3.8 NEWAUKUM CREEK SUBBASIN

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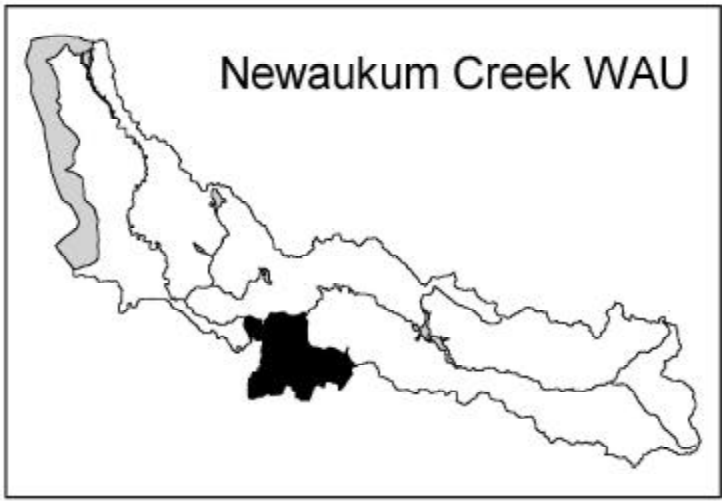

PHYSICAL DESCRIPTION

SUBBASIN

The Newaukum Creek (09.0114) subbasin drains an area of approximately 27.8 square miles. It flows from the mountains east of Enumclaw, across the Enumclaw Plateau, and enters the Green River at River Mile 40.7. The creek and its tributaries lie totally within the boundaries of King County. Portions of the subbasin lie within the Urban Growth Boundary (UGB).

The subbasin land area can be broken into the three segments:

- The upper subbasin (25 percent of the land area);
- The Enumclaw Plateau (57 percent of the land area); and
- The ravine (18 percent of the land area).

Newaukum Creek is unique in this reach of the Green River due to the large size of its drainage basin, flow, biological utilization and geographic location. It is one two large tributaries that flow into the middle reaches of the Green River, and is the most significant post-dam source of spawning gravel in to the middle reach of the mainstem Green River.

STREAM COURSE AND MORPHOLOGY

Newaukum Creek is approximately 14.0 miles long, and has eight tributaries that provide an additional 13.5 miles of stream length.

Its headwaters are formed by diffuse springs, snowmelt, and groundwater runoff in the 2,500- to 3,900-foot elevation range of Boise Ridge (a feature of the Grass Mountains, which are a part of the foothills to the Cascade Mountains).

The mainstem Newaukum Creek (09.0114) and the North Fork Newaukum Creek (09.0122) drop down steep ravines and gullies to the Enumclaw Plateau, where they join and flow across a relatively low-gradient area. The Osceola Mudflow originated from historic eruptions of nearby Mt. Rainier approximately 4,800 years ago and is the dominant geologic feature forming the Enumclaw Plateau. This mudflow was responsible for the deposition of large areas of unsorted clay sediments, which in turn have created a flat riverine topography.

After flowing across the plateau, they again enter a steep-walled ravine for the last three river miles before entering the Green River.

Newaukum Creek (RM 0.0 – 14.0) is subdivided into three channel types (Figure HM-2):

- The upper subbasin (RM 14 to RM 9) is classified as a High Gradient Contained Channel.

- The Enumclaw Plateau (RM 9 to RM 3) is classified as a Floodplain Channel (the channel is unconfined and has a gradient of 0.5).

- The ravine (RM 3) is classified as a Moderate Gradient Mixed Control Channel (the gradient increases to 2.7 percent (Boehm 1999). The channel is moderately to tightly confined but an area near the mouth of the creek has been severely altered by local landowners. The ravine extends to the confluence with the Green River, with only a short segment of alluvial fan (about 1,500 feet) extending into the Green River valley.

SALMONID USE

The known freshwater distribution of anadromous salmonids is depicted in the report Appendix. The presumed upstream distribution by chinook, coho and steelhead has been estimated by identifying the location at which the channel gradient steepens to over 12 percent. For Newaukum Creek, this 12 percent gradient break occurs at approximately RM 13.5 (Cutler 2000), about a half a mile upstream of an impassable cascade near RM 13.0 identified by Williams et al. (1975). The WDFW Spawning Ground Survey database indicates chinook have been observed upstream as far as RM 11.3, and that sockeye, coho, sockeye and chum salmon (along with winter steelhead adults) have also been observed spawning in the Newaukum Creek subbasin. Resident and anadromous cutthroat have been observed throughout the streams and lakes.

