Recommendations

Section 4

4-1 Connecting with the Community

To achieve the goal of fish habitat enhancement within the project area, the Lower Gales Plan recommends projects that help to restore natural functions to Gales Creek. These projects benefit the creek process by protecting and restoring riparian habitat, floodplain functions and increasing in-channel complexity.

Since the recommendations are only meaningful if the residents within the lower Gales Creek Project area accept them, land stewardship and education are important elements in the implementation and long-term sustainability of the recommended projects.

This section describes the existing conditions and recommended actions for the 13 project reaches identified within the lower Gales Creek Project area. Nine priority projects are presented at the end of the section. These projects have been selected for consideration because they provide a wide range of opportunities to implement projects throughout the project area. This list of projects provides a beginning for the implementation of projects that will benefit the community as a whole. The community within the priority area is encouraged to work with the Tualatin River Watershed Council on the development and implementation of other projects as well.

4-2 Target Functions

The recommendations included in this chapter are specific enough to set a direction for the design and implementation of the projects, yet flexible enough to incorporate property owners' desires in achieving the goals of the Lower Gales Plan. This plan utilizes the established criteria to evaluate the degree of impairment for each reach and to quantify enhancement targets for each reach. These targets establish a way to quantify the expected benefits.

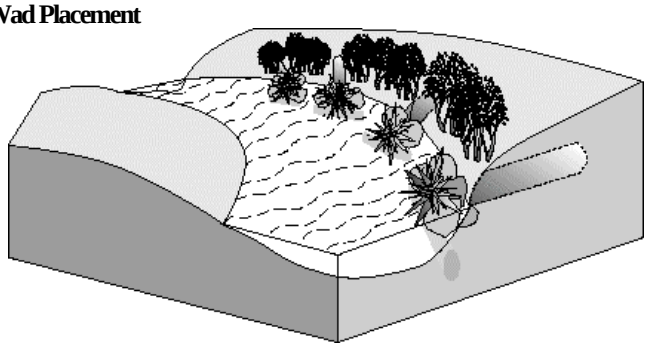
Reach descriptions include photographs of potential project locations to help meet the target functions. These are suggested locations only, as there are many opportunities to improve lower Gales Creek functions. The following 4 target functions were used to characterize the intended enhancement objectives for each of the project reaches. The target functions are related to the factors that are limiting the properly functioning condition of a project reach. For instance, if the analysis indicated that a reach had impaired habitat elements (few high quality pools, no off-channel habitat, limited woody debris), then the in-stream complexity target would be assigned to the reach. If the riparian area within a reach was degraded, then the riparian zone target would be assigned to the reach. The target functions for each reach are assigned in Section 4.3. The target functions are: 1) In-Stream Complexity; 2) Floodplain Connection; 3) Riparian Zones, and 4) Fish Barriers.

In-Stream Complexity

In-stream complexity provides the habitat elements that are critical during the various life cycles of salmonids and other fish and wildlife species in lower Gales Creek. The component of in-stream complexity include components such as adequate substrate for spawning and macroinvertebrate production, LWD, numerous, deep pools, off-channel habitat, and adequate refugia. Many of these components are lacking in Lower Gales Creek. The lack of variable habitat and increased levels of sediment from eroding banks and surface erosion, limit production of salmonids.

One strategy to develop more complexity in the channel is to increase the amount of LWD in lower Gales Creek. Trees, branches and root wads that fall into the channel perform several highly desirable functions. LWD provides habitat for fish by providing cover, shade and potentially deep pools which may have cooler water temperatures during the warm summer months. Areas of cooler water refuge are very important because of high summer water temperatures. The large wood also provides areas where fish can hide from the high flow velocities that occur during winter storms. In much of lower Gales Creek, the high winter flows are somewhat confined in the channel. The high flow velocities and high flow depths common to these confined channels can make it difficult for large wood to become established in the creek. In addition, it is common for property owners to clear the channel of wood debris in order to reduce flooding potential on their properties. Increasing the amount of LWD in the channel would entail placing and potentially anchoring wood in the stream at appropriate locations. The introduction of LWD in the channel may increase the upstream water surface elevation by increasing the flow resistance and constricting the channel flow area. For this reason, LWD must be placed in appropriate areas so as to not adversely impact adjacent properties. However, it can also be used as a mechanism for moving floodwaters out of the channel and into reconnected floodplains or wetlands, where desirable. Figure 4-1 is an illustration of in-stream woody debris root wads that would increase in-stream complexity.

