



Fish Habitat Management System for Yukon Placer Mining

Aquatic Health Report (2012)

Prepared by

The Yukon Placer Secretariat

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DRAFT - AQUATIC HEALTH MONITORING REPORT (2012)

The Adaptive Management Framework for Yukon placer mining is complemented by traditional knowledge and monitoring of water quality objectives, aquatic health, and economic health. The Aquatic Health Monitoring program is governed by the Aquatic Health Monitoring Protocol. The Protocol describes the locations, timing, frequency and methods employed during sampling, as well as the methods used to analyze sampling data. The Reference Condition Approach (RCA) is the method chosen for assessing the health of freshwater ecosystems in the Yukon, and an RCA model was developed for bioassessment based upon benthic macroinvertebrates.

The RCA model for invertebrates has been through three iterations. The most recent update was completed in 2013 and relies upon 293 reference sites collected over the period 2004 to 2012 by Fisheries and Oceans Canada, the Yukon Government, and the University of Western Ontario using a standard protocol. The invertebrate data set was analyzed at the family level.

There are two fundamental steps in the process of developing the predictive model. The first is to classify the reference sites based on their biological characteristics. This requires defining a number of community types based on the taxonomic composition. The second step is to determine a subset of habitat attributes that are associated with those community types. Following this step the number and type of organisms expected to occur at any given site can be determined from habitat attributes.

The first step resulted in five community groups being defined for reference sites in the Yukon River basin. There are 23 sites in Group A, 13 sites in Group B1, 44 sites in Group B2Ai, 108 sites in Group B2Aii and 98 sites in Group B2B.

The following is a summary of the general characteristics of each group:

Group A: These sites represent a very depauperate community with the lowest overall abundance and family richness, comprised almost entirely of Chironomidae (midges), but also characterized by Lumbriculidae and Naididae (Oligochaete worms), and Simuliidae (blackflies). These are more western, lower altitude sites, with lower precipitation, and they tend to have deeper, slower velocity channels.

Group B1. This is the most abundant community with 6 times more organisms per sample than any other group. Chironomidae are again the most common family, however Baetidae and Simuliidae are also very common in this group. These streams tend to be more northern and higher altitude. They have the lowest precipitation and the coolest spring temperatures. They have shallower, faster velocity channels.

Group B2Ai: These sites have the greatest family richness and moderate abundance. The invertebrate community is similar to sites in Group B2Aii, differentiated by a higher relative abundance of Heptageniidae (mayflies) and Nemouridae (stoneflies) and a

lower relative abundance of Chironomidae. Heptageniidae (mayflies) and Nemouridae and Chloroperlidae (stoneflies) help characterize the group. These are higher altitude, southern sites, with higher precipitation and warmer spring temperatures.

Group B2Aii: This is the most commonly occurring group of reference sites. These sites have second highest abundance and family richness. The invertebrate community is similar to sites in Group B2Ai, differentiated by a higher relative abundance of Chironomidae and a lower relative abundance of Heptageniidae and Nemouridae. As with Group B2Ai, Simuliidae and Baetidae also help characterize the group. These are higher altitude smaller catchment sites with a wetter climate and warmer spring temperatures.

Group B2B: This is the second most commonly occurring group of reference sites. These sites have low abundance but reasonable family richness. The invertebrate community is again dominated by Chironomidae, with frequently occurring but low abundance Simuliidae, Baetidae, Heptageniidae, and Nemouridae. These sites have average precipitation, warm spring temperatures, and slightly deeper and slower channels.

Thirty-eight sites were sampled under the aquatic health monitoring program in 2012. All sites were in the Yukon River Basin; 15 of the sites were sampled as potential reference sites, and 23 were test sites. The potential reference sites were chosen to improve the distribution of reference sites across the Yukon River Basin and were incorporated into the improved Yukon River Basin RCA model developed in 2013.

Of the test sites sampled in 2012, fifteen were new and eight were re-assessments of sites that were sampled in previous years. Two of these test sites (YPS-078.4 and YPS-081.4) were re-assessed for the fourth time in 2012 allowing a look at temporal trends in site results. The following table summarizes the 2012 test site results. More detailed information, including the temporal trends analysis results for sites YPS-078, YPS-081 and YPS-114, is found in the individual test site assessment reports, which are appended to this report. Temporal trends analyses results for the remaining five site re-assessments were not available at the time of writing.

