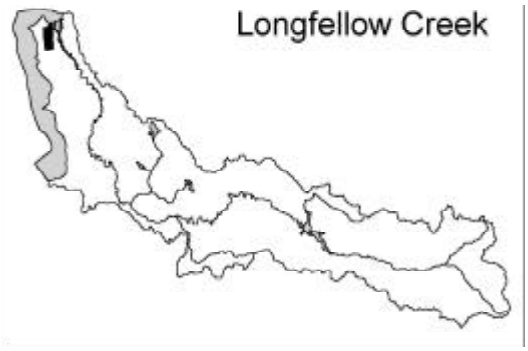
3.1 LONGFELLOW CREEK SUBBASIN (09.0359)

3.1. LONGFELLOW CREEK SUBBASIN (09.0359)



PHYSICAL DESCRIPTION

SUBBASIN

The basin is comprised of one distinct physical setting that was defined by the retreat of glaciers about 13,500 years ago. This retreat left a series of physical features that were shaped by the grinding action, which today are best described as depressions or hollows.

The Longfellow Creek Subbasin, is located in West Seattle's Delridge and Westwood Neighborhoods, entirely within the boundaries of the City of Seattle. Because the subbasin lies within a heavily urbanized area the borders are best defined geographically by using street names. Longfellow Creek subbasin is that area between SW Roxbury Street at the Seattle City limits to the south; between 13th Avenue SW and 21st Avenue SW on the east; 35th Avenue SW on the west (with an extension out to 41st Avenue SW in the northern portion of the subbasin); and north to SW Spokane Street and the industrialized area under the West Seattle Freeway to the north. Generally flowing from the south to the north, Longfellow Creek does not flow directly into the Duwamish River but rather into the West Waterway (also referred to as the West Duwamish Waterway. Longfellow Creek appears to fall under the category of "tributary to the Duwamish River" as defined by the boundaries used for the Duwamish River in 173-201A WAC, WQ Standards for surface waters in WA).

STREAM COURSE AND MORPHOLOGY

Longfellow Creek flows from an area of approximately 2,685 acres and was calculated as approximately 1.45 miles in length (Williams 1975) and more recently 4.2 miles long (J. Starstead, pers comm.).

The historical headwaters are located at a natural wetland and peat bog in what today is Roxhill Park. Even today, portions of Roxhill Park have been reported to be so wet that they are unusable for recreational activities. Seattle Parks is currently undertaking a project to reestablish this historic headwaters site through daylighting of the creek (which is now in a stormdrain beneath the site) and re-creation of the peat-based bog (which was filled many years ago). This project has the potential for improving water quality and stabilizing flows entering Longfellow Creek at

its historic headwaters. After leaving Roxhill Park, the creek travels north in pipes beneath the Westwood Village Shopping Center, which when constructed, was built on driven piles due to unstable soils. The upper 4,900 feet of Longfellow Creek is fully contained in pipes of various sizes. Today, approximately one third of the creek length lies within enclosed pipes and travels under developed urban areas including shopping centers, houses and roads.

The creek initially appears above ground at a Seattle Department of Parks and Recreation (Parks) open space site in the vicinity of 24th and 25th Avenues Southwest and north of Southwest Thistle Street. After leaving this location, the creek meanders through multi-family residential property before entering the 5-acre SW Webster Street Water Detention facility. This detention facility was recently modified in 1999, to improve operational efficiency during small and large storms and improve wetland habitat inside the facility. The creek exits the detention facility through a 60-inch by-pass pipe that runs along the back of K-Mart and reconnects with open channel at SW Myrtle Street.

Longfellow Creek meanders a considerable distance between private property, the West Seattle Golf Course, and a four-block Seattle Parks open space site, prior to entering a pipe at Southwest Andover Street and traveling beneath yet another parking lot. In the vicinity of Southwest Spokane Street, the Longfellow Creek pipe connects with another pipe carrying stormwater and the combined flow discharges into the West Duwamish Waterway.