Figure 4-1: In-stream Root Wad Placement



Floodplain Connection

The quality of fish habitat in lower Gales Creek is significantly affected by the creek's connection with the floodplain. Nutrients are cycled between the channel and the floodplain during flood events. Floodplains in their natural state typically have extensive riparian zones. Trees and shrubs in these zones provide flow resistance, which slows velocities and encourages deposition of nutrient rich sediments during flooding conditions. If the floodwaters are intense enough, they will wash large wood and other organic matter from

floodplains and into the streams where they can be deposited in the channel, where they provide habitat for fish.

The relationship between the stream channel and the floodplain is also critical in minimizing damage to human created structures during flooding conditions. By slowing flow velocities, the floodplains help to attenuate flood flows and reduce the peak flood flow. Flooding is a natural occurrence for streams. Floodplains augment basal flows, provide storage of flood flows and provide space for the stream to meander and migrate during flood events. This plan proposes the following actions to maintain connection and to reconnect disconnected floodplains.

Enhanced Riparian Areas

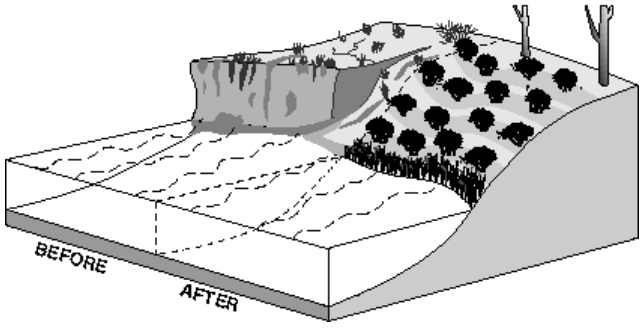
There are some large, existing riparian areas within the Lower Gales Creek Project area that should be protected. By protecting and enhancing areas that exhibit degraded riparian functions, the conditions that are typically found in a properly functioning riparian area can be restored with less effort. The primary purpose of enhancing these areas is to augment their natural functions by restoring native vegetation to the site. There may also be some potential opportunities to grade adjacent properties to make them available to flood waters.

A major threat to existing riparian areas is the intrusion of non-native vegetation that often has the ability to "out compete" the native vegetation. Examples of non-native vegetation that have invaded lower Gales Creek include reed canarygrass, Himalayan blackberry, English ivy, Japanese knotweed and European nightshade. In some areas, these plants have established themselves as a monoculture and have limited ecosystem function because they provide little biodiversity and habitat. The Lower Gales Plan proposes to remove non-native and invasive vegetation and replace with native plant species in existing riparian areas. Regular maintenance will be required in order to ensure that native plants thrive and non-native plants are not re-established.

Stream Bank Restoration (Terracing and Revegetation)

Floodplain reconnection focuses on restoring a creek's natural access to the floodplain. The idea is to cut back the banks in a series of terraces so that floodwaters may access the floodplain at lower water surface elevations. This may also be accomplished by removing soil to reconnect the channel to old meander bends during high flow conditions. Figure 4-2 is an illustration of stream bank terracing and revegetation.

Figure 4-2 Bank Terracing and Revegetation



The Lower Gales Plan proposes a process that involves working with willing landowners adjacent to the creek or adjacent wetlands. For properties adjacent to the creek, the banks will be terraced back as much as

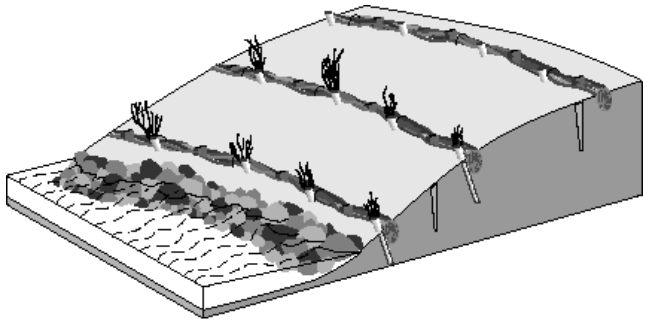
possible to allow for increased connection with the floodplain. The actual amount of terracing and reconnection will vary depending upon the specific conditions on a property. It is also possible to reconnect the floodplain by performing some terracing and placing some large wood structures, such as root wad revetment or log vanes. These structures will help to force water onto the newly reconnected floodplain.

