
Functional Reach Identification

Section 3

3-1 Process

A defined process for the evaluation of stream enhancement opportunities is essential in the development of a successful habitat enhancement plan. This enhancement plan establishes a process for the evaluation and prioritization of factors that are limiting salmonid production within the priority area and associated tributaries. The process provides a framework for the evaluation of the habitat condition and functionality of the priority area. The evaluation focuses on the mitigation for the loss of habitat for winter steelhead trout. However, it is recognized that there are other important species within the priority area and associated tributaries.

The process for the evaluation of stream enhancement opportunities in the priority area and associated tributaries includes the following steps:

- Step 1: Assess and characterize the habitat condition and functionality of the priority area and associated tributaries through the review of previous studies, surveys and field investigations.
- Step 2: Divide the priority area and associated tributaries into functional reaches.
- Step 3: Develop criteria to score each of the functional reaches according to their degree of impairment.
- Step 4: Identify factors that are limiting anadromous fish production.
- Step 5: Contact landowners along the priority area and associated tributaries to determine the feasibility of enhancement projects on their land.

Step 1: Characterization

Since early settlement, the waters of Gales Creek have been used for agriculture, log transportation, sawmills and drinking water. The development in the watershed has followed a typical pattern of population growth seen throughout the Northwest, with the removal of vegetation, channel straightening, bank hardening, water withdrawals and the introduction of non-native species. These changes have decreased the complexity and channel stability of the creek in developed areas, and affected the complex ecological functions necessary to support a healthy population of winter steelhead trout. However, through the analysis performed during the site selection process, it was determined that the identified priority area has the greatest potential for enhancement projects to benefit winter steelhead trout.

Developing an understanding of the biological, chemical and physical conditions within the priority area laid the foundation for the approach used to characterize the priority area. Data from existing studies and surveys that were conducted within the Gales Creek watershed were utilized. The following sources of data were used during the characterization:

1. Breuner, Nancy, 1998, *Gales Creek Watershed Assessment*.
2. ODFW (Oregon Department of Fish and Wildlife), 2001, *Distribution and Abundance of Fish, and Measurement of Available Habitat in the Tualatin River Basin Outside of the Urban Growth Boundary*.
3. ODFW (Oregon Department of Fish and Wildlife), 1995, *Distribution of Fish and Crayfish and Measurement of Available Habitat in the Tualatin River Basin, Final Report of Research*.
4. DEQ (Oregon Department of Environmental Quality), 2001 *Tualatin Subbasin, Total Maximum Daily Load (TMDL)*.
5. SWRP (Student Watershed Research Project), Data collected at Isaac Walton Park between 1992 and 2002
6. OWRD (Oregon Water Resources Department), Water Availability Report (WARS) database

Informal field surveys were completed in 3 days during Fall 2002. The purpose of the surveys was to obtain a general knowledge of the condition of the channel in the priority area. The two individuals that completed the survey spent portions of 3 days walking the channel, taking photos, making visual observations, evaluating the bed composition and performing a cursory examination of the biological characteristics of the priority area. Elements of the Oregon Stream Habitat Data Sheet were used to help with the visual characterization of the channel conditions.

