North Shore Streamkeepers
MacKay Creek Watershed Study
Photo Report, 2007 – 2009

March 31, 2009

Summary

The 2007-2009 water quality project on Mackay Creek in North Vancouver BC was a joint project of the North Shore Streamkeepers and North Shore Fish and Game Club. Water samples were collected once a month for one year at four sites from the headwaters to the creek mouth. Flow data were collected at the same time to provide information about seasonal trends and contribute to an estimate of contaminant loadings. Stream health was also assessed by evaluating benthic invertebrate communities and by conducting surveys for spawning salmon in the fall. Ongoing public awareness campaigns were another important project activity.

MacKay Creek is home to coho and chum salmon runs, resident cutthroat trout and many species of wildlife. The stream flows through residential, commercial and industrial areas before entering Burrard Inlet, which contribute runoff from roads and properties. Samples were analyzed for general water chemistry, total suspended solids, turbidity, nutrients (fertilizers), metals and coliform bacteria and on site measurements were made of temperature, pH, conductivity and dissolved oxygen. These parameters provide evidence of common pollutants in rain runoff from human activities in the watershed.

This photo report shows sampling sites, methods and common water quality concerns identified during the study, and complements the technical report, which contains all the data obtained in the study. From bottom to top of the developed area, four sites were sampled:

- Site 1: in MacKay Creek Park, below Marine Drive and upstream of the mouth
- Site 2: in Heywood Park, upstream of Marine Drive
- Site 3: in Upper MacKay Creek Park, a ravine surrounded by residential areas
- Site 4: headwater stream in Sarita Park, above most of the residential areas

Common contributors to reduced water quality included:

- consistently elevated fecal coliform (up to >24,000 mean probable number) and *E. coli* bacteria levels (up to 3,000 mean probable number) at Sites 1, 2 and 3, with highest numbers reported at Site 3. Dogs, wildlife and leakage from the sanitary sewers are potential sources of coliforms.
- elevated nutrient levels (up to 0.012 mg/L ammonia, 0.62 mg/L nitrate and 0.006 mg/L ortho phosphate during summer), also indicated by extensive algal growth
- sediment from poorly managed residential construction and landscape projects (in June, 5 km of MacKay Creek ran brown for several hours during heavy rain, total suspended solids up to 134 mg/L and turbidity of 55 NTU, well above water quality guidelines)
- metals levels within BC and CCME water quality guidelines most of the time, with exceedances noted for cadmium, copper, iron, lead and zinc during the June rainstorm, concurrent with the poorly managed landscape project in upper watershed.

This project's success is due to the efforts of volunteers from the North Shore Streamkeepers and North Shore Fish and Game Club (including a professional biologist and hydrologist) and partners who provided grants and inkind professional services:

Environment Canada (Environmental Damages Fund)
District of North Vancouver (equipment usage, maps, technical support)
Aquatic Informatics (equipment usage)
City of North Vancouver (maps)
Fisheries and Oceans Canada (technical support and logistics)
Students from the University of British Columbia (civil engineering and planning, through the Community Service Learning Initiative)

Photo1 **Mackay Site 1, January 2008, low water. This site is in the lower watershed in MacKay Creek Park, with industrial and commercial activities nearby. Margaret Phelan, Environment Canada Project Liaison, joined us.**

Photo 2 **MacKay Site 2, March 2008, in Heywood Park collecting a water sample. This site is downstream of residential areas.**

Photo 3 **MacKay Site 3, February 2008, is in the ravine upstream of Edgemont Village. UBC students helped collect water and benthic invertebrate samples. High quality fish and wildlife habitat in the ravine is threatened by spread of invasive plants and recreational use.**

Photo 4 **MacKay Site 4, is in a headwater tributary in Sarita Park, above most of the residential development. The flows year round and supports trout.**

Photo 5 **Using the YSI meter to measure water temperature, pH, dissolved oxygen and conductivity, August 2008 at MacKay Site 2. Britta Ng from District of North Vancouver joined us.**

Photo 6 **Preparing bottles for sampling, December 2007 at MacKay Site 1.**

Photo 7 **Cutthroat trout, coho and chum salmon are common in MacKay Creek. The upper limit of salmon distribution is just upstream of Site 3, due to instream barriers (culvert and flood repair works).**

Photo 8 **Crayfish inhabit the stream and are considered a sign of good water quality.**

Photo 9 **Benthic invertebrates were collected in September 2007 and February 2008 (see photo 3). UBC students assisted in sample sorting in February. Benthic communities provide information about stream health.**

Photo 10 **Filamentous green algae growth was common at all sites in the spring.**

Photo 11 **Dense algae growth (diatoms) was present in summer, reflecting relatively high nutrient loads (up to 0.012 mg/L ammonia, 0.62 mg/L nitrate and 0.006 mg/L ortho phosphate during summer).**

Photo 12 **June 2008 – we sampled in the rain, too, when turbid water is expected, but were surprised to see such brown water at Sites 1 (above), 2 and 3.**

Photo 13 **June – this improperly managed landscaping site was unprepared for rain and was the source of highly turbid water – 5 km of stream ran brown for several hours (total suspended solids up to 134 mg/L, turbidity of 55 NTU, well above water quality guidelines). Silt damages fish gills and clogs stream substrates.**

Photo 14 **Storm drains are the main pathways for pollutants from road runoff to enter a stream. This was from the June rainstorm at landscape site.**

Photo 15 **Fecal coliform bacteria levels were elevated at Sites 1, 2 and 3 throughout the year and were highest at Site 3 in the MacKay ravine. E. coli numbers up to 3000 (mean probable number) were reported. Potential sources are dogs, wildlife and sanitary sewer leaks.**

Photo 16 **An oil – grit separator near Site 1, provides some treatment of road runoff in commercial and industrial area. These structures require periodic maintenance to remove accumulated oil and sediment.**

Photo 17 **Inside the oil – grit separator.**

Photo 18 **Oily sheens were observed on some sampling dates, especially at MacKay Site 1 (in photo), downstream of Marine Drive.**

Photo 19 **Evidence of a fish kill on a North Vancouver stream. Fish kills result from the discharge of toxic substances, including harsh cleaners, swimming pool and hot tub water, wash water from cement work, and other sources, either accidentally or on purpose.**

Photo 20 **Storm drains lead to fish habitat in streams or the ocean. The storm drain marking program (Fisheries and Oceans Canada) encourages volunteers to paint the yellow fish to remind people about this.**

Photo 21 **Public awareness projects help connect residents to the beauty and ecological functioning of nearby streams, and let them know simple ways of protecting the streams. North Shore Streamkeepers events organized or attended in 2008 include:**

- **four invasive plant removal events on MacKay Creek (ravine near Site 3)**
- **two invasive plant removal events on Hastings Creek (Lynn Valley)**
- **planting in lower MacKay Creek (sponsored by Dist of North Vancouver)**
- **Coho Walk (sponsored by Coho Festival of North Shore, Metro Vancouver**
- **Rivers Day (on Morten Creek, a tributary of Lynn Creek)**
- **Gumboots and Goats (on Wagg Creek, Evergreen Foundation)**
- **distribution of MacKay Creek News (newsletter) to 900 residents in upper MacKay watershed**
- **annual MacKay Creek cleanup near MacKay Site 1 (sponsored by North Shore Fish and Game Club)**