After terracing is completed, the site will be revegetated with native riparian vegetation that will bind the soil. These plants will also provide shade to the creek and could help reduce water temperatures during the warm summer months.

Riparian Zones

Zones adjacent to the creek that have little or no existing riparian area will be candidates for intensive riparian area planting. Planting banks that are devoid of riparian plants or areas that have a monoculture of non-native species is an ideal way to stabilize eroding banks and reduce flow velocities. The Lower Gales Plan proposes to plant eroding streambanks with native vegetation where applicable. Figure 4-3 illustrates stream bank stabilization and planting. In some situations where high velocities are actively eroding the toe of a bank, there may be a need to incorporate riprap, log vanes or other options to stop the erosion of the toe and then plant the upper portion of the bank. There are also areas that have existing riprap on the banks, but have limited riparian vegetation. In these areas, it is proposed to plant willow, alder and other appropriate plants through the riprap in order to augment the riparian zone vegetation.

Figure 4-3: Bank Stabilization and Planting



Fish Barriers

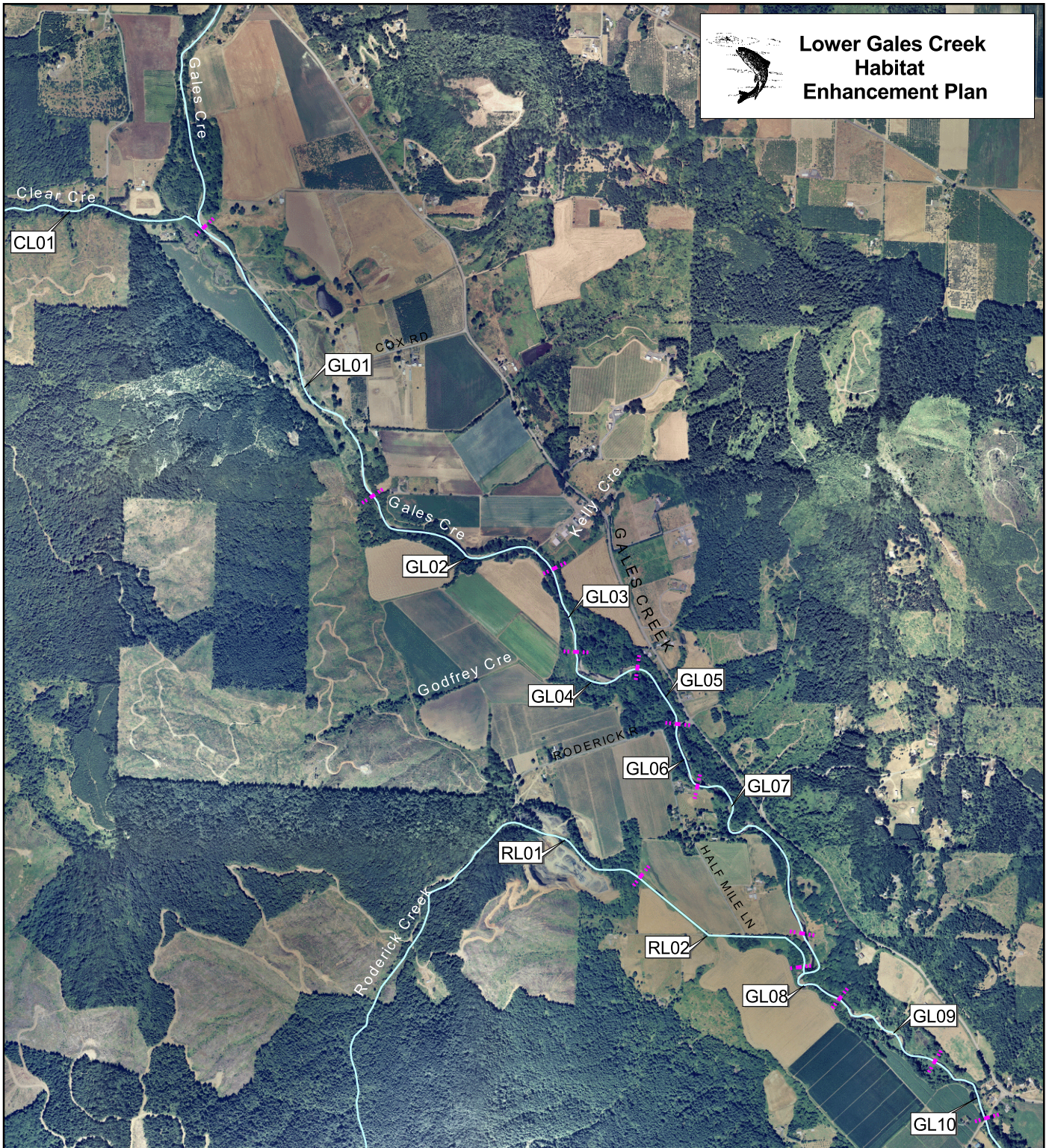
There are a couple of culverts and a water supply diversion along Roderick Creek that may be fish barriers. In addition, there are municipal water supply diversions in the Clear Creek basin that are barriers as well as an old water supply pipe that crosses Clear Creek that may be a barrier. The plan proposes that these barriers be evaluated to determine the value of their removal.