No attempt is made in this report to include abundance estimates of salmon and steelhead in this subbasin. However, the subbasin is considered to be a major producer of winter steelhead, coho and chinook salmon (Washington Department of Fish and Wildlife and Western Washington Treaty Indian Tribes 1994). During typical years, hundreds of adult chinook and adult coho salmon enter this subbasin to spawn. Malcom (1999) calculated that between 1986 and 1997, a mean of 15.6 percent of the naturally spawning adult chinook salmon that entered the Green River Basin (excluding Soos Creek because of the large hatchery returns), spawned in the lower 4 miles of Newaukum Creek.

FACTORS OF DECLINE

FISH PASSAGE

Known barriers to anadromous salmonids are shown in the reportAppendix.

King County is conducting (completion date early 2001) a comprehensive Green River Basin investigation of culvert and bridge crossings of county roads. This investigation should produce a basin-wide database identifying anthropogenic barriers or constrictors of stream channels.

In 1998, a culvert and remnants of an old dam were removed from RM 2.0 of the North Fork Newaukum Creek in order to improve access for anadromous salmonids to 1,200 meters of habitat. Subsequent smolt trap monitoring at the project site documented coho and trout use upstream (Dimock 2000).

Deposition of gravel at the mouth of Newaukum Creek where it enters the Green River floodplain has created a small alluvial fan that has impeded fish migration in at least two years (see Sediment Condition, below). Passage impediments are further exacerbated by the lack of deep holding pools on the fan (see Hydromodification) and throughout the lower mile of channel in Newaukum Creek (Malcom 1999).

Shallow or subsurface flows (see Hydrology—Low Flows) have impeded the upstream migration of adult chinook salmon into Newaukum Creek, especially the early run component (Malcom 1999; Boehm 1999).

RIPARIAN CONDITION

Riparian habitat is severely degraded in this subbasin and is believed to be contributing to the decline of natural salmonid production within this subbasin. The headlands of both Newaukum Creek and the North Fork of Newaukum Creek are used for commercial timber production.

From RM 10.0 to RM 4.0, the riparian habitat consists of a narrow (typically less than five meters wide) strip of vegetation (pers. comm. R. Fritz as reported in Malcom 1999). The forest can best be described as in transition. With the cooperation of landowners and local enhancement groups, selected locations between RM 3.0 and RM 10.5 have undergone riparian vegetation enhancement to widen the habitat (Anderson, 2000).

Because of the importance Newaukum Creek has for anadromous salmonids (particularly chinook), there have been at least two recent comprehensive surveys of the lower reaches of the mainstem creek. Boehm (1999) and Malcom (1999) separately examined the lower river mile. The riparian habitat in the lower mile consists of second-growth deciduous hardwoods and shrubs with a few conifers.

At approximately RM 0.5 the riparian forest begins to mature as additional numbers of coniferous trees are present, consisting of western red cedar, Sitka spruce, Douglas fir (*Pseudotsuga menziesii*), and western hemlock (*Tsuga heterophylla*). The deciduous trees are also more mature, with older big leaf maples and red alders present. The shrub layer also

includes snowberry (*Symphoricarpos alibis*), red elderberry (*Sambucus racemosa*), indian plum (*Oemleria cerasiformis*), sword fern, and devil's club (*Oplopanax horridus*) (Boehm 1999).

Young deciduous soft and hardwoods dominate the riparian zone of the lower 0.5 river miles of Newaukum Creek. Young red alders (*Alnus rubra*), scattered 20- to 30-year-old black cottonwoods (*Populus trichocarpa*), and big-leaf maples (*Acer macrophyllum*) dominate this reach. There are a few young western red cedars and Sitka spruce. The understory shrub layer consists of Himalayan blackberry (*Rubus discolor*), salmonberry (*R. spectabilis*), willows (*Salix spp.*), vine maples (*Acer circinatum*) and red-oiser dogwood (*Cornus stolonifera*).

Between 1996 and 1997, approximately 1,155 feet of the stream channel was realigned beginning at approximately RM 0.1 upstream to 0.25. During this time, the right bank was cleared, riprapped within the floodplain, and sprayed with a herbicide (pers. comm. Doug Hennick (WDFW) reported in Boehm 1999).

