. Significant factors that affect the council's direction include unmet Scappoose Bay watershed needs as identified in Section 5; how the watershed issues and projects relate to local and regional conservation plans and efforts; the proximity of the watershed to the growing populace of Portland and potential associated pressures; and potential opportunities that the council may not have yet considered.

Unmet Watershed Needs

Section 5 described how council activities for the past 14 years have addressed issues identified in the SBWA. Given the watershed's location within the Lower Columbia River and the combination of both floodplain and forested waterways, future work should focus primarily on the protection and enhancement of salmonid refugia.

The greatest unmet need may be protecting the Scappoose Estuary due to its importance and the challenge of involving landowners, plus the potential financial resources likely required. Additional unmet actions include protecting the headwaters of North and South Scappoose Creeks, addressing stream flow data gaps, maintaining roads, and assessing potential erosion.

The SWBA recommended that the SBWC initially focus on projects with a low risk of potential environmental impact and a high probability of success (such as riparian plantings), and then follow with higher risk and more experimental projects, such as large wood placement. This process has begun with the recent emphasis on riparian restorations, but greater emphasis should be placed on more complex projects.

Recommendations based on unmet needs:

- Increase efforts to identify and work with landowners in the Scappoose Bay Bottomlands who may be interested in protection opportunities.
- Look for additional bottomland restoration projects that may lead to greater exposure for potential protection projects.

- Develop larger, more complex habitat restoration projects and seek funding to implement them. Examples:
  - An implementation proposal for Milton Creek Large Wood Enhancement was submitted October 2014.
  - The South Scappoose Creek Enhancement has already been designed. Additional funding and partners should be sought for its implementation.
- Previous monitoring should be reviewed within the context of focusing future efforts on parameters not included, such as stream flows, and locations that were not sampled, such as at the mouth of major Scappoose Bay tributaries and in Multnomah Channel. Monitoring at a finer scale in some areas should be considered where data analyses suggest concerns.

Local and Regional Conservation Plans

SBWC Strategic Plan

In 2008 the Scappoose Bay Watershed Council Strategic Planning Committee published a Five Year Strategic Plan (January 2008). The committee recognized a “window of opportunity for planning and implementing large-scale projects,” stating a potential concern for “major economic development and population influx.” Four long-term goals (to accomplish in the next 20 years) were identified:

- Develop and implement a strategy to protect important wetlands along the major creeks and in the Scappoose Bay Bottomlands.
- Develop an understanding of the major changes in the main creek corridors connecting the upper watershed to the bay in order to successfully undertake large-scale restoration projects.
- Identify factors limiting the health of the watershed, including impacts to salmon and other keystone species, and implement projects to address significant habitat concerns.
- Identify opportunities to connect important natural areas such as Sauvie Island Wildlife Area and Ridgefield National Wildlife Refuge.

The second and third bulleted items have been addressed to some extent with the LFAs, RBAs, and the “South Scappoose Creek Restoration Plan.” These documents identify limiting habitat factors and support an understanding of the changes in the main creeks. Implementation of the recommendations from these studies has begun in some areas.

In addition to the long-term goals the committee developed internal and external goals and objectives, where internal goals dealt with funding and organizational structure, and the external goals identified projects and activities to concentrate on in the shorter term. The external goals were:

- Protect and enhance Scappoose Bay and connected wetlands

- Restore salmon habitat and creek corridor connections
- Track watershed trends and project effectiveness
- Develop community watershed stewardship

Some progress has been made toward these goals, as noted previously, but additional efforts are required (see Recommendations below).

OWEB Committee Summary

In 2005, the OWEB published the "Willamette Basin Restoration Priorities Watershed Summaries" (Willamette Basin Watershed Councils, 2005) to help identify priorities for restoring fish and wildlife habitat and water quality throughout the Willamette Basin. Key sub-watersheds identified within the Scappoose Bay Watershed were Milton and Scappoose Creeks, and specifically South Scappoose Creek as it "contains the greatest amount of intact habitat remaining in the entire watershed."

Prioritization considerations noted were:

- Continue to remove remaining high-priority barriers.
- Encourage natural reconstruction of habitat diversity through placement of LWD.
- Protect significant wetland properties through conservation easements or acquisitions.
- Manage invasive species and enhance existing native populations.

