Lower Mission Creek
Watershed Status Survey
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Prepared For:
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ENVIRONMENTAL REPORT – MISSION CREEK DRAINAGE AREA

Introduction

This report contains the information gathered from the drainage area of Mission Creek on August 12th, 13th, and 14th. The survey focused on the problems related to low flow and contamination of Mission Creek, as well as the possibility of groundwater contribution to the stream channel. By way of establishing a methodology of work, initially a site visit was made of the drainage area located above 23rd Street, hereafter named *Urban Zone*, where the scenario is typical of urban regions, with residences and paved streets that make a large area impermeable. Also visited were the areas within Larson Park and Mahon Park, south of 23rd Street to the Wagg Creek culvert at Keith Road. In this report, henceforward, these parts will be called *Natural Zone*. In these areas, especially in Mahon Park, the vegetation is more preserved and there is little urban development.

The comments made in this report were based upon field visits as well as maps of the Mission Creek Watershed by Kerr Wood Leidal Associates Ltd., and information contained in the student report "*Mission Creek Aquatic Habitat Survey*", May 2002, from Capilano College.

Although the study area was initially restricted to Mission Creek, a brief inspection also was carried out along Wagg Creek, taking into account that the two creeks are very close and share partially the same drainage area.

Discussion

i) Urban Zone area

The highest part of the Mission Creek watershed, according to the maps by Kerr Wood Leidal Associates,. is in the area situated above 23rd Street and below 29th Street, and between Westview Drive and Lonsdale Avenue. All the area is strongly urbanized in a process that indeed brought on intense changes on the natural processes that control the flow patterns of Mission Creek.

It must be noted that increases of impermeable area by the urbanization process affects the rate of water infiltration through the soils, generates run off processes, concentrates floods events and affects the hydrologic cycle by rearranging the water storage and changing the water trajectory. The construction of culverts and storm sewers also bring on severe changes to the stream channel and flood plain by increasing the volume and speed of the water, besides direct changes in the watercourse.

The fact that the urbanization process was much stronger in this part of the drainage area than in the lower one, aggravated the situation because this higher area historically received the greatest share of water infiltration that contributes to the creek channels and aquifers. If there were once other small tributaries of Mission Creek, they probably faded and vanished under the earthworks or because of the decrease of water infiltration. Nevertheless, the area was already altered long ago and the efforts now must concentrate in preserving the channels and avoiding the presence of pollutants. In the present

scenario, much more attention must be given to the lower part of the area where the natural conditions were much more preserved.

ii) Natural Zone

This portion involves reaches 1,2 and 3 as defined in the report *"Mission Creek Aquatic Habitat Survey"*. The higher part (R3) extends from the Larson Road culvert to the culvert at 23rd Street, being approximately 150 meters in length. The flow level in this portion, at the time of the site visit, is already low showing a wetted width that varies from less than 1 meter to about 2.5 meters, no deeper than 0.1 meter. However, the stream channel indicates that there is a great increase in the flow rates during the rainy season. On visual inspection, no contaminants were present, but as the rains start most likely there will be some pollutants carried into the storm drains and storm sewers. When the rain starts the water flow will increase as peak flows discharge from the culvert. The effects of these variations should be evaluated further.

It is recommended that a monitoring program be conducted to evaluate the increase of the discharge during storms, as well as to carry out analysis of some few specific pollutants that will provide important information about variations in stream conditions between different seasons and over time. Further in this report are suggestions for monitoring parameters.

Below the culvert at Larson Road is found the more protected portion of the drainage area of Mission (R1 and R2 in the *Aquatic Habitat Survey*) and Wagg creeks. Mission Creek in this area is about 1 km in length showing variations of the wetted width and depth according to the channel shape. In some portions the values are lesser than 1-meter width and 0.05 meter depth. Anyway, in the entire course the level of flow is presently very low, certainly influenced by the lack of rains.

Evidences of groundwater were found along the course of Mission Creek starting about 450 m above its confluence with Wagg Creek. Spots of a black and very wet soil (probably hydromorphic soil) were noticed close to the water channel. Although there wasn't water gushing, the high moisture of the soil that spilled out water when squeezed, indicates that the groundwater in that point is close to the surface. When the rains start the level of groundwater will become higher and seepage will probably occur, releasing water into the stream channel. The shallow groundwater may also be helping to keep flow even during the dry season. It is very important to protect these sources from the activities of park users, taking into account that the sites are situated very close to the track.

