City of Bellevue Watershed Management Plan

Greater Kelsey Creek Watershed Assessment

EXECUTIVE SUMMARY

Purpose of This Assessment

The purpose of this report is to assess the conditions in the Greater Kelsey Creek Watershed that are limiting the health of its streams. This assessment includes the evaluation of potential limiting factors from the Conceptual Model that describes the primary effects of urban runoff on streams (See Figure 2) and their consequences for stream health.

The City is preparing a series of Watershed Assessment Reports (ARs) that will provide the basis for the recommended actions to improve stream health culminating in a city-wide Watershed Management Plan (WMP). One AR will be prepared for each of the City of Bellevue's (City's) major watersheds: Coal Creek, Greater Kelsey Creek, the Lake Sammamish tributaries within Bellevue (including Lewis Creek), and the small Lake Washington tributaries within Bellevue.

In addition to the watershed condition assessment, each AR will include limiting factors, data gaps (if any), and identified opportunities for improving in-stream watershed conditions. The ARs are based on data from three primary sources: 1) the recent Open Streams Condition Assessment (OSCA) performed by the City; 2) existing data collected by the City from past projects and ongoing monitoring efforts; and 3) existing project and environmental monitoring data collected by the City and a variety of public resource agencies.

CITY OF BELLEVUE WASHINGTON

Watershed Management Plan
Our streams, our future

Description and History of the Greater Kelsey Creek Watershed

The mainstem of Kelsey Creek flows approximately 10.7 miles from its present-day headwaters in the Lake Hills Greenbelt to Mercer Slough and ultimately, Lake Washington. Kelsey Creek receives flow from the smaller tributaries of Richards Creek, Sunset Creek, West Tributary, Goff Creek, Valley Creek, and Sears Creek before joining with Sturtevant Creek at Mercer Slough. In addition to fluvial channels and tributaries, surface water features in the Greater Kelsey Creek Watershed include floodplains, wetlands, and lakes.

The Greater Kelsey Creek Watershed is relatively low gradient at the headwaters, with many streams originating in large wetland complexes. Gradients tend to increase as the channel flows over the edge of the plateau, then decrease again as they approach Mercer Slough and Lake Washington. Streams in the Greater Kelsey Creek Watershed have been highly affected by urbanization, including altered riparian vegetation, high-flow bypasses, dams, detention facilities, ditching and confinement by roadways, and long stretches that are piped underground. While urbanization has affected all of the City's watersheds, this is especially true for the Greater Kelsey Creek Watershed.

The geology of the Greater Kelsey Creek Watershed is primarily characterized by a combination of glacial and post-glacial deposits (glacial till) deposited during the Fraser glaciation, approximately 13,000 to 16,000 years ago. The Greater Kelsey Creek Watershed is unique within the City because of extensive peat deposits along the stream channel in its headwaters and in the Mercer Slough and Sturtevant subbasins. These peat deposits are bordered by glacial outwash and non-glacial deposits. The valley that contains the mainstem of Kelsey Creek was formed by the incision of the erosive glacial meltwaters into the glacial deposits described above. Although ongoing channel incision is a part of a natural geologic and geomorphic process, there are some places within the Watershed where the rates of channel incision have been exacerbated by hydrologic alterations. The soils at the surface tend to be highly erodible and the soils just below the surface tend to have low permeability.

The land cover in the Greater Kelsey Creek Watershed is typical of urban watersheds with a lower percentage of tree canopy and higher percentage of impervious surface. The Greater Kelsey Creek Watershed is comprised of large Parks including Kelsey Creek Park, Lake Hills Greenbelt, and several smaller City parks. Several wetland complexes exist within the Greater Kelsey Creek Watershed, including Mercer Slough, the wetlands at Kelsey Creek Park, and the Lake Hills Greenbelt. Within Bellevue, ownership of the riparian corridor across all of the subbasins within the Greater Kelsey Creek Watershed is approximately 90 percent private property and 10 percent publicly owned (primarily parks).

Human intervention in proximate waterbodies has affected Greater Kelsey Creek Watershed and Kelsey Creek itself. In the late 1800's, the outlet of Phantom Lake was diverted to Lake Sammamish, effectively reducing flow to Kelsey Creek. Also, lowering of the Lake Washington lake level in 1917 impacted Mercer Slough, as have the seasonal raising and lowering of lake levels to reduce winter storm impacts since that time. Human use and activity within the Greater Kelsey Creek Watershed includes unauthorized encampments, recreational use of riparian areas, roadway and vehicle pollutants, and numerous other urban residential pollutants which all have the potential to negatively impact water quality.