LARGE WOODY DEBRIS

There is no quantitative information on the historic abundance of LWD in Newaukum Creek. In the 1950s, LWD was reportedly systematically removed from lower Newaukum Creek to protect a bridge located approximately 1,000 feet upstream of the confluence with the Green River (Boehm 1999).

Separate investigations by both Malcom (1999) and Boehm (1999) indicate that the quantity and quality of pools, riffles and LWD in the lower Newaukum Creek are insufficient. When NMFS habitat rating parameters (NMFS 1995) are applied Malcom' data, this reach of Newaukum Creek is rated as "Not Properly Functioning" for LWD. Malcom concluded that the habitat quality in this reach would continue to decline due to the age and condition of the riparian corridor and passive restoration would not be successful in the near term.

Data concerning current LWD amounts elsewhere in the Newaukum Creek subbasin is lacking. However, observations (Malcom pers. comm.; Nelson pers. comm., Boehm 1999) indicate that amounts of LWD are low and possibly average five pieces per 100 meters of stream. When NMFS criteria (NMFS 1995) is applied to LWD amounts in this range, the entire subbasin would be rated as "Not Properly Functioning."

Severe scouring and a lowering of the stream channel of the Newaukum Creek bed (see Hydrology, and Sediment Condition—Scouring, below) has thwarted attempts to place wood in the streambed (Malcom 1999).

HYDROLOGY

LOW FLOWS

Because alluvial fans are formed of deep, porous deposits of generally coarse sediment that readily transmits water, streams flowing across such sites are naturally highly vulnerable to low or subsurface flows (Levin 1981).

The Muckleshoot Indian Tribe conducted a low flow trend analysis for Newaukum Creek to determine if surface and ground water withdrawals were reducing stream low flows (Malcom pers. comm.). The analysis of 7-day low flows from 1967 to 1992 did not indicate a declining trend.

However, data from two other studies (Carlson 1994; Culhane 1995) indicate evidence to the contrary.

Carlson's study examined three streams similar in drainage basin size to Newaukum Creek. He concluded that declining flows were not caused primarily by declines in precipitation, but by water withdrawals.

Culhane's analysis of data from 1953 to 1992 showed a significant decline in 7-day low flows. The analysis in this investigation found an estimated 20 percent decline in mean annual flows and a 24 percent decline in low flows from 1953 to 1992When the decline in annual precipitation is compared to the measured declines in Newaukum Creek subbasin's mean annual flows and low flows, it suggests that precipitation alone is not responsible for the declining stream flows. It is reasonable to conclude that a combination of water withdrawal (surface and ground water), the conversion of historic forest lands to agricultural lands, and the elimination of the historic wetland complex of the Enumclaw Plateau have contributed to a reduction in the low flows of Newaukum Creek in the reaches of the Enumclaw Plateau and further downstream. The reaches of Newaukum Creek and the North Fork Newaukum Creek upstream of the Enumclaw Plateau are predominantly in private commercial timberland. The impacts of this land use management on flows within this reach and downstream are not known. The average 7-day low flow generally occurs during the period when chinook salmon are migrating upstream, suggesting that additional areas of low flow concerns may be present in Newaukum Creek.

WATER RIGHTS AND CLAIMS

Culhane (1995) indicated that there are 41 ground water rights in the Newaukum Creek subbasin. Three of these are for municipal use and represent 56 percent of the allocated instantaneous water quantity and 75 percent of the annual water quantity. While the majority of the number of water rights and claims in the subbasin are for irrigation and small domestic systems, the majority of the water used is for domestic purposes. Table Newaukum-1 shows water rights and claims.

NEW-1: Newaukum Creek Subbasin Water Rights

Source	Total Number of Water Rights	Qi (cfs)	Total Number of Water Claims	Qi (cfs)
Ground	41	14.2	163	6.3*
Surface	36	8.4	32	1.2

Source: Culhane 1995.
* = Estimated quantities

The tributaries to the Green River have been closed to additional surface water withdrawals since 1980 (Chapter 173-509 WAC). Potable water wells that produce less than 5,000 gallons per day

are exempt to a water right requirement. It is not known how many of these wells are present in the subbasin and what their cumulative impact might be.

