YUKON
PLACER
SECRETARIAT

Fish Habitat Management System
for Yukon Placer Mining

Aquatic Health Monitoring Report (2010)

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AQUATIC HEALTH MONITORING REPORT (2008)

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. One RCA model was developed for bioassessment based upon benthic macroinvertebrates, and a second model was developed to assess the diversity of fish species.

The RCA model for invertebrates relies upon 237 reference sites collected over the period 2004 to 2010 by the University of Western Ontario, Fisheries and Oceans Canada, and the Yukon government, using the same 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 53 sites in Group 1, 56 sites in Group 2, 24 sites in Group 3, 91 sites in Group 4 and 13 sites in Group 5.

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

Group 1: Intermediate abundance, chironomids are less dominant, this is a mayfly (Baetidae and Heptageniidae) dominated community but stoneflies (Nemouridae) and Simulidae are also abundant. These are streams in the eastern Yukon with lower rainfall but higher snowfall; the catchments also have a higher percentage of alpine habitat.

Group 2: These are sites of intermediate abundance, but the community is dominated by chironomids which represent more than 40% of the community. These sites have the lowest amount of alpine land cover in the catchments and have deeper stream channels.

Group 3: These sites represent a very depauperate community, almost entirely chironomids and the lowest overall family richness. These are more western sites, with lower snowfall but higher rainfall; again they tend to have deeper channels.

Group 4: This is the most abundant community with 10 times more organisms per sample than communities 1 and 2. Chironomids are again the most common family, however the Baetidae are also very common. These streams tend to be in the western part of the Yukon. They have the highest rainfall and the greatest proportion of alpine land cover in their catchments.

Group 5: This site has the greatest number of organisms. Chironomids are again the most common family, however the Baetidea and Simulidae are also common. These streams tend to be in the northwestern part of the Yukon. They have the coolest June temperatures and the least amount of January precipitation.

Data from the same 237 reference sites was used to develop the RCA model for fish. The fish bioassessment is of interest, yet it should be noted that far more weight is assigned to the results of the invertebrate assessment. Fish may be present or absent during any short-term sampling event, while invertebrates have comparatively limited mobility and range during their aquatic stage. For this reason the presence or absence of invertebrates is a much more reliable indicator of aquatic health.

Fifty sites were sampled under the aquatic health monitoring program in 2010. Not all the sites that were sampled in 2010 could be used in the Yukon River Basin RCA model, as some of these sites were sampled to support the development of models and authorizations for the Liard and Alsek River watersheds. Two of the sites were sampled as potential reference sites, and 13 were test sites. The new reference sites were chosen to improve the distribution of reference sites across the Yukon. The reference sites sampled in 2010 have been incorporated into an improved Yukon River Basin RCA model that will be applied to test sites sampled in 2011.

Of the test sites sampled in 2010, nine were new and four were re-assessments of sites that were sampled in previous years. The following table summarizes the test site results. Only results that differ from the mean of the group by at least one standard deviation have been considered in the analysis. More detailed information is found in the individual test site assessments, which are appended to this report.

REFERENCE CONDITION APPROACH (RCA) RESULTS FOR TEST SITES

Site Code (year of sampling)	Group (probability of belonging to group)	Watershed	Watercourse	RCA Model Results for Benthic macroinvertebrates	Reason for Benthic macroinvertebrate Results
YPS-078.1 (2006)	Group 2 (44.1%)	Klondike River	Hunker Creek	stressed	One family of aquatic invertebrates with a 67% probability of occurrence was found in numbers that greatly exceed the mean of the Group 2 reference sites.
YPS-078.2 (2008)	Group 2 (41.4%)	Klondike River	Hunker Creek	potentially stressed	One with a 99% probability of occurrence was found in numbers that exceed the mean of Group 2 reference sites, and one family with a 68% probability of occurrence was less abundant than the mean.
YPS-078.3 (2010)	Group 1 (63.0%)	Klondike River	Hunker Creek	stressed	Six families with a high probability of occurrence were found in numbers that exceed the mean of Group 1 reference sites.
YPS-081.1 (2006)	Group 2 (42.7%)	Klondike River	Bonanza Creek	potentially stressed	Two families with a high probability of occurrence were found in numbers that exceed the mean of Group 2 reference sites.
YPS-081.2 (2008)	Group 2 (41.2%)	Klondike River	Bonanza Creek	stressed	One family with a 99% probability of occurrence was found in numbers below the mean of Group 2 reference sites, and one family with a 63% probability of occurrence was more abundant than the mean.
YPS-081.3 (2010)	Group 1 (63.7%)	Klondike River	Bonanza Creek at Highway	stressed	Four families with a high probability of occurrence were found in numbers that exceed the mean of Group 1 reference sites, and two families with a probability over 50% were absent.
YPS-084		Klondike River	Bonanza Creek	stressed	Sampled in 2006 using the first model developed. The model has been revised a couple of times since 2006.
YPS-084.2 (2010)	Group 1 (62.1%)	Klondike River	Bonanza Creek	severely stressed	Nine families were significantly more abundant then expected, two of which were sensitive to disturbance, and on family with a probability over 50% was absent.