ODFW Conservation and Recovery Plan

The ODFW's "Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead" (ODFW, 2010) is a federal recovery plan for Oregon fish populations listed under the Endangered Species Act and a State of Oregon conservation plan under Oregon's Native Fish Conservation Policy. It serves as a guide to implement actions needed to conserve and recover salmon and steelhead in the Oregon portion of the Lower Columbia River sub-domain, which includes Scappoose Bay.

Two of the overarching strategies listed in the Scappoose sub-basin section are:

- Identify, prioritize, and protect existing high-quality and functioning habitat
- Identify, prioritize, and restore existing degraded habitat

Streams identified for these strategies include Milton and South Scappoose (for coho), and North Scappoose, Scappoose Bay, and Multnomah Channel (for coho, winter steelhead, and fall Chinook).

Recommendations based on local and regional plans:

The themes common to the above plans are (1) protect Scappoose Bay Bottomlands and wetlands, (2) identify and protect high-quality salmon habitat, particularly in South Scappoose Creek, and (3) restore degraded habitat. A significant amount of work has been done in identifying issues within the sub-watersheds, and restoration has begun in many areas.

Recommendations for additional efforts include:

- Develop community awareness of watershed condition and function with regard to salmonid protection and enhancement, and with the goal of gaining interest in potential opportunities.
- Increase efforts to gain additional funding for restoration projects, utilizing existing restoration designs in some areas.
- Identify and pursue protection and restoration projects on the southern reaches of the watershed, including south Scappoose Bay Bottomlands, Multnomah Channel, and Sauvie Island.
- Track watershed trends through additional monitoring in areas not addressed (such as Multnomah Channel and Sauvie Island), as well as by a review of locations where projects have been implemented (project effectiveness).

Local Population Pressures

Columbia County has shown a steady rise in population in the past decade. According to the Columbia County Economic Team (CCET), an economic development services entity, in-migration has been the primary driver of population growth. From 2000 to 2010,the population increased from 43,560 to over 49,351, a 13-percent increase; by 2035 projected population will reach over 60,000 (U.S. Census and CCET).

Building permits for residential buildings in the county grew from 265 units worth $36.1 million in 2000, to 358 units worth $68.3 million in 2005. The economic slowdown of 2008–2010 reduced that growth, but it is currently increasing again—from 58 units worth $12.5 million in 2010 to 81 units worth $19.9 million in 2013. This compares with the nearby Portland metropolitan area, which saw an increase in permit numbers from 12,962 units in 2000, to 17,251 units in 2005, followed by a slowdown of 4,476 in 2010, increasing to 7,785 units in 2012 (latest numbers available).

In 2010, the Scappoose Economic Opportunities Analysis reported that the city of Scappoose's current urban growth boundary is not large enough to accommodate a 20-year supply of buildable land, based on employment forecasts and current land use patterns (DKS Associates, 2010). Traffic volumes are expected to increase at a rate of 1.6 percent annually, with 60 percent of that coming from the south (Portland metropolitan area).

The Columbia Soil and Water Conservation District, located in St. Helens, has reported a steady increase in Technical Assistance requests, mostly from landowners with small acreage seeking support with conservation plans and animal practices (for small animal units).

These factors indicate expected continued growth in the county and potentially greater interest from landowners in land use practices. Much of this pressure is coming from the Portland metropolitan area to the south, and will have a significant impact on the southern end of the county, in the lower reaches of the Scappoose sub-watershed.

Recommendations based on local population pressures:

- Assess the potential impacts from population pressures in terms of growth rates and land use changes and development.
- Work with local jurisdictions and economic development entities to review policies regarding growth, expected areas of development, and their relation both to the entire watershed and specifically to the lower watershed that has been identified as critical for protection.
- Work with entities to promote the benefits of maintaining and enhancing the natural areas of the watershed, particularly to county newcomers, and in those areas most likely to be affected by development pressures.

Potential Opportunities

Watershed Areas South of Scappoose

The SBWA focused on the Milton and Scappoose sub-watersheds and the Scappoose Bay Bottomlands, and the SBWC has also centered its efforts in these areas. However, the Scappoose Bay Watershed also includes the Gilbert River sub-watershed, an area that includes Sauvie Island and the forested west slope above Multnomah Channel (see Figure 6-1).