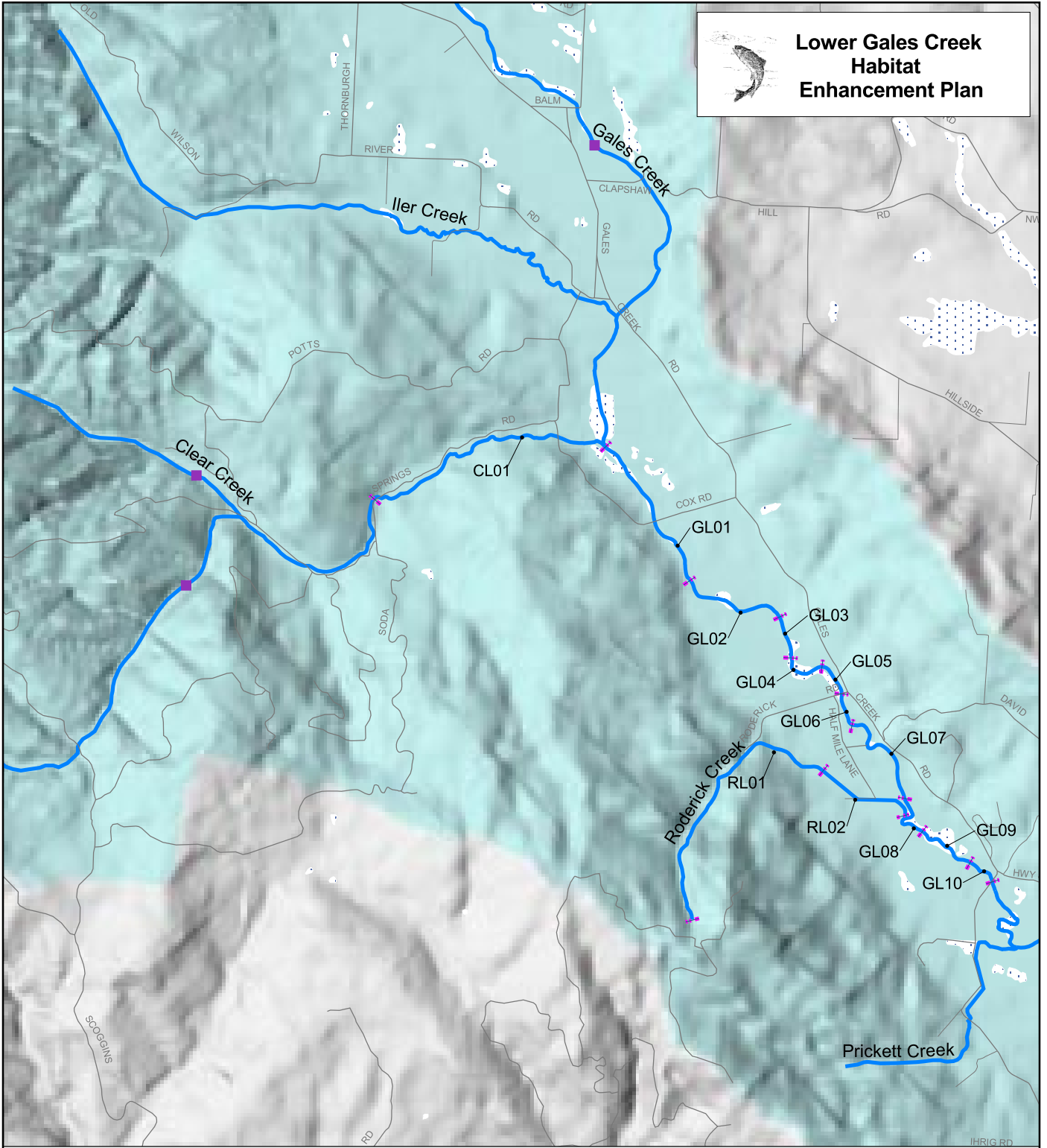
Step 2: Identify Functional Reaches

After the review of data from existing studies and completing the field surveys, the priority area was divided into functional reaches. Gales Creek was divided into 10 reaches, Roderick Creek into 2 reaches and Clear Creek was treated as one reach. The reach delineation was based on specific changes in channel type (e.g. stream reached confined by bank hardening, bed material, vegetation changes, bridges), and channel geomorphic characteristics such as bank condition, number and size of wood pieces, and primary flow characteristics. The habitat type characteristics were generally categorized as riffle, pool or glide. Figure 3-1 presents the relationship of the reaches within the priority area.

Step 3: Development of Criteria

The initial evaluation of the project reaches was performed to assess the habitat condition and functionality of each of the reaches. Six major areas of habitat condition were evaluated as to whether the reach was in Properly Functioning Condition, At Risk of not properly functioning, or Not Properly Functioning. The criteria used to determine the level at which a reach was functioning was based on criteria developed by NOAA Fisheries (National Oceanic and Atmospheric Administration Fisheries), the EPA Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers, and the Oregon Watershed Assessment Manual. Table 3-1 presents an outline of the criteria used in the condition assessment for each of the reaches. A table that describes the criteria in more detail is included in Appendix E.