SEDIMENT CONDITION

SCOUR

From RM 0.0 to RM 3.0, Newaukum Creek traverses a steep ravine. Soils in this ravine have been classified as a mixture of Alderwood and Kitsap soils (SCS 1985). These soil types exhibit a natural tendency to erode and become unstable, and this is exacerbated by historic land use practices within the ravine (e.g., timber removal and clearing for upland development). Scour has removed much of the suitable substrate in this reach and deposited gravels at the mouth of Newaukum Creek. In some years, this gravel fan can create a barrier to the upstream migration of adult chinook. In 1996 and 1998, a channel had to be hand excavated through this gravel bar to allow for upstream chinook migration. No adult chinook had been observed in Newaukum Creek prior to this excavation . Adult chinook were observed spawning immediately after the channel was excavated (pers. comm. R. Fritz as reported in Malcom 1999).

Scour surveys conducted by MIT indicate that Newaukum Creek has sufficient flows to scour salmon redds during periods when eggs would be incubating (MIT 1996). During 1997, in the lower mile of Newaukum Creek scour was so extreme that the scour survey chains could not be recovered because over 14 inches of scour occurred.

Gravels are transported rapidly through the reach and deposited in lower-gradient stream reaches. Boehm (1999) found the lower river mile of Newaukum Creek to be a mixture of large gravel (35%), cobble (30%), small gravel (20%) and sand (15%). The stream reach that had the poorest spawning gravels was the lower 1,500 feet that had been channelized by a private landowner (see Hydromodification).

A desired pool-to-riffle ratio is 1:1. Typically, as structure (LWD) is eliminated, the ratio shifts towards a riffle-dominated reach. Newaukum Creek is deficient in LWD (see Large Woody Debris, above). In many places in lower Newaukum Creek, the streambed is eroded down to a stable channel bottom with long riffle sections (Williams 1975). These long riffle sections limit holding areas (pools) for adult and juvenile salmonids and rearing areas for some species of salmonids. When NMFS habitat rating parameters (NMFS 1995) are applied Malcom's 1999data, this reach of Newaukum Creek is rated as "Not Properly Functioning" for pool frequency and quality, and for off-channel habitat.

The lower 500 feet of Newaukum Creek flow across the floodplain of the lower Green River, forming an alluvial fan composed of cobble and smaller sized sediments. No data on the historic extent or distribution of gravel bars was located. A gravel bar that has built up at the confluence with the Green River currently impairs upstream migration of adult chinook at some flows (Malcom 1999). The gravel bar may be an intermittent migration impediment as during a October 2000 field review it was observed that the channel had regraded to a consistent 2 percent grade through the bar (Tom Nelson, pers. com.). No additional information on the existing or historic extent of gravel bars in the remainder of Newaukum Creek was located during the course of this investigation.

The Moderate Gradient Mixed Control segment of Newaukum Creek (RM 0.3 to RM 4) is essentially unconfined by levees, revetments or riprap (Malcom 1999). No information was located describing current artificial channel constraints upstream of RM 4.0 in Newaukum Creek.

WATER QUALITY

Newaukum Creek is not listed on the Washington State Department of Ecology (WDOE) 1998 303(d) list for water quality problems associated with high temperatures or low dissolved oxygen. However, temperatures greater than the NMFS criteria for properly functioning habitat (57^{o}F) have been recorded at the USGS gage near RM 1.0 (Malcom 1998).

While not directly an adverse impact to salmonids, there are numerous reaches of Newaukum Creek listed on the WDOE 303(d) list for exceeding allowable fecal coliform limits. Samples taken at 11 stations (RM 0.9 to RM 10.8) all met the criteria to be listed on the 303(d) list. This is more of an indicator of current land use practices that may be adversely impacting the natural reproduction of salmonids.

High turbidity discharges typically occur each year during high flows in Newaukum Creek, resulting in downstream turbidity plumes in the mainstem Green River. Malcom (pers comm.) noted that on October 29, 1997, the water discharge from Newaukum Creek created such high turbidity in the Green River that chinook redds could not be identified and enumerated for as far as 4 miles downstream of the mouth of Newaukum Creek. The specific source of these high-flow discharges is currently unknown, but it appears that contributions from the commercial forest production lands, runoff from agricultural lands, and direct incision of tributary stream channels near agricultural lands may all be sources. This increased turbidity and its impacts should be further investigated, since water quality problems associated with increases in turbidity may be a limiting factor to natural salmonid production in this subbasin and immediately downstream in the mainstem Green River.

LAND USE

The Newaukum Creek subbasin is one in transition from historic forested lands to agriculture and now to rural residential.