Longfellow Creek has two small, unnamed tributaries, both of which were not identified in Williams (1975). Both tributaries are on the left bank and the largest is located in the West Seattle Golf Course. The tributaries are believed to be too small for anadromous fish use, but the lower reaches, particularly of the tributary in the golf course, may be important refugia for overwintering salmonids from high flows (MacIntosh, 1990).

Information concerning the amount of total effective impervious surfaces within this basin was not located during the course of this investigation. However, given the heavy urbanization and residential development it is assumed to be quite high.

SALMONID USE

The known freshwater distribution of anadromous salmonids and the presumed distribution of coho and steelhead are depicted in the report Appendix. This presumed distribution uses a stream gradient of $\geq$12 percent as the point which steelhead and coho are presumed to be present. Historically, Longfellow Creek was thought to contain populations of coho salmon, cutthroat trout and steelhead trout (MacIntosh 1990). Williams (1975) indicated that the stream might contain coho salmon. The WDFW Spawning Ground Survey Database (1999) does not contain any indication of adult salmonid observations in Longfellow Creek for any species. Prior to the middle 1990's there was the rare report of an adult salmonid observed (Dick Lunt, 1990, personal communication reported to B. MacIntosh) and the creek was not believed to support a self-sustaining population of any salmonid species.

MacIntosh (1990) observed coho smolts and juvenile coho rearing in portions of Longfellow Creek. In 1999, Seattle Public Utilities (SPU) conducted spawning surveys on Longfellow Creek. These surveys indicated the presence of sixty (60) adult coho salmon. During 1998, SPU

staff observed forty-four (44) adult coho salmon carcasses stranded along the banks of lower Longfellow Creek. *The Riparian Zone*, a local citizen newsletter about events of Longfellow Creek basin, also reported adult salmon sightings by local neighbors in both the Fall of 1995 (approximately 20 coho), and reported anecdotal accounts from December 1993 and 1994, of 13, and 2 adult coho, respectively.

In addition, juvenile rainbow trout and coho salmon were captured during electrofishing surveys in 1999, from the mouth up to SW Graham, and up to SW Oregon streets, respectively (Washington Trout, In Preparation). It is not known if the creek supports a self-sustaining population of coho salmon, because it is not known if the adult coho returning to the creek originate from hatchery strays, hatchery releases, or are being produced by the system (Katherine Lynch, pers. comm.).

Numerous groups have released coho salmon fry into Longfellow Creek for several years. Coho smolts and juvenile coho have been observed rearing in portions of Longfellow Creek (MacIntosh 1990; Washington Trout, In Preparation). To date there have not been any verifiable adult salmonid returns linked to these programs due to lack of a monitoring program.

FACTORS OF DECLINE

FISH PASSAGE

There are several known and potential barriers in this system. Some are located in pipelines, such as the lower 3,161 feet, and likely occur when maintenance has not removed debris. A list of known and potential culverts is shown in table LONG 1.

LONG 1: Longfellow Creek Known and Potential Barriers to Anadromous Salmonids

Location	Known	Potential	Brief Description
Downstream of Andover St.		X	Debris in pipe could be a barrier
Culvert under Genesee St.		X	Culvert with a 45 degree bend
Culvert under 12th Fairway, W. Seattle Golf Course		X	Long, narrow culvert with 2.5 percent gradient
Golf Course falls	X		Constructed waterfall, cats as upper limit for anadromous fish
South end of W. Seattle Golf Course	X		Perched (2') culvert
Culverts at Willow Street	X		Perched culverts 3-4 feet above streambed.
Culvert under K-Mart parking lot	X		Velocity barrier and may represent upper limit accessible to fish
Miscellaneous debris barriers	X	X	Require annual maintenance through streamwalks.

LAND USE

The percent of impervious surfaces in the Longfellow Creek subbasin are approximately 45 percent in the upper part of the basin, 35 percent in the middle part of the basin, 50 percent in the lower part of the basin (Longfellow Creek Watershed Characterization Background Report, 1992).