The NOAA Fisheries criteria for Habitat Elements that were used in the evaluation set a rather high standard. They were developed for mountain streams and some would argue that they are not applicable to lower elevation streams that flow through more developed areas. However, it is believed that even if some of the specific measures within the criteria (e.g. # of pools = 35/mile) may not be directly applicable to lower Gales Creek, they still provide a tool to evaluate the functionality of the reaches. The criteria used to estimate the degree of impairment is relative for all project reaches. The NOAA Fisheries criteria did not go into

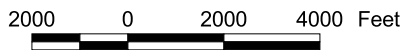


**Lower Gales Creek
Habitat
Enhancement Plan**

Legend

- GL00 - Project Reach
- Barriers
- ▬ Reach Divider
- ▬ Stream Centerline 2002
- - - County Line
- ⋯ NWI Wetlands

Priority Area Overview Map



Data Sources: Washington County (2002)
 Metro (RLIS Lite 2002)
 National Wetlands Inventory (1992)
 ODFW (2002)
 SWCD (2003)
 March 2003

Figure 3 - 1

significant detail concerning riparian conditions. Since much of the riparian area along Lower Gales Creek is impaired, it was important to include a habitat category that covers riparian conditions. Therefore, riparian condition criteria from the EPA and Oregon Watershed Assessment Manual were added to the condition assessment.

Table 3-1: Summary of Channel Condition Assessment Criteria

Habitat Category	Channel Conditions	Riparian Conditions	Water Quality	Water Quantity	Habitat Access	Habitat Elements
Habitat Factors	1) Streambank Condition 2) Floodplain Connectivity 3) Channel Modifications	1) Width of Riparian Area 2) Vegetation Characteristics 3) Stream Shading 4) Riparian Recruitment Potential 5) Bank Stability	1) Temperature 2) Sediment 3) Chemical Contamination and Nutrients	1) Peak/Base Flows 2) Diversions 3) Drainage Network	1) Physical Barriers	1) Substrate 2) Large Woody Debris 3) Pool Frequency 4) Pool Quality 5) Off Channel Habitat 6) Refugia

After the reaches had been characterized, they were scored according to their degree of impairment relative to each of the habitat factors. Based on the evaluation criteria in Table 3-1, each reach was ranked on a scale from 1 (most impaired) to 5 (least impaired). Those reaches that were least impaired were considered to be in a properly functioning condition. A reach is considered to be properly functioning when it is dynamic, but also resilient against land use actions that would cause significant changes in its biological or physical characteristics. A reach is considered to not be properly functioning when land use actions have led to a significant change in its biological or physical characteristics. The following scoring was used:

- Properly Functioning = 5
- At Risk of not properly functioning = 3
- Not Properly Functioning = 1

After each of the project reaches were given scores in the 6 habitat categories, weighting factors, from 1 – 3, were applied to each of those areas. The weighting factors are summarized in Table 3-2. The purpose for weighting each of the habitat categories was to emphasize the importance of each of the categories in providing habitat for winter steelhead trout. The main stem of lower Gales Creek is known to be used for migration and has potential to be used for rearing and spawning. It is assumed that the greatest potential use would be for rearing. Therefore, the weighting system was designed to give more weight to the conditions that are critical for rearing of juvenile winter steelhead trout.

Table 3-2: Weighting Factors Used to Assess Degree of Impairment

Habitat Category	Weighting	Purpose for Weighting
Channel Conditions	2	Moderate factor
Riparian Conditions	3	Significant factor due to large diurnal temperate variability from lack of shading.
Water Quality	2	Moderate factor
Water Quantity	2	Moderate factor
Habitat Access	1	Small factor due to no presence of barriers in the mainstem of Gales Creek, within the priority reach.
Habitat Elements	3	Significant factor due to lack of pools, LWD in the channel, and off-channel habitat. Limits opportunities to find refugia during high summer water temperatures and during high winter flows.

Table 3-3 summarizes the results of the degree of impairment scoring. The complete spreadsheet tables that form the basis for Table 3-3 are included in Appendix F.

Table 3-3: Summary of Degree of Impairment Scoring

	Channel Conditions	Riparian Conditions	Water Quality	Water Quantity	Habitat Access	Habitat Elements	Score x Weighting Factor	Overall Rating
Weighting Factor	2	3	2	2	1	3		
Project Reach								
GL01	1.7	1.0	2.3	2.3	5.0	1.3	24.7	1.9
GL02	1.7	3.4	2.3	2.3	5.0	1.7	32.9	2.5
GL03	3.7	3.0	2.3	3.7	5.0	2.0	39.3	3.0
GL04	3.0	2.2	2.3	3.7	5.0	2.3	36.6	2.8
GL05	2.3	3.8	2.3	3.7	5.0	1.0	36.1	2.8
GL06	1.7	3.8	2.3	2.3	5.0	1.3	33.1	2.5
GL07	1.7	2.2	2.3	3.0	5.0	2.0	31.6	2.4
GL08	1.7	2.6	2.3	3.7	5.0	1.7	33.1	2.5
GL09	2.3	2.2	1.7	3.7	5.0	1.0	29.9	2.3
GL10	2.3	1.8	1.7	2.3	5.0	1.0	26.1	2.0
RL01	3.0	3.4	2.3	3.0	1.0	3.0	36.9	2.8
RL02	1.0	1.0	1.7	3.0	1.0	1.0	18.3	1.4
CL01	4.3	5.0	3.7	3.0	1.0	5.0	53.0	4.1