There are also several small shallow ponds within the stream channel, where gradient is very low. These little ponds can be found at several points along Mission Creek, being part of the stream and do not appear to be fed by groundwater. It is probable that the ponds will disappear as the rains start and the channel flow increases.

Storm sewer outfalls were found at two locations along Mission Creek. These specific sources of water must be evaluated because they might contribute to erosion by gushing high-speed water, besides being potential sources of contaminants brought from outside areas.

iii) Wagg Creek

Considering the proximity of Wagg Creek and Mission Creek as well as the fact that they share part of the same drainage area, an inspection also was made along its course. The problems described above related to the influence of urbanization over the natural processes are the same for Wagg Creek, but the flow rates in this creek are superior than in Mission Creek. Close to Keith Road, trash (paper,

can) was noticed in the stream channel, indeed carried by the stream from upper areas during periods of higher discharges.

However, the principal problem that is observed along the Wagg course is the erosion at several points. In the map contained in the *"Mission Creek Aquatic Habitat Survey"* these areas were marked. The erosion problem is caused by run off processes from upper areas flowing through the slope where the vegetation is poor or was removed. During the rainy season those devegetated areas will be filled by torrents that weaken the soil structures and carry the particles into the stream channel, causing not only erosion problems, but also a reduction of the creek depth due to the precipitation of suspended sediments when the water become slower.

Suggestions

Regarding the irreversible process of urbanization that happened in the higher part of the drainage area, it would be very important to concentrate restoration over the more preserved area, here called *Natural Zone*.

The implementation of a monitoring program in the entire area is suggested, evaluating parameters such as: discharge rates, transport of suspended sediments and specific chemical parameters.

Monitoring of discharge rates will show the variation of water discharge between different seasons, being of paramount importance to estimate the erosion processes in the channels and stream banks. The monitoring would also help in evaluating the influence of impermeable areas over the flow, besides allowing the creation of a historic data bank that will indeed helps further projects in the area.

Regarding the very low flow in Mission Creek, the monitoring of suspended sediment rates is very important. After the rains, when the water speed becomes slower the suspended sediments precipitate into the channel and can block the flow further. If the results show that the rate of suspended sediments is high, the source of these sediments must be identified and controlled.

In addition to the analysis of dissolved oxygen and pH carried out during the *Mission Creek Aquatic Habitat Survey,* it is suggested monitoring three more parameters: Chemical Oxygen Demand (COD), Chlorides and Ammoniun Nitrogen.

COD testing is widely used as a means of measuring the organic strength of waters. The COD studies are of extreme importance in the environmental context, because high COD levels can consume great part of the dissolved oxygen in streams and cause serious damage to the aquatic life.

Chloride, due to its low attenuation by soil, is well known as a natural tracer. The presence of chloride usually indicates the leading edge of a contamination plume. High levels of chlorides can indicate that more dangerous pollutants are also migrating through the groundwater.

The compounds of nitrogen are of great interest to environmental engineers because of the importance of nitrogen compounds in the life processes of all plants and animals. Ammonium nitrogen can be toxic to several fish species and its concentration must be controlled.

All the parameters suggested to be monitored can be quickly analysed, are not expensive and will indicate the background of the water quality in Mission Creek. Initially analysis should be made before the rains start and after strong storms. Afterward, depending on the results, an evaluation could be made to determine if there is a need for further analysis or periodic monitoring.

Regarding the spots of hydromorphic soil close to the Mission Creek channel, it is very important to protect these from park users, as the sites are situated very close to the track. The use of educational signs alerting park users about the place can be useful.

Regarding Wagg Creek, it is strongly recommended to reduce the erosion processes before the rains start again. Measures such as revegetation at specific areas and mini dissipation basins along the slope could be efficient in that situation. A monitoring of the problem as the rains start would indicate the need to adopt stricter procedures.

Conclusion

From field investigation it was observed that the low flow in Mission Creek probably is a consequence of the hard urbanization process, which occurred in its higher drainage area. However, the impacts of this process cannot be estimated only on the initial investigation outlined in this report, and a monitoring program of some parameters is recommended for the area. It is also suggested that the monitoring should start before the rainy season in order to allow future comparisons between different seasons.

Evidences of groundwater were found along Mission Creek but additional information taken from existing boreholes would be interesting, including evaluating variations in groundwater levels.

Erosion problems are evident in several points along Wagg Creek. It is strongly recommended that slope protective measures be undertaken to halt the process.

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