RIPARIAN CONDITION

MacIntosh (1990) examined the riparian habitat of Longfellow Creek as a part of the Puget Sound River Basin Team. She divided the creek into segments, working from downstream to upstream, and provided narrative descriptions of each segment. These same segments were used as a basis for a habitat evaluation in the Longfellow Creek Habitat Restoration Master Plan, January 1999. The information below is attributed to MacIntosh et al unless otherwise noted.

Segment 1. The lower 3,161 feet is completely contained within a culvert. The Port of Seattle installed "skylights" in 1998, in an attempt to improve fish passage and has committed to outfall and pipe hydraulics improvements at some time in the future. There has not been any monitoring program in place to determine the effectiveness of these "skylights". Because this stream segment is entirely within pipes there is no effective riparian habitat. Land use within this reach is predominantly scattered residential and industrial.

Segment 2. This segment lies between the culvert intake at Andover Street and Genessee Street. The four-block open space between SW Yancy and SW Genesee Streets has been purchased as Seattle Parks open space. Land use within this reach is predominantly scattered residential and industrial. This segment ranked as a high priority in the Master Plan, based on minimal obstacles to salmon; reasonable habitat potential; and, high public visibility and accessibility.

There is no quantifiable data for canopy coverage or age but the riparian habitat was considered "fair to good" in the lower portions of this reach and "lacking" in the upper portions. There were several unvegetated eroding stream banks observed in this reach in 1990. Site restoration work is currently underway here, and instream and upland improvements are scheduled for completion in 2001.

Segment 3. The majority of this reach is located within a wooded ravine in the West Seattle golf course, and includes that portion of open channel from SW Genesee Street to the confluence of unnamed tributary in golf course. Two major obstructions prevent salmon access to relatively good habitat upstream. Public access is now limited. In the lower portions of this reach there is some canopy present but it is generally considered "lacking". Upstream of the lower 150 feet the canopy quality improves. Golfers searching for "missing" golf balls have cut numerous trails into the riparian corridor and contribute to its degradation.

Segment 4. This segment consists of a small left bank tributary that drains from a steep ravine believed to originate from a brushy wetland area to the west. Numerous small slides have occurred in the upper portion of the tributary channel. This area probably accounts for a significant proportion of the observed suspended sediment load in the main channel. Here too, golfers searching for "missing" golf balls have cut numerous trails into the riparian corridor and contribute to its degradation.

Segment 5. This reach extends from the confluence of the left bank tributary upstream to SW Brandon Street and winds through a wooded ravine. The overhead canopy was considered "dense" except in the vicinity of the several golf course walkways across the creek. Recurrent bank failure problems exist in this reach and one channel obstruction is present.

Segment 6. This reach extends from SW Brandon Street upstream to the location of the stormwater bypass segment enters the mainstem of Longfellow Creek. Numerous trails and pathways have effectively eliminated much of the riparian vegetative zone. The overhead canopy was termed “dense”. The upper portions of this reach have a riparian zone termed “brushy” with only minimal overhead canopy present.

Segment 6. This reach extends from SW Brandon Street upstream to the outlet of the stormwater bypass channel north of SW Findlay Street. MacIntosh indicated that numerous trails and pathways have effectively eliminated much of the riparian vegetative zone. The overhead canopy is termed “dense”. The upper portions of this reach have a riparian zone termed “brushy” with only minimal overhead canopy present.

Segment 7. This reach includes open channel from the bypass channel outlet to SW Juneau Street (bypass channel starts at SW Juneau Street). The reach is characterized by a highly modified stream bank that has been channelized and armored, and flanked on both sides by private property. . A corresponding amount of limited canopy and overhanging vegetation is present.

Segment 8. This reach stretches from SW Juneau Street upstream to SW Graham Street and has a “dense” canopy present throughout most of its length. There are local areas where no canopy is present. Himalayan blackberries and reed-canary grass are present in areas with minimal or no canopy.

Segment 9. This reach extends between SW Graham Street to SW Willow Street and flows primarily through a residential area in the lower portion and a park-like area in the upper section. Canopy was termed “adequate” in the upper section.

