YUKON
PLACER
SECRETARIAT

Fish Habitat Management System for Yukon Placer Mining

Aquatic Health Monitoring Report (2011)

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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 224 reference sites collected over the period 2004 to 2009 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 50 sites in Group 1, 56 sites in Group 2, 22 sites in Group 3, 83 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.

Fifty-four sites were sampled under the aquatic health monitoring program in 2011. Not all the sites that were sampled in 2011 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. In the Yukon River Basin fourteen of the sites were sampled as potential reference sites, and 20 were test sites. The new reference sites were chosen to improve the distribution of reference sites across the Yukon. The reference sites sampled in 2011will be incorporated into an improved Yukon River Basin RCA model that will be applied to test sites sampled in 2012.

 Of the test sites sampled in 2011, seventeen were new and three 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-429 (2010)	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.
YPS-429.2	Group 4 (54.8%)	Stewart River	Black Hills Creek (Upper)	Stressed	Total abundance is well below group 4 mean. Four families predicted with high probability (>70%) were present, but well below the mean of Group 4 reference sites. One of these families is sensitive to disturbance, Three families with a probability over 50% are absent.
YPS-430 (2010)	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-430.2	Group 4 (60.3%)	Stewart River	Maisy May Creek	Unstressed	
YPS-432 (2010)	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-432.2	Group 4 (95.0%)	Stewart River	Barker Creek	Potentially Stressed	Total abundance is well below group 4 mean. Five families predicted with high probability (>70%) were present, but well below the mean of Group 4 reference sites. One of these families is sensitive to disturbance, Four families with a probability over 50% are absent.
YPS-476	Group 4 (60.7%)	Klondike River	Goring Creek	Unstressed	
YPS-477	Group 4 (87.6%)	Klondike River	Too Much Gold Creek	Unstressed	
YPS-478	Group 4 (53.3%)	Klondike River	Last Chance Creek	Potentially Stressed	Total abundance is well below group 4 mean, and number of families is also below group 4 mean. Three families predicted with high probability (>70%) were present, but well below the mean of Group 4 reference sites. One of these families is sensitive to disturbance, Four families with a probability over 50% are absent.
YPS-479	Group 4 (41.7%) Group 1 (38.8%)	Klondike River	French Gulch	Unstressed	Group 4 assignment is weak, with nearly equal probability of assignment to Group 1. When assessed as Group 1 the result was "Stressed".

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-483	Group 4 (33.3%) Group 3 (31.8%)	Indian River	Sulphur Creek	Potentially Stressed	Group 4 assignment is weak, with nearly equal probability of assignment to Group 3. When assessed as Group 3 the result was "Unstressed". Total abundance is well below group 4 mean. Three families predicted with high probability (>70%) were present, but well below the mean of Group 4 reference sites. One family sensitive to disturbance predicted at 64% is well below group 4 mean. One family that would not have been present if the site was in reference condition was found.
YPS-484	Group 4 (68.4%)	Indian River	Gold Run Creek	Stressed	Abundance and number of families are well below group 4 means. One family predicted with high probability (>70%) was present, but well below the mean of Group 4 reference sites. Three families predicted with high probability (>70%) were absent. One of these families is sensitive to disturbance, Three families with a probability over 50% are absent.
YPS-490	Group 4 (98.1%)	Mayo River	Highet Creek	Unstressed	
YPS-491	Group 4 (96.3%)	Mayo River	Bennett Creek	Unstressed	
YPS-492	Group 4 (91.7%)	Mayo River	Minto Creek	Potentially Stressed	Abundance and number of families are well above group 4 means. One family predicted with high probability (>70%) was present, but well above the mean of Group 4 reference sites. Two families predicted with high probability (>70%) was present, but well below the mean of Group 4 reference sites. One family with a probability over 50% was absent. Five families with probability <5% were present, and one family with a probability of 7% was present in very high abundance compared to the group 4 mean.
YPS-493	Group 4 (97.3%)	Mayo River	Roaring Fork Creek	Unstressed	
YPS-495	Group 3 (46.0%)	McQuesten River	Bear Creek	Potentially Stressed	Abundance and number of families are well above group 3 means. One family predicted with high probability (>70%) was present, but well above the mean of Group 3 reference sites. Three families predicted with probability (>50%) were present, but well above the mean of Group 3 reference sites. Four families with probability <5% were present.
YPS-496	Group 4 (97.8%)	McQuesten River	Johnson Creek	Unstressed	
YPS-504	Group 5 (42.6%)	White River	Squirrel Creek	Severely Stressed	Total abundance is well below group 5 means. Four families predicted with high probability (>70%) were present, but well below the mean of Group 5 reference sites. One of these families is sensitive to disturbance. One family predicted with high probability (>70%) was absent. Two families predicted with probability (>50%) were present, but well below the mean of Group 5 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-505	Group 5 (43.9%)	White River	Unnamed tributary to Duke River	Severely Stressed	Total abundance is well below group 5 means. Five families predicted with high probability (>70%) were present, but well below the mean of Group 5 reference sites. One of these families is sensitive to disturbance. Two families predicted with probability (>50%) were present, but well below the mean of Group 5 reference sites. One of these families is sensitive to disturbance. One family that would not have been present if the site was in reference condition was found.
YPS-506	Group 4 (52.1%)	White River	Burwash Creek	Severely Stressed	Total abundance is well below group 4 means. Three families predicted with high probability (>70%) were present, but well below the mean of Group 4 reference sites. One of these families is sensitive to disturbance. Two families predicted with high probability (>70%) were absent. One family predicted with probability (>50%) was present, but well below the mean of Group 4 reference sites.
YPS-507	Group 5 (33.7%) Group 4 (26.9%)	White River	Wade Creek	Severely Stressed	Group 5 assignment is weak, with reasonable probability of assignment to Group 4. When assessed as Group 4 the result was "Potentially Stressed". Total abundance is well below group 5 means. Five families predicted with high probability (>70%) were present, but well below the mean of Group 5 reference sites. One of these families is sensitive to disturbance. Two families that would not have been present if the site was in reference condition was found.
YPS-508	Group 5 (51.1%)	White River	Quill Creek	Severely Stressed	Total abundance is well below group 5 means. Five families predicted with high probability (>70%) were present, but well below the mean of Group 5 reference sites. One of these families is sensitive to disturbance. One family predicted with probability (>50%) was absent. One family predicted with probability (>50%) was present, but well below the mean of Group 4 reference sites. One family that would not have been present if the site was in reference condition was found., while two other families with probability <5% were present.

Note: YPS-429, YPS-430, YPS- 432 were re-assessments of sites sampled in 2010.