Most of the northern half of Sauvie Island is part of the ODFW's SIWA, which was established in 1947 to protect and improve waterfowl habitat. The southern portion of Sauvie Island is primarily agriculture land, composed of a mix of small farms and residential acres; the entire island contains significant acres of lakes, rivers, and managed wetlands. The west slope above Multnomah Channel is a steep, forested area, containing numerous small streams.

Within a larger scale, Sauvie Island and the Scappoose Bay Bottomlands are an important link within a regional natural area, within proximity to the Ridgefield National Wildlife Refuge (to the east), and Forest Park and Vancouver Lake to the south (see Figure 6-2).

These areas should be reviewed for (1) their value and condition in the context of salmonid protection and other wildlife and watershed benefits, (2) the work being done to enhance critical areas and entities involved in these projects, and (3) opportunities to partner with and support those individuals or entities interested in enhancing these areas.

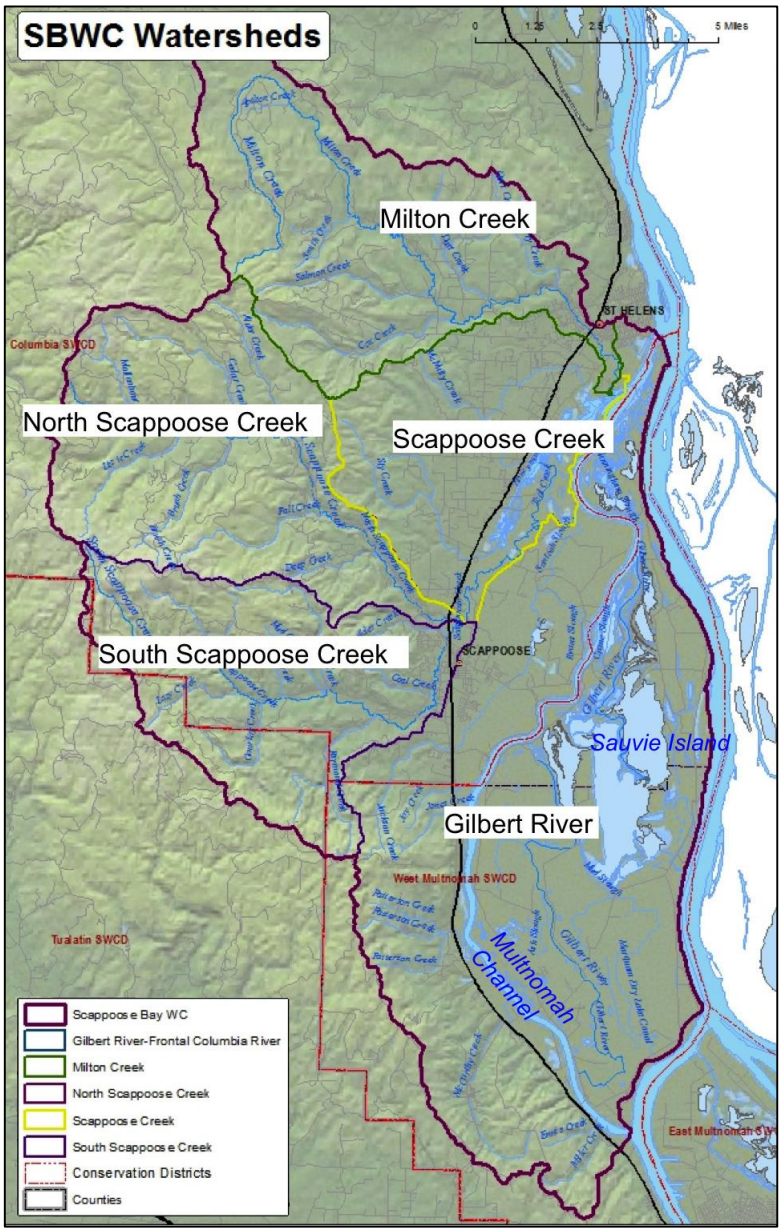

Figure 6-1. Map of the SBWC watershed.