Segment 10. Flowing between SW Willow Street and SW Myrtle Street, this section had stream associated vegetation that was dense and brushy.

Segment 11. This segment is comprised of a piped channel from SW Myrtle Street to the SW Webster Street Detention Basin, and an open channel from the detention basin to SW Holden Street. Most of the segment is piped, with modest trout habitat potential within the open channel portion. Rock grade control structures located in the stream channel upstream of the detention basin are two feet high, and impede passage by all anadromous and resident fish species. Seeps from hillside behind K-Mart may contribute fine sediments to bypass pipe. Streambank erosion was observed along channel upstream of the detention basin.

Segment 12. This reach extends between SW Holden and SW Thistle Streets, and contains modest trout habitat potential. Most of the segment is on private land, with the exception of a small open space parcel, contiguous with Chief Sealth High School. The creek is highly visible to local apartment dwellers, and there is little to no riparian buffer in this reach as high-density housing is constructed in some cases to the stream’s edge. Open space next to high school has been recently improved with trails and native vegetation in recognition that this “headwater” reach is important to downstream segments.

In conclusion, the riparian habitat of Longfellow Creek suffers from many of the ailments associated with urbanization including in many reaches dominated by non-native plant species,

lack of suitable buffer width or functioning buffer and can only be considered to be "Not Properly Functioning."

LARGE WOODY DEBRIS

There has been no quantification of LWD in Longfellow Creek, but visual stream surveys by MacIntosh (1990) indicate that LWD is quite limited. This is probably due to inadequate recruitment potential from the degraded riparian zone.

MacIntosh (1990) specifically noted the need for additional instream structure and wood placement. Seattle Public Utilities began adding LWD to Longfellow Creek in 1999, particularly to the stream reach between Andover and Genesee streets, where most of the adult coho were recorded during spawning surveys in 1999 (WA Trout, In Preparation). Although LWD is limiting in Longfellow Creek, it has been placed in critical reaches over the last couple of years, and may not be a major limiting factor compared to stormwater runoff. Specific stream channel and riparian improvement projects identified by the Longfellow Creek Master Plan are intended to improve fish passage and access to significant habitat areas, and enhance available salmonid habitat via a combination of in-stream and riparian habitat diversity and channel stabilization

HYDROLOGY

MacIntosh (1990) suggested that the high quantity and degraded quality of stormwater was detrimental to salmonid production. Davis et al (1992) also concluded that the adverse effects of increased volumes of stormwater flows and decreased volumes of low flows were a result of urbanization in the subbasin. The Longfellow Creek Wastewater Management Committee identified the issues associated with high stormwater flows and increased urban runoff as principle problems facing the creek (Davis 1992a).

This problem persists, at least in part, due to the City of Seattle Comprehensive Drainage Plan adopted in 1989 that states that Longfellow Creek will remain the principle conduit for stormwater for the drainage basin. One solution to this problem is to control the flow rate and treatment of stormwater to the creek.

Very few flow measurements have been taken in Longfellow Creek, and no hydrograph has been established for the creek. Flow was measured in 1976 at 2.5 cubic feet per second (cfs) at SW Webster Street and SW Andover (City of Seattle 1977). Flow measurements taken in 1990 at SW Adams Street averaged 1.15 cfs (Davis et al. 1990). It is unclear if the dates of both measurements were similar, but both were attributed to possible low flow measurements. It is believed that impervious surfaces increased in the intervening 14 years. Increases in impervious surfaces results in less infiltration and are associated with a decrease in low flows, and an increase in the magnitude, duration, and frequency of storm events (Booth, 1991).

Longfellow Creek is the natural drainage conveyance for a watershed of approximately 2,685 acres. Today, Longfellow Creek receives surface water from natural areas in addition to stormwater runoff from streets, paved areas such as parking lots, and run-off from a series of constructed ditches. Some of these ditches are lined with impervious materials while others have placed rocks or vegetation. Collectively, these all channel stormwater into Longfellow Creek.