Land use in the headwater reaches zone consists primarily of commercial forest production with minor impacts by development to date. This area is located outside the Urban Growth Boundary (UGB) and most probably will remain in commercial forest production in the future. The upland part of the basin accounts for approximately 25 percent of the land area.

Agriculture (predominantly in the form of pasture) is the major land use on the Enumclaw Plateau. The subbasin currently has a diverse development pattern, ranging from low-density residential and pasture uses to high-density residential and commercial land uses. Presently, most commercial and low-to-high-density residential land uses are situated within the UGB. The UGB encloses an area beyond the incorporated city limits of Enumclaw and faces likely future annexations and zoning changes. These future land use changes within the UGB will lead to increases in impervious-area percentages in the subbasin. The Enumclaw Plateau area occupies approximately 57 percent of the subbasin.

Forestry has been the historical land use within the ravine area. However, an increasing number of single-family residences are appearing in the ravine area. The ravine reach accounts for about 18 percent of the basin area.

NON-NATIVE SPECIES

ANIMALS

No known exotic fish species are believed to occur in the waters accessible to anadromous salmonids of this subbasin. It is likely that warmwater fish occur in some of the farm ponds and lakes of the Enumclaw Plateau.

PLANTS

Reed canarygrass (*Phalaris arundinacea*) is abundant throughout this subbasin.

Neither non-native plant or animal species are believed to be a limiting factor to natural salmonid production in this subwatershed.

HYDROMODIFICATION

Channelization and bank modifications have altered channel morphology in the short alluvial fan of Newaukum Creek. Between 1984 and 1990, a landowner periodically bulldozed and re-aligned Newaukum Creek between RM 0.1 and RM 0.3, straightening meanders and piling LWD in the old channel to force flows into the newly excavated channel (Boehm 1999). In addition, the riparian zone was cleared and recently riprapped just downstream of RM .01 to protect a septic and well system (Boehm 1999).

OFF CHANNEL HABITAT

This riverine topography, when combined with numerous depressions has formed a complex of wetlands across the landscape of the Enumclaw Plateau. The historic wetlands of this subbasin were large enough that many have been named (King County 1990a). They include:

- Newaukum Creek No. 21 (158 acres);
- Newaukum Creek No. 51 (144 acres);
- Newaukum Creek No. 22 (63 acres);
- Newaukum Creek No. 14 (45 acres); and Newaukum Creek No. 31 (29 acres).

Most of these wetlands have been converted into agricultural lands (primarily pastures) through ditching, draining and filling activities over the past 100 years.

FLOODPLAIN CONNECTIVITY

Floodplain development is naturally limited in the High and Moderate Gradient Contained Channel segment, thus human activities have not substantially altered floodplain connectivity in upper (RM 9 to RM 14) or lower (RM 0 to RM 5) reaches of Newaukum Creek.

No quantitative data on historic or current floodplain connectivity was locate. However, the floodplain segment of Newaukum Creek (RM 5 to RM 9) is associated with a floodplain that typically would be able to support inundation-tolerant vegetation, contain side- and off-channel habitats, and serve as a groundwater re-charge zone. The palustrine channel segment is described as "cutting through pasture and flat farmlands with very little natural growth available to provide shade and protection to the creek" (Williams et al. 1975). Agricultural and rural residential development have continued to influence habitat in the palustrine segment of Newaukum Creek, and have resulted in altered floodplain function. In many places, the mainstem Newaukum Creek streambed is eroded down to a stable channel bottom with long riffle sections (Williams 1975).

Many of the tributaries to Newaukum Creek have been channelized into roadside and drainage ditches. The lower three miles of Newaukum Creek flow through a deep, confined ravine. The lower 500 feet of Newaukum Creek currently has a moderate gradient (about 2%) and during seasonal low flows a blockage to adult chinook may exist at the mouth (See Sediment Condition, above). The mainstem Newaukum Creek does flood in some localized areas, particularly in areas upstream of constriction points such as undersized culverts and riprap (Kerwin, pers. obs.).

There was no available data located on the historic frequency of off-channel habitats in Newaukum Creek. Based on channel type, it is expected that off-channel habitats are likely to be present only in the 1,500 foot long reach where the alluvial fan crosses the Green River floodplain or in the Palustrine segment (RM 5 to RM 10) under undisturbed conditions. There are considerable numbers of off-channel habitats between RM 2 and 3. These off-channel habitats consists of numerous side channels, many of them 100 meters or greater in length that have associated extensive wetland complexes. Numerous braided stream channels are visible from aerial photographs. Off-channel habitats are expected to be rare in the High Gradient Contained segment (RM 10 to RM 14) because the confining valley walls effectively limit lateral migration.

