

Presentation to the public at the Gardom L Planning Process Open House

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Goal 8 – Restore Mallory Creek

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- As part of the Gardom Lake Management Planning process our committee needed to look at the entire Gardom L watershed as everything upstream of the lake impacts the lake. Mallory Creek is the only inflow stream to Gardom Lake and therefore it is very important to the health of the lake ecosystem.
- MoE had no water quality information on the creek. On Apr 1st members of the local community took me on a preliminary field trip to survey the creek. We went from the height of land along the road right to the lake – a distance of 2.2 kms. Local information provided valuable background information, both historical and current and our goal was to see what human impacts were along the path of this small creek and scout out possible water quality sites. Many photos were taken of the creek, dams and ponds and where available, local residents were approached. This led to a 2 pronged approach; checking on water licences and establishing water quality sites with water sampling.
- Contacted the Water Allocation Section of the Ministry of Forest, Lands and Natural Resource Operations to obtain all water licences along the creek. Since the late 1960's 18 water licences had been granted for a variety of purposes; irrigation, storage to support this irrigation in the form of ponds and domestic use. Since that initial granting, 6 of those licences have been cancelled or abandoned, leaving 12 currently active.

- Other impacts were noted. We compared an old 1929 air photo to current conditions and quickly realized that the flat area just above Musgrave Rd was once a wetland complex and the creek, which flowed through it, was ditched to the base of the hill while the wetland was filled to provide pasture land. In addition, the outlet of the creek into the lake was diverted and ditched approximately 100 m to the east.
- The second approach was water quality. MoE has dedicated some money towards collecting water quality information. Two water quality collection sites were established on the creek, one up as high as we could get and still feel comfortable that the water would be flowing all year round and downstream as close to the lake as possible where the water was still flowing, that being just on the upstream side of Musgrave Rd. Unfortunately there is a lot of standing water between Musgrave Rd and the lake so we aren't able to accurately determine the human impacts in the last little stretch of the creek. We collected our first set of water samples at these 2 sites on Apr 16th and just recently received the data back from the lab. Here is a brief snapshot of these results.

Hardness - The water in the creek is very hard, meaning that it has high mineral content as opposed to soft water which has low mineral content. The source of this hardness is determined by the concentration of multivalent cations or positively charged metal complexes in the water such as calcium or magnesium, the most common ones, or iron, aluminium and manganese. These cations enter the creek by leaching from minerals in the bedrock within an aquifer and, it's totally natural. The interesting part however is the fact that this hardness decreases in Mallory Cr as it flows downstream. Usually, in most streams, it's the other way around where water picks up these minerals as it flows. At the bottom site it is important to note that the hardness is still above the Drinking Water standards so please don't drink the water right out of the creek. The World Health Organization says that there doesn't appear to be any convincing evidence that water hardness causes adverse health effects in humans but some

studies have shown a weak relationship between water hardness and cardiovascular health. The best guess as to why it decreases going downstream is that there is a lot of standing water in the ponds. These ponds have high organics which causes the metals to precipitate out and become locked into the bottom substrate. One other point of note is that the lake hardness is lower than the stream. This is probably due to softer water from groundwater flow, snowmelt and rain at the lake.

Organic Carbon – Carbon comes from decaying natural organic matter as well as synthetic sources such as detergents, pesticides, fertilizers, herbicides, industrial chemicals and more. The water in the creek is 3 times over the Drinking Water limit for Organic carbon and it increases from top to bottom. As it is, the water is safe to drink with this amount of carbon but if this water was chlorinated at a treatment facility the chlorine would react with the organic carbon and produce chlorinated disinfection by-products which are highly carcinogenic.