Approximately 45 percent (1,208 acres) of the subbasin is served by combined sewers. The remainder collects surface water in ditches and pipes and delivers it directly to the creek. Sewers and storm drains were separated along SW Roxbury, SW Webster, and through most of the lower watershed by the late 1970's. Drainage improvements in the early 1980's included: separation of sewers and storm drains, the construction of a 26-acre foot capacity detention basin at SW Webster Street, and installation of four combined sewer overflow holding tanks (10 yr-storm event capacity). A by-pass was constructed between SW Juneau and SW Findlay in 1989 to relieve a channel constriction and associated flooding.

HYDROMODIFICATION

Longfellow Creek, as is the case with many streams in urbanized settings, has undergone a long history of extensive floodplain modifications. The City of Seattle calculates the length of Longfellow Creek as 20,630 feet long (Joe Starstead, pers. comm., calculated from GIS measurements) and with two left bank unnamed tributaries each contributing approximately 1,300 and 270 additional linear feet there is approximately 22,200 total linear feet of creek length (Joe Starstead, SPU, personal communication, calculated from GIS measurements). Approximately 8,200 (36.1%) linear feet of Longfellow Creek lie entirely within pipelines and another 1,034 (4.7%) linear feet under road crossings (Joe Starstead, SPU, pers. comm., calculated from GIS measurements). There are also numerous sections that are channelized, between bank hardening features such as rock gabions, poured concrete walls, large placed rocks and stacked broken slabs of concrete. The channelization of this creek has caused a simplification of channel complexity, increased water velocities, loss of pools for juvenile rearing and adult and juvenile holding, loss of spawning habitat, loss of side channels, loss of any significant wood recruitment and loss of connectivity with its historic floodplain.

The length of these areas was not available for this report but based on professional observations (MacIntosh 1990) it is expected to be significant.

While there has not been an exhaustive inventory of floodplain modifications there is sufficient data (MacIntosh 1990, Davis 1992a, Davis 1992b) to indicate extensive modifications have occurred". MacIntosh (1990) did conclude that despite urbanization, the subbasin still contained some usable fish habitat. This information, in combination with the presence of juvenile rainbow and coho found during the1999 electrofishing surveys (WA Trout, In Preparation, Taylor & Associates, 1999) suggests that there are reaches within Longfellow Creek that possess some capacity to support juvenile salmonid rearing. However because of the extensive amount and nature of the modifications to the floodplain it should be rated as severely impaired and "Not Properly Functioning."

OFF CHANNEL HABITAT

The ability of Longfellow Creek to form off-channel habitats has been eliminated in approximately the 40 percent of the creek where it is within pipelines. Other portions of Longfellow Creek are channelized between bank hardening structures that limit lateral movement that is necessary to form many off-channel habitats.

FLOODPLAIN CONNECTIVITY

The extent and form of channelization within Longfellow Creek has greatly interfered with this system's capacity to connect to its historic floodplain. Additionally, as in many urban streams, increases in streamflow have caused the creek to incise in many places, further impacting floodplain connectivity.

WATER QUALITY

Longfellow Creek is designated as a Class A stream by WDFW and WDOE. While Longfellow Creek does not directly flow into the Duwamish-Green River, it is considered a tributary to the Duwamish River, which is designated as a Class B surface water (Chapter 173-201A WAC). However, water quality is only currently listed as degraded for fecal coliform violations on the EPA 303(d) list for 1998. Table LONG 2 illustrates the Environmental Protection Agency 303(d) 1998 list for Longfellow Creek.

LONG 2: Environmental Protection Agency, Clean Water Act 303(d) 1998 List for Longfellow Creek

Sampling Location (RM)	Parameter
LFC 24	Fecal Coliforms
RM 1.1	Fecal Coliforms
RM 0.5	Fecal Coliforms
LFC 1	Fecal Coliforms
LFC 3	Fecal Coliforms

While fecal coliform violations are a human health threat, they are not necessarily a threat to natural salmonid life history stages. However, they may be an indicator of overall stream health and because of the multiple excursions beyond acceptable limits provide cause for concern. Fecal coliform counts were noted to exceed acceptable limits when samples were taken during both low flows and storm events (Goldberg et al 1992, Minton 1998). They also noted increased levels of Total Suspended Solids (TSS) and turbidity during storm events and metal concentrations increased as TSS increased.