The results of this evaluation were used as a tool for comparing the degree of impairment of each of the project reaches and determining the types of projects that would benefit habitat within the respective reach. For example, if a reach scored low for riparian conditions, it is recognized that this reach would benefit from riparian enhancement. The overall rating provides a picture of the overall condition of the reach. The least impaired reaches are closer to a properly functioning condition. It is assumed that they will maintain themselves if they are protected from further impairment. Moderately impaired reaches are likely to provide the best potential for improvement of aquatic habitat. Improvement of habitat in the most severely impaired

reaches may be difficult due to the potential for substantial labor and equipment costs relative to ecological benefit.

Proposed projects cannot be based solely upon the technical benefit criteria. For a type of project to be successful, the construction of the project must be feasible and not overly costly. Therefore, feasibility criteria and cost criteria were developed.

The feasibility criteria measured the risks associated with project implementation, monitoring and maintenance. These criteria were evaluated on the basis of public involvement feedback, the project team's experience, discussions with resource agency representatives, and review of applicable documents from the Oregon Department of Fish and Wildlife, Natural Resources Conservation Service, Oregon Division of State Lands, U.S. Army Corps of Engineers, and county land use planning departments. The criteria are:

- Public acceptance (landowner concerns and community support)
- Regulatory support (feasibility and ease of permitting)
- Implementability (considering such issues as construction access and ability to water new plantings)

A cost criterion was used to compare the capital costs of each project type. The assumptions used in the cost estimates for the project evaluation and recommended costs for project types are detailed in Table 3-4.

Table 3-4: Basis for Order of Magnitude Cost Estimates

Type of Enhancement Activity	Estimated Costs	Source/Notes
Acquire conservation easements	\$3,700 per acre	(1) Highest value from Metro appraisal reports – irrigated crop lands.
Removal of non-native species in riparian areas	\$300 per acre	(2) Assumes 50% removed by hand and 50% by machine.
Riparian area site preparation and planting	\$7,000 per acre	(2) Assumes beaver protection, weed mats, etc.
Riparian area maintenance	\$300 per acre	(2) Assumed to be same as removal costs, but all work by hand.
Grading, planting and LWD placement on floodplain (not in channel)	\$17,000 per acre	(3) This covers work on floodplain, not in-channel work.
Increase in-stream complexity	\$1,250 mobilization fee plus \$125 per linear foot	(2) Assumes placing LWD, bank reinforcement & planting.
Modify channel alignment	\$65,000 per acre	(3) Creation of new meanders in channel.
Sources: (1) SPOTAC Memorandum #11 (2) NRCS – Cost Estimate Spreadsheet 2002g-LWB (3) Clean Water Services – Phone message from Kendra Smith 2/20/2003		

Step 4: Identify Limiting Factors

In Step 3, six habitat categories were examined to develop an understanding of habitat condition and functionality in the project reaches. This was completed in order to determine which of the habitat factors are

likely to be limiting winter steelhead trout production within the project area. The process revealed that the Habitat Elements category had the greatest number of factors limiting production of winter steelhead trout. This category includes factors related to substrate embeddedness; number of pieces of large woody debris (LWD); pool frequency; pool quality; off-channel habitat; and refugia. However, there are numerous factors that limit fish production in some of the reaches. The limiting factors for each of the reaches are presented in Section 4.

Step 5: Landowner Contact

Landowner participation is critical to the success of implementation of projects identified in the Lower Gales Plan. With the majority of the land in the project area privately owned, it is necessary to both work with landowners to obtain access to the stream and to incorporate their knowledge and interests in the land into future project designs. In order for the Lower Gales Plan to lead to meaningful enhancement of Gales Creek in the long run, it is vital that a good relationship is developed and maintained between the landowners and the organizations working on enhancement projects, monitoring and maintenance.