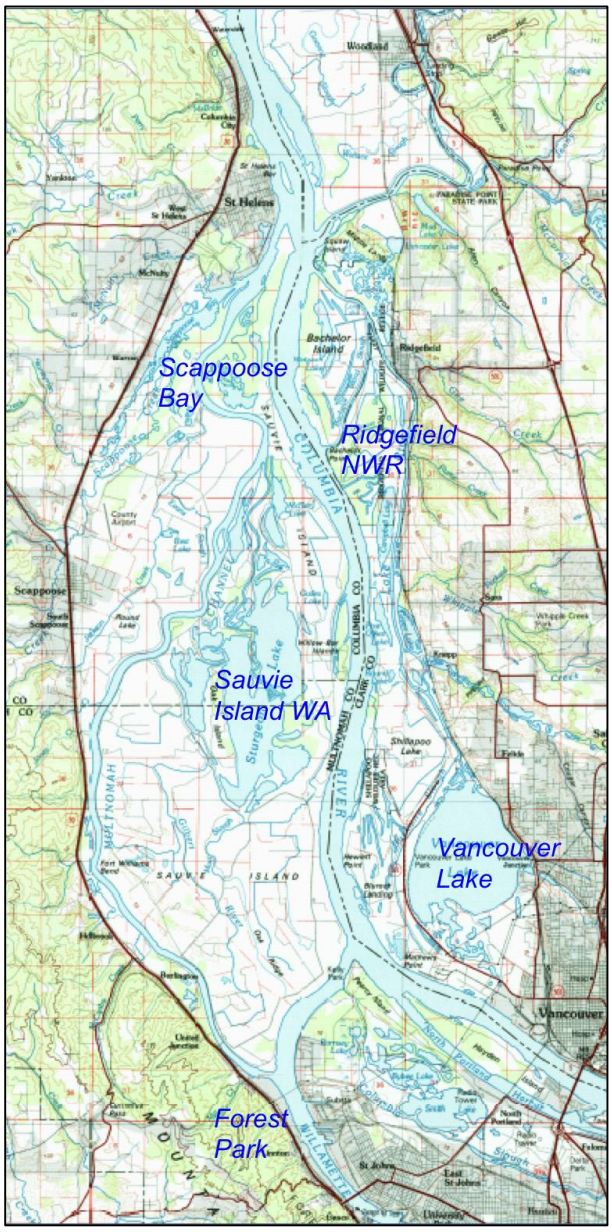

Figure 6-2. Regional map.

Current Proposals

The SBWC has completed, or is nearing completion of, three major project designs:

- Milton Creek Large Wood Enhancement Project
- Duck Lake Wetlands
- Dart Creek Fish Passages

Milton Creek has been submitted to OWEB for funding as an Implementation Proposal (detail below). Duck Lake is in the final stages of alternative selection and a proposal will be submitted to the BPA in January 2015 for funding for a final design (discussed Section 4). The Dart Creek Fish Passages project completed construction designs for five fish passage corrections starting where Dart Creek enters Milton Creek. The first of these, at Robinette Road, is a significantly expensive project due to the road and barrier type and will be submitted to OWEB as a single project for funding in spring 2015. The remaining four fish passage corrections will be submitted as a proposal in fall 2015.

Milton Creek Large Wood Enhancement Project

The Milton Creek Large Wood Enhancement Implementation Project has been submitted to OWEB for funding. The project was designed through an OWEB Technical Assistance grant that assessed a stretch of Milton Creek between the anchor sites identified in the LFA (discussed in Section 4). Fifteen reaches were identified to place large wood that would either be felled in place along the stream or imported from a nearby forest. The city of St. Helens, which owns the property adjoining the stream, is a partner on the project.

The goal of this project is to increase stream complexity and connection to the floodplain through added side channels and to support sediment aggregation for spawning salmonids.

An additional grant from DEQ will enhance the wood placement project through riparian restoration. That work will include invasive weed management on 2.5 acres in the upper reaches of this stretch of the creek, plus planting of native conifers and other riparian vegetation in 8.5 acres. A map of the conifer and riparian planting areas is shown in Figure 6-3.