4-3 Recommendations by Reach

During the project reach identification process, the Lower Gales Creek Project area was divided into 13 project reaches. The mainstem of Gales Creek is divided into 10 reaches, Roderick Creek is divided into 2 reaches and Clear Creek is treated as one reach (Figure 4-4). Each reach was evaluated using the criteria in Table 3-1 to determine the existing habitat condition. Many of the reaches were determined to not be properly functioning for one or more of the criteria. Target functions have been assigned for each of the reaches in order to provide generalized project descriptions that may be implemented in order to restore properly functioning conditions.

A series of aerial maps have been developed for the thirteen project reaches. These maps show the centerline of the creek as interpreted from 2002 aerial photos that were provided by the Farm Service Agency (FSA). The 2002 creek centerline is overlaid on a 1998 digital aerial photo that was provided by Washington County. The locations where the 2002 and 1998 centerlines don't line up are areas where the stream channel has moved during that 4-year period. The maps also provide a visual context for the land use adjacent to the reaches. 1994 digital aerial photos were also used during the analysis. These provided a context for the creek location prior to the 1996 floods.

Each reach has the existing conditions described, the degree of impairment scoring, limiting factors, target functions and an itemized list of recommended actions. References to left and right bank are always in oriented towards looking downstream. Since lower Gales Creek mainly flows in a southeast direction, the left bank is typically the east bank and the right bank is typically the west bank.



Legend

GL00 - Project Reach
Reach Divider
Stream Centerline 2002
County Line

Lower Gales Creek Priority Area

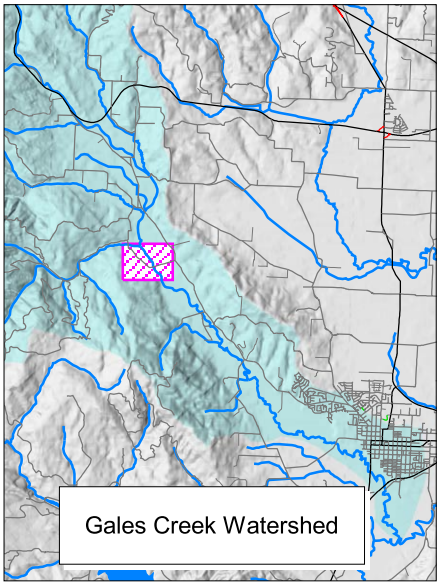
1000 0 1000 2000 Feet

N

Data Sources: Washington County (1998 orthophoto base)
Washington County (2002)
SWCD (2003)

March 2003

Figure 4 - 4



Reach GL01

1998 Aerial Photo Map

Lower Gales Creek Habitat Enhancement Plan

Legend

GL00 - Project Reach
Reach Divider
Stream Centerline 2002

N

300 0 300 600 Feet

Data Sources: Washington County (1998 orthophoto base)
Washington County (2002)
Metro (RLIS Lite 2002)
SWCD (2003)

March 2003

Reach GL01

Existing Conditions

Reach GL01 begins at the confluence of Clear Creek and Gales Creek and extends approximately 4600 feet in a southeasterly direction.