Landowners in the project area were contacted several times during the development of the Lower Gales Plan. In order to gain access to the stream in the project area, selected landowners were contacted for verbal permission to access the portion of creek on their property. As the project progressed we felt that it was necessary to inform landowners about our interest in the project area. A letter was sent out inviting the landowners with property along the creek to attend a community meeting. In addition, landowners were called to make sure that they had received the letter and to encourage them to attend the meeting. Several landowners attended the meeting and filled out a form indicating their thoughts about the project and any additional information they would like to receive about the project. A follow-up letter was sent to all of the landowners who did not attend the meeting. The letter provided a synopsis of the public meeting and included a survey form for landowners to fill out and return if they had interest or concern about the project.

Several landowners responded favorably to the idea of working with the Council and partners to develop enhancement projects on their land. Other landowners expressed an interest in receiving updates about progress with the Lower Gales Plan. Landowner responses from phone calls, meetings, and completed surveys formed the public acceptance feasibility criteria, and helped to direct the selection of priority projects listed in Section 4.

3-2 Enhancement Components

Moving from the planning stage to the development of implementation strategies is often difficult. It is challenging to know where to begin the process. A description of enhancement components is provided as a means to move from the planning and evaluation stage to the implementation stage of the project. The enhancement components are described and related target functions are assigned to each of these components. The target functions identify recommended actions that will be implemented to address factors that are limiting the production of winter steelhead trout in the project area. The recommended actions are described in more detail in Section 4.

Fish Habitat Enhancement

Lower Gales Creek is impacted by activities that occur throughout the entire watershed. The cumulative effects of land use practices within the contributing watershed and modifications to the stream channel affect the condition and functionality of fish habitat within the priority area. Channelization, bank hardening, encroachment into riparian areas and floodplains, and filling of wetlands have all occurred within the watershed. Lower Gales Creek exhibits many of the symptoms of a creek where modifications such as these have occurred within the contributing watershed. These symptoms include channel entrenchment, extensive bank erosion, and loss of in-channel habitat complexity, such as the number of stable, deep pools and large woody debris structures.

There is a wide range of fish habitat enhancement opportunities. Undercut banks and meander backwaters provide some excellent fish habitat. Some of the most important habitat is provided by the formation of large wood jams. Stable and persistent wood structures create important hydraulic controls that provide a variety of functions beneficial to winter steelhead trout. Some of the benefits include pool formation, channel bed stability and control of bank erosion. One of the primary goals of the Plan is to evaluate opportunities to increase in-stream complexity by supplying large wood to Lower Gales Creek in both the short term and long term. This consists of the anchoring of large wood pieces in the stream channel. It also includes planting of trees adjacent to the channel so that there is increased LWD recruitment potential.

The target functions that relate to enhancement of fish habitat are: increasing in-stream complexity; enhancement of the riparian zone; floodplain connection and removal of fish barriers. Target functions are assigned to each of the project reaches in Section 4, as a way to provide a basis for the recommended actions.

Riparian Enhancement

Riparian areas are essential for water temperature moderation and fish and wildlife habitat. Critical functions of riparian areas are stream shading, bank stabilization, sediment control, water runoff filter, large wood and organic litter recruitment, and augmentation of basal flows. These areas are important links in providing a food source for macroinvertebrates in the form of decomposing leaf litter. Many of these riparian areas lie within the floodplain. Inundation of the riparian areas during high flow conditions allows access for winter steelhead trout to off-channel refuge areas during winter peak flows.

Floodplain Connection

Enhancement of natural functions within Lower Gales Creek will require recognition that the adjacent floodplain provides essential functions for flood storage, augmentation of basal flows and supply of essential off-channel habitat for winter steelhead trout. Allowing floodwaters access to the floodplains through connection with backwater channels (old channels, oxbows, and depressions of the main channel) will allow for the creation of off-channel habitat for juvenile steelhead trout. During winter months, juveniles may use these off-channel habitats as refuge from adverse main channel conditions such as high velocities and large volumes of suspended sediment.

The floodplain within Lower Gales Creek area falls into three categories:

- Floodplains that are well connected to the stream and have an intact riparian area with backwater areas that provide refuge during high flow conditions.
- Floodplains that are connected to the stream, but are farmed and provide little, if any refuge during high flow conditions.
- Floodplains that have become disconnected from the stream channel and don't flood during high flow conditions.

3-3 Limits of Plan

The Lower Gales Creek Habitat Enhancement Plan is not intended to be a stand-alone document nor an end in itself. Rather, it is intended to be a planning document that provides a basis for the design and installation of fish habitat enhancement projects over a 5-year time horizon (FY 2003 – 2007). This document provides guidance concerning the types of projects that are needed to enhance the functions within the project area. However, it does not provide design details at any specific location.