Surveys of lower Newaukum Creek conducted in 1998 categorized the area between RM 0 and RM 0.6 as having "few or no backwaters and no off channel ponds" (Malcom 1999) and are assumed to be representative of the entire Moderate Gradient Mixed Control segment. There is no information on the current extent of off-channel habitat available in the Palustrine segment between RM 5 and RM 10.

FLOODPLAIN CONNECTIVITY

Approximately 1,155 feet of the stream channel were realigned between 1996 and 1997 beginning at approximately RM 0.1 upstream to 0.25. This activity has reduced stream channel complexity (pers. comm. Doug Hennick (WDFW) as reported in Boehm 1999). In response to the channelization, an adjacent landowner attempted to protect his property by clearing and riprapping the right bank (as well as removing LWD and applying herbicide to vegetation within the riparian zone).

KEY FINDINGS AND IDENTIFIED HABITAT-LIMITING FACTORS

- The virtual absence of LWD is believed to be a limiting factor to natural salmonid production in this subbasin.

- Stream scour is exacerbated by uncontrolled stormwater runoff from upstream roads that have no stormwater controls, farms, and urban areas in Enumclaw. Scour and bedload movement are believed to be a limiting factor to natural salmonid production throughout Newaukum Creek subbasin.

- Channel conditions are believed to be a limiting factor to natural salmonid production in this subbasin.
- There is a general lack of riparian habitat information for this subbasin.

- Newaukum Creek is the first significant source of stream transported spawning gravels for the mainstem Green River downstream of HHD.

- The Newaukum Creek subbasin supports significant numbers of spawning chinook along with coho, winter steelhead, chum, sockeye and coastal cutthroat.

- The lower 0.3 miles of Newaukum Creek have been dredged and straightened by private landowners.

- Stream cleaning and riparian harvest have reduced the frequency of LWD in the lower 1.4 miles of Newaukum Creek to 0.3 pieces per channel width, a level considered “poor” or “not properly functioning”. Pools are also scarce.

- Although the subbasin is undergoing a transition from forest to rural and urbanization land use there is still significant portions of the subbasin that could be effectively restored.

- Summer low flows are decreasing.

- Although no quantifiable information was available, it was the professional judgement of Technical Advisory Group members that the riparian buffer in this subbasin was insufficient. This is in at least partly due to current and historic land use practices.

- There is a lack of LWD throughout the streams in this subbasin.

- Summer low flows have decreased in the Newaukum Creek subbasin. These low flows effectively limit available rearing production for species of salmonids that require over-summer residency.

- Water quantity (both seasonal low flows and winter storm flows) due to changes from historic land use patterns and withdrawal, are limiting the natural production of salmonids in this subbasin.

DATA GAPS

- Little data available on hydromodifications channel condition, LWD and other critical habitat conditions or habitat in the Newaukum Creek Subwatershed.

- The impacts of seasonal high flow peaks and durations on salmonid production should be determined.

- Water quality, particularly during stormwater events and potential adverse impacts to salmonids are unknown.

- Actual, instantaneous water use within the basin is not known.

- There was no data available that provided the location and magnitude of mass wasting sites.

EARLY ACTION RECOMMENDATIONS

- Conduct a comprehensive inventory of current salmonid habitats.

- Conduct a comprehensive barrier assessment and habitats upstream of identified anthropogenic.

- Because of this lack of site specific habitat data, comprehensive base line habitat surveys should be initiated. These surveys should at a minimum include an inventory of LWD, riparian habitats present, quality and quantity of spawning gravels, quality and quantity of pool, an evaluation of streambank stability and associated mass wasting and erosion/sedimentation problems. We need to more adequately understand the spatial dynamics and distribution of LWD and associated habitats and identify opportunities for accelerated riparian forest recovery. To accomplish this, counts of wood loading, distribution and characteristics over time at key locations stratified by stream order, elevation and channel reach type, gradient, riparian zone features (width, species composition and age composition) should be made.

- A water use and water level monitoring program should be established.

- Additional water flow data should be gathered to provide more certainty about long-term flow trends in this subbasin.

LIST OF TABLES