Nutrients – Nitrogen and Phosphorus - Overall the nutrient levels in the creek are good as they are very low. The Nitrogen parameters increase from top to bottom whereas the Phosphorus parameters decrease. At this point I can't explain the decrease in phosphorus but the increase in Nitrogen is probably due to all of the standing water in the ponds. Nitrogen content in the air, roughly 80%, is much greater than the soil, roughly 10 to 20%, and so it is being absorbed out of the air by the water in the ponds. The nutrients in the creek aren't contributing to the lake "loading" or in other words increasing the concentration of nutrients in any significant way. Internal loading in the lake has more influence to the ecology of the lake than what is coming in from the creek. To clarify this a bit, when a lake contains oxygen all the way to the bottom the nutrients are able to be locked into the sediment in the bottom by a chemical reaction and are literally not available. At any time of the year when the bottom is anoxic or contains no oxygen the nutrients are released and recirculated again. Gardom Lake has 2 deep basins, they are greater than 20 meters, and even with aeration in the NE basin in the winter there is a lot of

bottom water that is anoxic year round. Any increase of nitrogen or phosphorus to the lake from natural sources, such as the air, living or dead organisms and the soil, or human sources such as sewage, fertilizer or garbage dumps would add to the nutrients already circulating in the lake and increase plant life and algae blooms, not a good thing for this lake. We are fortunate that the lake doesn't completely turn over in the spring or the fall as we would probably end up with some nasty algae blooms.

Metals – A water sample was taken for a complete spectrum of metals. None stood out except for Zinc and it is above the guidelines for long term exposure for Aquatic life. It is bedrock related but then again so are all the other metals that were tested and none of them showed up. It may be because of the culverts. New culverts contain a coating agent of Zinc which is why we sample above them. Zinc at the water hardness level that we have in the creek is not toxic. If the creek had very soft water then the Zinc would be a problem.

Bacteria – E.coli is a bacterium which normally lives in the intestines of healthy people and animals and is contained in sewage or manure. It can cause severe abdominal cramps, bloody diarrhea and vomiting. E. coli was tested at both water quality sites and was found to be very low but it did increase from top to bottom. It is never a good idea to drink raw water.

As another note, I have heard of a toxic dump along the creek but our initial water quality samples don't indicate a problem. Perhaps it has been covered enough for so long or it has leached away that it is stable at this time. Initial data indicates to leave this area alone and don't remove or expose it just in case something is dug up but future testing will help verify this.

With what we know about the water licences, the alterations to the creek and the water quality, where do we go from here? Possible Restoration Plan.

1. In the case of the water licences, any cancelled or abandoned water licence must have the works removed immediately and the landscape returned to previous natural conditions. Our preliminary field trips indicate that, in some cases, this didn't happen. The current landowner, whether they are the original licence holder or not, is responsible and can be charged for having illegal works on their property and must bear all costs of removal and remediation. This is the heavy hand of the law but perhaps a compromise can be reached. The dams and ponds are having an environmental impact to the creek and are also a major liability safety wise. The ones that are legal and maintained properly have every right to be there but the ones that are not maintained properly will need some work and the illegal works must be removed. Further downstream, I mentioned about the filling of the wetlands and 2 spots where the creek was ditched, at the former wetlands and at the lake. Wetlands are natural purifiers of water.
2. In the case of water quality, the Friends of Gardom Lake have committed to sampling the creek at the 2 sites mentioned 11 more times, once a month from now until next March, with funding for the analysis being provided by the MoE. By collecting water quality data over a long period of time we are establishing the current conditions and by comparing the top and bottom sites a possible change in water quality can be monitored.

In our Lake Management Plan meetings we talked about the possibility of a partnership to conduct a creek restoration project. What we proposed for the future is that a Restoration Planning Committee be formed to oversee the development of such a plan and to meet with landowners along the creek to talk about the possibilities and benefits or problems of; removing illegal and legal dams to daylight the creek, restoring wetlands and redirecting the creek through them and moving the creek mouth back to its

original channel, or anything else that might be possible. This is a very ambitious project that will need funds and the involvement of experts on stream and wetland restoration and most importantly the partnership, cooperation and support of the landowners. It might not all be possible or come to fruition but this proposal is definitely food for thought and something which I believe could have exciting positive environmental implications for Mallory Cr and Gardom Lake.