Site Code (year of sampling)	Group (probability of belonging to group)	Watershed	Watercourse	RCA Model Results for Benthic macroinvertebrates	Reason for Benthic macroinvertebrate Results
YPS-153 (2006)	Group 3 (43.3%)	Yukon River North	Henderson Creek	potentially stressed	There were two taxa with greater than 50% probability of occurrence which were absent, including *Chironomidae* which has a 96% probability of occurrence. Relative abundance was higher than the group means for three taxa. There was one taxa present that does not occur in the group.
YPS-153.2 (2009)	Group 3 (43.3%)	Yukon River North	Henderson Creek	unstressed	The total number of families and families with a high probability of occurrence were observed in numbers that fall within the mean of Group 3 reference sites.
YPS-153.3 (2010)	Group 3 (45.5%)	Yukon River North	Henderson Creek	unstressed	The total number of families The total number of families and families with a high probability of occurrence were observed in numbers that fall within the mean of Group 3 reference sites.
YPS-426	Group 4 (87.1%)	Stewart River	Valley Creek	stressed	Three families with a low probability of occurrence were found in numbers below the mean of Group 4 reference sites, one family present was not expected and three families with a 50% probability of occurrence were not found.
YPS-427	Group 4 (63.2%)	Stewart River	Rosebud Creek	Potentially stressed	Three families with a low probability of occurrence were found in numbers below the mean of Group 4 reference sites, one family present was not expected and two families with a 50% probability of occurrence were absent.
YPS-428	Group 4 (84.8%)	Stewart River	Black Hills Creek (mouth)	severely stressed	Two families with a low probability of occurrence were found in numbers below the mean of Group 4 reference sites and seven families with a 50% probability of occurrence were absent.
YPS-429	Group 4 (58.8%)	Stewart River	Black Hills Creek (Dome Creek Confluence)	potentially stressed	Six families with a relatively low probability of occurrence were found in numbers below the mean of Group 4 reference sites.

Site Code (year of sampling)	Group (probability of belonging to group)	Watershed	Watercourse	RCA Model Results for Benthic macroinvertebrates	Reason for Benthic macroinvertebrate Results
YPS-430	Group 4 (61.1%)	Stewart River	Maisy May Creek	potentially stressed	Six families with a relative low probability of occurrence were found in numbers below the mean of Group 4 reference sites, and two unexpected families were present.
YPS-431 Change with 75%	Group 4 (70.4%)	Stewart River	Scroggie Creek	potentially stressed	Five families were less abundant than expected. Two families with a probability of occurrence of 50% or greater were absent, one of which is sensitive to disturbance.
YPS-432	Group 4 (95.0%)	Stewart River	Barker Creek	Severely stressed	Five families with a low probability of occurrence were found in numbers below the mean of Group 4 reference sites and four families with 50% probability of occurrence were absent.
YPS-433 Changed with 75%	Group 4 (89.6%)	Stewart River	Brewer Creek	potentially stressed	Five families were less abundant than expected. One of these families is sensitive to disturbance. Four families with a probability of occurrence of 50% or greater were absent.
YPS-435	Group 3 (41.1%)	Stewart River	Clear Creek	potentially stressed	A significant number of families with a high probability of occurrence were found in numbers that exceed the mean of Group 3 reference sites, and two families with a probability over 50% were absent.

Note: YPS-078.3, YPS-081.3, YPS-84.2 were re-assessments of sites sampled in 2006 and YPS-153.3 was a re-assessment of a site sampled in 2006 and 2009.