A more suitable indicator of overall stream health is the presence, diversity and population of benthic invertebrates. MacIntosh (1990) and Goldberg (1992) both indicate an overall lack of benthic invertebrates that is indicative of overall stream degradation. Healthy populations and species diversity of aquatic invertebrates have not been found in Longfellow Creek (Davis et al 1992, Goldberg 1992). This may be due to a combination of factors including high storm flows, low base flows, degraded water quality and/or degraded habitat conditions.

During water quality sampling conducted prior to 1992, Longfellow Creek exceeded state water quality criteria for fecal coliforms, turbidity, lead, copper, zinc and dissolved oxygen. The levels of total lead, copper, and zinc exceeded both acute and chronic criteria more than 50 percent of the time during storm flows but not during low flows.

Longfellow Creek Data Review and Segment Ranking Technical Memorandum, September 1998, reviewed the water quality data contained in the *Longfellow Creek Background Characterization Report* (City of Seattle 1992) and in the draft *Review of Water and Sediment*

Quality Data for Longfellow Creek (Resource Planning Associates 1998). In addition, this technical memorandum reviewed water quality data provided by Seattle Public Utilities (SPU). The monitoring data provided by SPU are summarized in LONG 3 below.

LONG 3: Longfellow Creek Water Quality Sampling Locations

Station ID	Location	Sampling Period	No. of Baseflow Samples[1]	No. of Storm Samples[1]
C370	Longfellow Creek at Yancy Street	3/93-12/97	46	11
LFC3	Longfellow Creek at Adams Street	11/79-7/90	49	12
LFCP23	Storm drain pipe discharging to Longfellow Creek near Edmunds Street	3/90-7/90	0	6
J370	Longfellow Creek at Brandon Street	12/92-12/97	46	12
LFC24	Longfellow Creek at Findlay Street	11/87-6/90	2	19
LFCP25	Storm drain pipe discharging to Longfellow Creek near Myrtle Street	3/90-7/90	2	13
Sta91	Longfellow Creek at Graham Street	12/95-4/97	0	8
LFC1	Longfellow Creek upstream of Webster Basin	5/89-7/90	5	8

Note: Baseflow and storm samples identified in *Review of Water and Sediment Quality Data for Longfellow Creek* (Resource Planning Associates 1998).

Evaluation of this data was confined to sampling results collected since January 1990. Key findings, related to descriptive statistics (e.g., median, mean, maximum, minimum) for each constituent of potential concern, and compared with current state water quality criteria for Class A waters, are summarized as follows:

- Fecal coliform densities often exceeded the state criteria during storm events. Fecal coliform is a human health concern but not a major aquatic life concern. Domestic pets and geese are believed to be the most likely sources of fecal coliform in stormwater runoff. Combined sewer overflow at SW Henderson Street and SW Orchard Street are also potential sources. Fecal coliform densities were occasionally high in baseflow samples, which may indicate leaking sanitary lines or cross-connections to the storm drain system.

- Overall water quality was fair for aquatic life. Under baseflow conditions, the creek generally met the water quality criteria for aquatic life protection. However, samples collected during storm runoff occasionally exceeded the criteria for copper, pH, and temperature.

- Dissolved oxygen (DO) did not meet the state criteria on two occasions. However, DO has not been measured at night or just prior to first light, when aquatic plant respiration tends to reduce DO levels. Water temperature exceeded the state criteria on a few occasions during the months of July and August.

- Total suspended solids and turbidity were often elevated during storm events.

- Nitrate-nitrogen was often elevated. Total phosphorus concentrations were within the typical range for urban streams. The lack of DO problems suggests that nutrient enrichment has not had a major impact on the creek.

- Samples collected from the two storm pipelines generally contained higher pollutant concentrations than the in-stream stations.