Note: Permission for access was not granted for this portion of the creek, so no field review was completed*

Channel Habitat Type: LM (Low Gradient, Moderately Confined)

Adjacent Land Use: Agriculture (Crops, Pasture, Christmas Tree Farm and Private Industrial Forest Land)

Characteristics:

- *Channel Conditions:* Discussions were held with the landowner about bank restoration after the1996 flood. NRCS assisted with restoration and provided a hand drawn map of suggested restoration activities. The flood deposited a band of debris, gravels and cobbles within the floodplain along the left bank. Much of this land was re-claimed by hauling the debris and rock off the property. Re-vegetation along much of the bank was proposed by the NRCS. In addition, riprap armoring was proposed at four locations along the property. The gradient of the stream within the reach is approximately 0.3 percent. The valley slope is approximately 0.5 percent. Review of the 2002 aerial photo reveals that there are few trees or shrubs in the floodplain.

- *Riparian Conditions:* Review of 2002 aerial photo slides show limited riparian vegetation along a significant portion of the reach. There is approximately 2000 feet of bank that has no real riparian area. Reach GL01 has the most degraded riparian area within the Lower Gales Creek Project area. Average width is approximately 20 feet.

- *Water Quality:* Summer temperatures downstream at the Roderick Road Bridge are in the 70's – See the DEQ TMDL report (DEQ, 2001). Temperature measurements taken at Roderick Road (the closest temperature monitoring location to this reach) show that the largest diurnal temperature variability, of any of the monitoring stations along Gales Creek, occurred at Roderick Road. It appears likely that solar heating and a lack of riparian vegetation cause the high variability in daily temperatures. Figure 4-5 shows a comparison of diurnal temperatures at three monitoring stations.

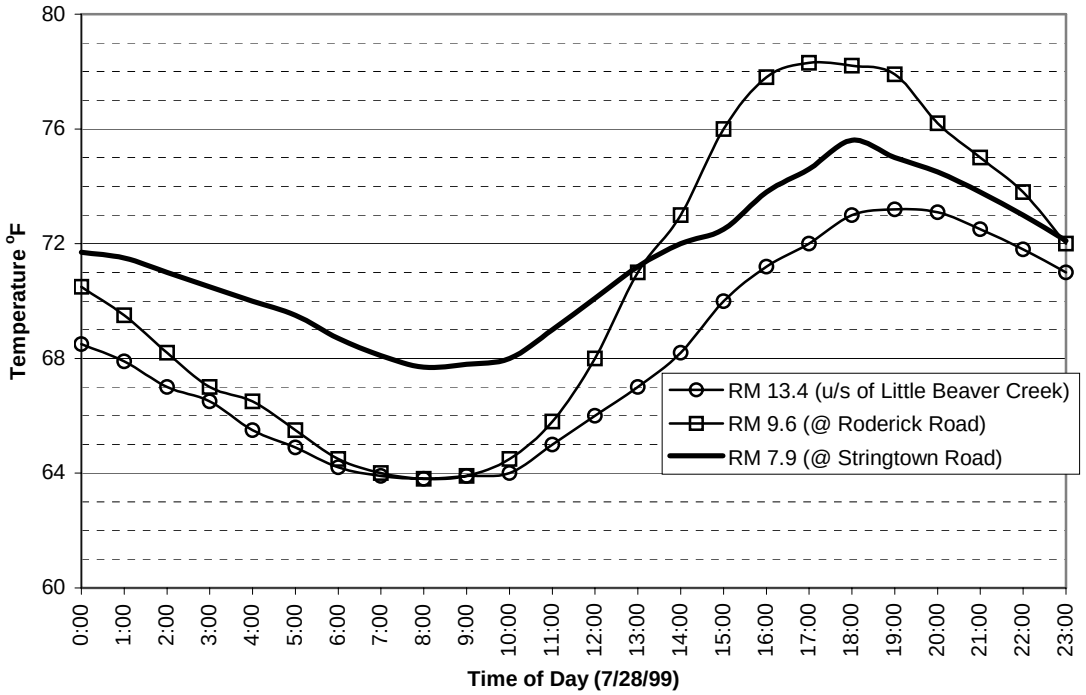


Figure 4-5 - Diurnal Temperature Trends Observed in Gales Creek on July 28, 1999 (DEQ – Tualatin River TMDL Report)

- *Water Quantity:* Six water supply diversions were noted along this reach of the creek. This sub-reach was not visited in the field so there is no information as to whether the ends of the diversion pipes are screened. Table 4-1 presents information for the following permitted diversions along the reach. All diversions were for irrigation (IR).