Beavers are active throughout much of the Greater Kelsey Creek Watershed. Beaver activity has the potential to cause flooding in confined urban areas if it is not properly managed. While beaver activity in certain areas may have negative effects for people and infrastructure, beavers play a critical role in habitat creation and enhancement with significant benefits to fish and wildlife habitat. Beaver activity can reduce water velocities, increase sediment and stormwater retention, increase habitat complexity, and increase water depths (for example, behind beaver dams) that results in cooler stream temperatures and water storage to help with climate change resiliency.

The Greater Kelsey Creek Watershed has a number of regional stormwater facilities and high-flow bypasses. Instream regional stormwater facilities were designed to address flooding issues caused by development that occurred prior to the requirement for stormwater control. More than 37 percent of the Greater Kelsey Creek Watershed was developed before 1974 with more than half (57.6 percent) developed before the mid-1980s, at which point multiple regional flow control facilities were built.

The Greater Kelsey Creek Watershed is important for salmon, as it has historically provided extensive spawning and rearing habitat for a larger number of anadromous and migratory salmonids and other fish species. Salmonid species such as Chinook (Oncorhynchus tshawytscha), Sockeye (Oncorhynchus nerka), Coho (Oncorhynchus kisutch), Cutthroat Trout (Oncorhynchus clarkii), and Steelhead (Oncorhynchus mykiss). Also, Peamouth Minnows (Mylocheilus caurinus) return to Kelsey Creek from Lake Washington to spawn, via the Mercer Slough, in the spring. Several of these species can still be observed throughout the Watershed today, though spawning and rearing habitat extents have decreased with urbanization.

Factors that Limit the Health of the Greater Kelsey Creek Watershed

The following were identified as limiting factors for the Greater Kelsey Creek Watershed per the Conceptual Model, in general order of importance across all nine subbasins within the Watershed:

1. **Pollutant Loading:** Stormwater runoff from impervious surfaces (Limiting Factor #1) causes erosion from higher flows, and transports pollutants (metals, nutrients, fecal coliform, and others) associated with urban development that are detrimental to the health of aquatic organisms and people. Road runoff, illicit discharges, and possibly septic systems are the likely sources of these pollutants. Also, water quality treatment facilities were not required for approximately 94 percent of the current developed area in the Bellevue portion of the Greater Kelsey Creek Watershed.

2. **Stormwater Runoff from Effective Impervious Surfaces:** Increased stormwater runoff flow rates and volumes during storm events from impervious surfaces in the Watershed, in combination with historic channel alterations for flood risk reduction purposes or land development, are contributing to negative effects on water quality, instream habitat quality, including fish and wildlife habitat.

   Although the City required stormwater flow control for new development beginning the mid-1970s, these facilities designed and built through the mid-1990s, has been shown to be not very effective at protecting streams from erosion and other negative effects of runoff. These facilities and parts of the City that were developed prior to any stormwater control requirement make up approximately 86 percent of the current developed area in the Bellevue portion of the Watershed.

3. **Road Culverts and Other Physical Barriers:** A number of physical barriers to fish passage have been identified in all the streams of the Greater Kelsey Creek Watershed. In addition, there are undocumented barriers on private properties throughout the Watershed. These barriers prevent fish from accessing areas for spawning and/or rearing, effectively reducing their activities to areas of the stream downstream of these barriers.

4. **Loss of Floodplain and Riparian Function:** Urban development has confined many of the stream reaches in the Watershed. This effectively reduces the amount of floodplain storage and reduces wood from entering the stream, leading to high velocities and flowrates with limited channel complexity. There are tracts of wetlands and floodplains where the creek channel can migrate naturally which is why other Limiting Factors are of greater importance in the Greater Kelsey Creek Watershed. The tree canopy in the Greater Kelsey Creek Watershed is largely concentrated in the park areas around the creek channels. There are several stream reaches with very limited tree canopy and vegetation and these should be addressed. Because the Greater Kelsey Creek Watershed does have a relatively large percentage of tree canopy overall, this limiting factor is of lower importance than the others at the watershed scale.

   The Greater Kelsey Creek Watershed has wetlands and connected floodplain that essentially provide storage for the high flows and stormwater volumes witnessed in the Watershed. The existing storage and relatively low gradient of the Greater Kelsey streams means that the high velocities and volumes haven't caused erosion to the same extent as seen in other high-gradient systems in the City with limited or no wetlands or connected floodplain.

Past and Present Investments

The City has invested tens of millions of dollars in the Greater Kelsey Creek Watershed over the past 15 years on in-stream projects that include repairing stormwater outfalls, stabilizing stream slopes, removing fish passage barriers, catching and removing fine sediment, and improving conveyance.

Future Opportunities

Potential future investments in the Greater Kelsey Creek Watershed will address the limiting factors identified here and include both in-stream investments and investments in the contributing areas so as to address the pollutant loading and stormwater runoff challenges in the Watershed.

Prepared by Jacobs HERRERA