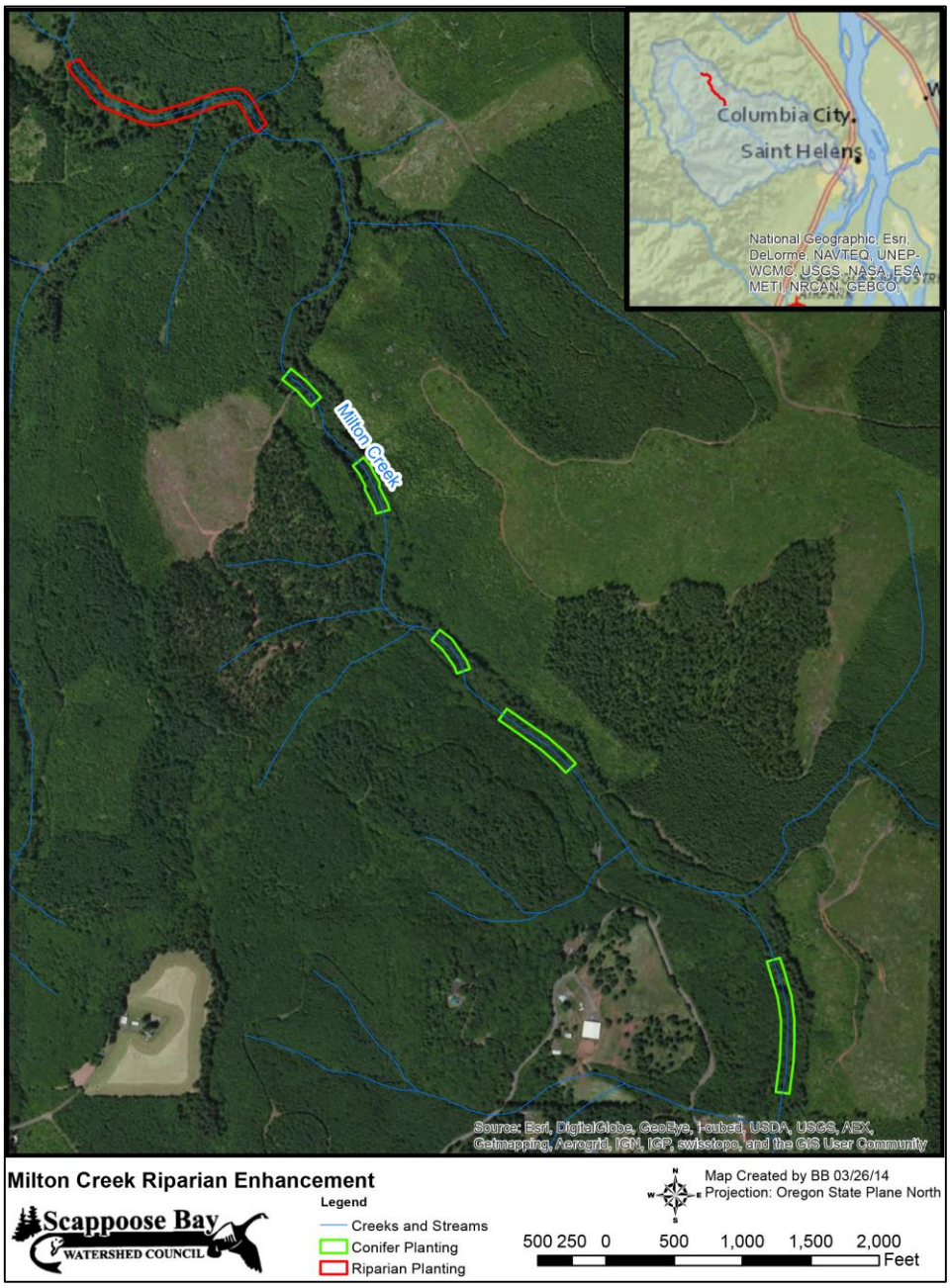

Figure 6-3. Map of conifer and riparian planting areas around Milton Creek.

Additional Funding

There are a few projects that were submitted as proposals but did not receive funding. These include a LWD enhancement project on Cedar Creek at its confluence with Scappoose Creek, and an additional project at Veteran's Park in Scappoose. These proposals should be revisited, along with others that may be in the final design stage, and reviewed with respect to finding potential funding sources and within the larger scope of the council priorities.

Summary

The SBWC has made significant progress toward addressing the watershed concerns identified in the SBWA. Many of the data gaps have been addressed, either fully or partially, and much more is known about the stream habitat, water quality, and specific improvements to apply for salmonid enhancement. A large number of fish passage barriers have been corrected, and recent projects have become more complex and cover larger stretches of the river. Protection of the Scappoose Bay Bottomlands and headwater refugia remain major challenges.