Table 4-1: Reach GL01

Permit Number	Use	Rate	Notes
35154	IR	0.12 cfs	No field verification of screening
30411	IR	0.39 cfs	No field verification of screening
36821	IR	0.16 cfs	No field verification of screening
43760	IR	0.13 cfs	No field verification of screening
30412	IR	0.87 cfs	No field verification of screening
42104	IR	0.33 cfs	No field verification of screening

Clear Creek flows into the reach at the upstream end of the reach. The Clear Creek drainage basin area is 5,950 acres (12.0 percent of the total basin area).

- *Habitat Access:* There are no passage barriers along this reach.

- *Habitat Elements:* No formal habitat survey was completed along the reach. However, Leader (2001) surveyed a 1000-meter stretch of Gales Creek immediately upstream of the confluence of Clear Creek with Gales Creek. Leader reported that this area had predominately riffle/glide characteristics with approximately 10 percent pools. The substrate consisted of gravel and cobbles with some bedrock bed. A large woody debris (LWD) rating of 1.1 was assigned to this reach. This is a rating of wood complexity as it relates to fish habitat and ranges from 1 – 5, with 5 being the most complex. Leader surveyed fish populations during the summer and fall of 1999 and winter and spring of 2000. During the sampling, they collected only 2 rainbow/steelhead trout and 1 unidentified salmonid species. Table 4-2 provides a summary of water quality data collected during the Leader study.

Table 4-2: Water Quality Measurements from Summer 1999 – Spring 2000 (Leader, 2001)

Parameters	Summer 1999	Fall 1999	Winter 2000	Spring 2000
Turbidity (NTU)	1.4	2.7	3.1	2.0
Dissolved Oxygen Saturation	106.1	106.6	96.6	108.1
Dissolved Oxygen (mg/l)	11.4	13.0	12.1	11.7
Temperature (^{o}C)	12.3	6.8	5.8	11.7
Mean Velocity (m/s)	1.1	2.4	4.1	2.7
Maximum Velocity (m/s)	2.6	4.1	5.9	5.6
Conductivity (µS)	101.5	99.0	65.0	80.9
Total Dissolved Solids (mg/L)	48.2	47.0	30.6	38.2
Salinity (ppt)	0.1	0.1	0.0	0.0
pH	–	7.8	7.4	8.0

The 2002 aerial photo shows 3 gravel bars within this reach. The Leader report stated that the reach upstream of GL01 had about 5 percent soil in the substrate when it was surveyed during the summer 1999.

Degree of Impairment Score = *1.9*

Limiting Factors

- Riparian conditions
- Habitat Elements
- Water Quality

Target Functions

- Riparian Zone – Intensive riparian vegetation planting to restore stream shading and large wood recruitment in areas that have little or no existing riparian vegetation.
- Floodplain Connection - Reconnect wetlands to enhance their natural functions of flood storage and water filtration.

- In-stream Complexity – Place wood in the stream to provide in-channel habitat diversity, deep pools, and locations with cooler water temperatures during the warm summer months.

Recommended Actions

1. Work with the landowner to plant and maintain native vegetation in the pasture area along the left bank, between the creek and ponds. Reconnect the wetlands along the left and right banks to the main channel thorough localized grading. Limit access for farm vehicles in this area.
2. Work with the landowner to restore the riparian zone along both sides of the creek. Open areas within the floodplain and on the banks would be planted with appropriate native vegetation. Vegetation would provide bank stability and shade for the creek. It is recommended that the newly planted riparian zone be at least 100 feet wide.
3. Increase the in-stream complexity of the channel through the placement of LWD. This work should initially concentrate near the confluence of Clear Creek. The work would consist of creating areas with large wood and deep pools that fish can utilize for refuge from high water temperatures. Specific activities will be determined during the project design phase.
4. Work with property owners near the creek to educate them about programs that promote stream stewardship and that are available to agricultural operations through state and federal grants.