Site Code	Group (probability of belonging to Group)	Watershed	Watercourse	RCA Model Results for Benthic Macroinvertebrates	Reason for Benthic Macroinvertebrate Results
YPS-078.4	B2Aii (0.403)	Klondike River	Hunker Creek	Possibly Different from Reference Condition	High richness, low numbers of Chironomidae.
YPS-081.4	B2B (0.501)	Klondike River	Bonanza Creek	Possibly Different from Reference Condition	High abundance and richness, missing Nemouridae and Simulidae.
YPS-114.2	B2Aii (0.574)	Sixty Mile River	Matson Creek	Possibly Different from Reference Condition	High richness.
YPS-164.2	B2Aii (0.521)	Yukon River South	Thistle Creek	Possibly Different from Reference Condition	Low overall abundance, in particular low numbers of Heptageniidae and Simulidae.
YPS-315.2	B2B (0.557)	White River	Gladstone Creek	Possibly Different from Reference Condition	High richness, absence of Nemouridae.
YPS-316.2	B2Ai (0.715)	White River	Nansen Creek	Different from Reference Condition	Low abundance, low richness, absence of Chloroperlidae.
YPS-317.2	B2Ai (0.879)	White River	Victoria Creek	Possibly Different from Reference Condition	Low overall abundance in particular low numbers Nemouridae and Chloroperlidae.
YPS-323.2	B2Aii (0.854)	White River	Klaza River	Possibly Different from Reference Condition	Low abundance, in particular Dipteran families.
YPS-534	B2Aii (0.461)	Yukon River South	Kirkman Creek	Possibly Different from Reference Condition	Low abundance.
YPS-535	B2Aii (0.312) Site is weakly assigned to Group B2Aii – probability that it belongs to Group A is 0.306.	Yukon River South	Thistle Creek	Possibly Different from Reference Condition	Low abundance, in particular chironomids and Simulids, high richness, absence of Heptageniids.
YPS-537	B2B (0.392)	Yukon River South	Donahue Creek	Different from Reference Condition	High abundance, in particular a shift in community dominance and abundance of Nemouridae and Chironomidae, low richness - absence of Baetidae and Heptageniidae.
YPS-538	B2Aii (0.617)	Sixty Mile River	Matson Creek	Possibly Different from Reference Condition	Low total abundance, in particular low numbers of Chironomids.
YPS-540	B2Ai (0.628)	Fortymile River	Browns Creek	Possibly Different from Reference Condition	Low overall abundance at the site, in particular the low numbers

					Heptageniidae and Nemouridae.
YPS-541	B2Aii (0.612)	Fortymile River	Bruin Creek	Reference Condition	
YPS-542	B2Aii (0.451)	Fortymile River	Un-named Trib. to Bruin Creek	Possibly Different from Reference Condition	Low abundance of all families.
YPS-543	B2B (0.341)	Klondike River	Flat Creek	Possibly Different from Reference Condition	High richness.
YPS-551	B2B (0.537)	Southern Lakes	Becker Creek	Possibly Different from Reference Condition	High abundance, high richness, shift in dominance from Chironomidae to Baetidae and Heptageniidae.
YPS-552	B2B (0.642)	Southern Lakes	Partridge Creek	Possibly Different from Reference Condition	High abundance, shift in dominance from Chironomidae to Baetidae and Heptageniidae.
YPS-554	B2B (0.675)	Southern Lakes	Lewis Creek	Possibly Different from Reference Condition	High richness, shift in dominance from Chironomidae to Baetidae.
YPS-555	B2B (0.557)	Southern Lakes	Bear Creek	Possibly Different from Reference Condition	High richness, shift in dominance from Chironomidae to Baetidae, Heptageniidae and Simuliidae.
YPS-558	B2Aii (0.391)	White River	Arch Creek	Very Different from Reference Condition	Low abundance, low richness - many missing families.
YPS-559	B2Aii (0.515)	White River	Un-named Tributary to Reed Creek	Possibly Different from Reference Condition	Low abundance, high richness. There appears to be a shift in community structure.
YPS-560	B2B (0.548)	White River	Coon Creek	Possibly Different from Reference Condition	Shift in the dominant families from Chironomidae to Simuliidae and Baetidae.