The SBWC is now poised to review priorities and explore new opportunities to help determine the focus of its future efforts. The last major revision to its strategic plan was done in 2008, and regional conservation plans have been newly created or updated in recent years. Local funding support for large projects, such as fish passage barrier corrections, is limited. Efforts should be placed on seeking opportunities to collaborate with other local and regional resource entities.

Scappoose Bay. (Photo by Pat Welle)

Appendix

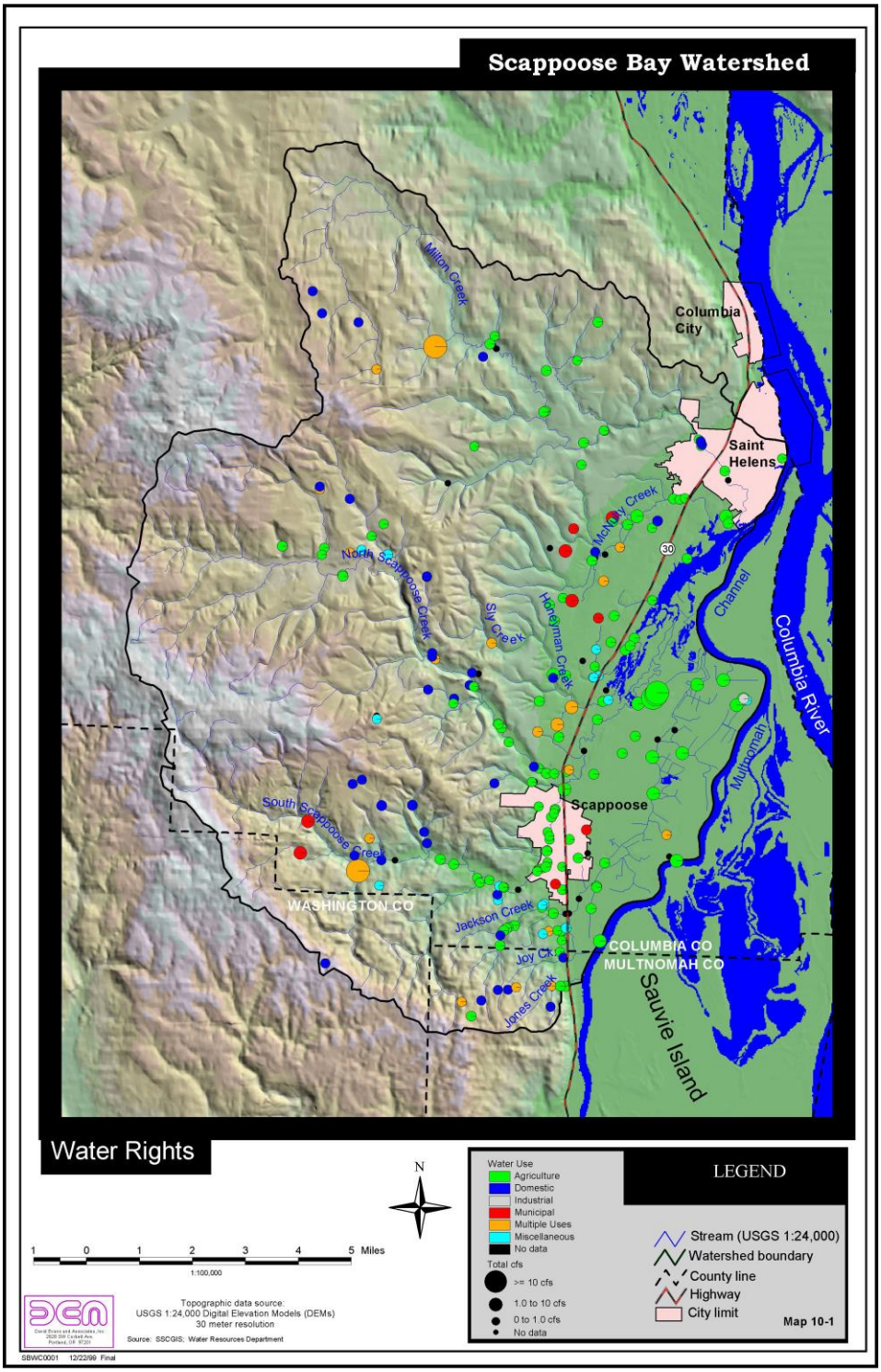

Figure 10-1. Water rights map (from “Scappoose Bay Watershed Assessment”).