- There was little difference in water quality among the creek stations. Water quality in the upper, middle, and lower reaches was similar. This spatial pattern indicates that there are no major point sources (or distinct non-point source areas) affecting the creek between monitoring stations.

Table 4-5 in the Longfellow Creek Data Review and Segment Ranking Technical Memorandum, summarizes the results of the water quality evaluation for each segment. Potential areas within each segment are noted in the table. (Attach).

SEDIMENT CONDITION

MacIntosh (1990) noted numerous areas where the streambed was sand, mud and/or compacted gravels. Some of these reaches were in areas that were on top of gabion bottoms. Rock gabions and/or cyclone fencing have been placed over the stream banks and streambed between Nevada and Genesee streets, which would limit access to spawning gravels in this reach (MacIntosh, 1990, WA Trout, In Preparation). High amounts of fine sediments were also present in several reaches.

Eroding stream banks were noted throughout the creek by MacIntosh (1990) and are one source of the sediment problems noted previously.

Although not surveyed, the apparent limited availability of suitable amounts and quality of spawning gravels may be a limiting factor to the natural production of salmonids in this stream. Erosion of streambanks and fine sediment input by stormwater contributes to the poor quality of those gravels that are present.

NON-NATIVE SPECIES

ANIMALS

No information was obtained to indicate the presence of non-native aquatic animal species.

PLANTS

Non-native plant species found in the subbasin include numerous ornamental species associated with plantings by private and public landowners. Examples include mountain ash (*Sorbus spp.*), blue beech (*Carpinus spp.*), butterfly bush (*Buddleia spp.*), cherry laurel *Laurocreasus officenalis*), dogwoods (*Cornus spp.*), and non-native rhododendrons (*Rhododendron spp.*). Exotic species of plants more closely associated with riparian and aquatic environments include: scotch broom (*Cytisus scoparius*), reed canarygrass (*Phalaris arundinacea*) which is abundant throughout this subbasin and Himalayan blackberry.

Non-native animal and/or plant species do not appear to currently be a limiting factor to natural salmonid production.

KEY FINDINGS AND IDENTIFIED HABITAT-LIMITING FACTORS

- Naturally producing anadromous salmonids may be absent from this subbasin, possibly since 1939. In recent years adult coho have been observed and recent electrofishing surveys indicate the presence of rainbow trout.
- The creek suffers from extensive channelization
- Water quality in Longfellow Creek is a significant adverse issue impacting anadromous fish success.
- Hydrologic regime has been severely altered along with system's ability to support salmonids
- Instream structures are needed to produce channel complexity for successful salmonid production.
- Known and potential anthropogenic barriers limit access to spawning and rearing habitat.
- The quality and quantity of gravels in the stream may be limiting anadromous and resident salmonid spawning success and potentially juvenile rearing.
- Although no quantifiable storm-flow information was available, it was the professional judgement of the TAG that flood flows due to increased impervious surfaces would serve to adversely limit any successful egg incubation.
- There are only limited amounts of off-channel habitat suitable for juvenile salmonid rearing and holding.

DATA GAPS

- Fish passage barriers have not been comprehensively assessed for the subbasin.
- Information regarding existing riparian conditions and functions for supporting salmon habitat is limited.
- There is no LWD inventory for the subbasin..
- Aquatic invertebrate populations should be monitored and the cause of lack of diversity and presence should be determined and addressed.
- Present fish use information of the system is not comprehensive.

- The state of the stream channel condition is unknown.
- Flow data is scarce or non-existent. Hydrologic analysis designed to assess the potential for salmon restoration is essential.
- The impacts of water quality to salmonid productivity have not been documented.

RECOMMENDED EARLY ACTIONS

- A comprehensive baseline habitat survey including elements that address the above referenced data gaps should be initiated to shape a subbasin-wide, ecosystem-based, stream rehabilitation strategy. The strategy should be used to direct the type and timing of rehabilitation activities to maximize resource potential and promote efficient expenditures.

LIST OF TABLES