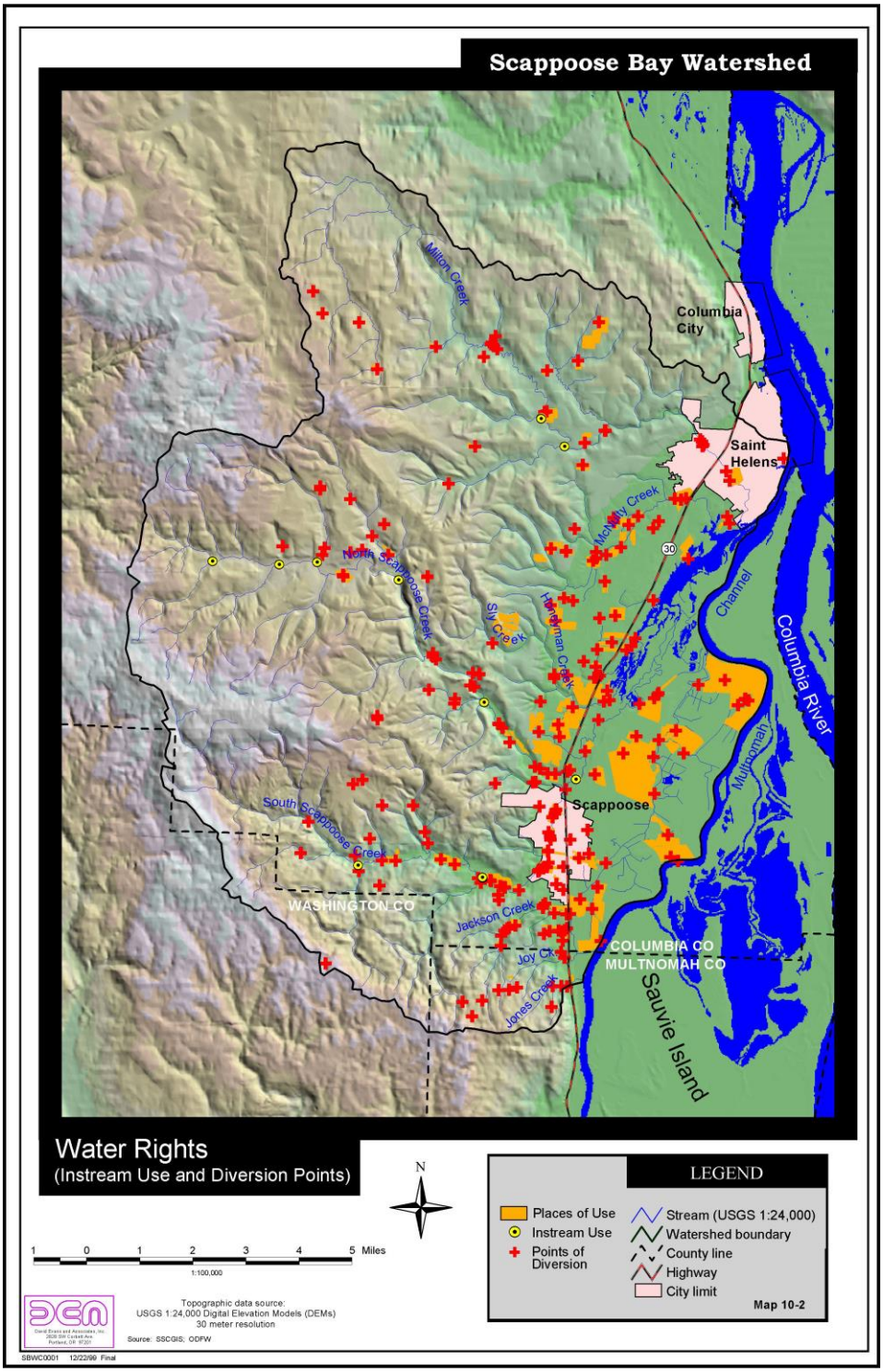

Figure 10-2. Water rights (instream use and diversion points) map (from “Scappoose Bay Watershed Assessment”).

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