



Fish Habitat Management System for Yukon Placer Mining

Aquatic Health Report (2014)

Prepared by

The Yukon Placer Secretariat

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Introduction

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.

An RCA model was first adopted for assessing watershed health under the FHMS for Yukon placer mining in 2007. In January 2008, this model was re-calibrated incorporating data collected in 2007. Further development of the model was undertaken in 2010 using new data collected in 2008 and 2009. In 2013, site data collected in 2010-2012 was incorporated into the model and additional data collected in 2007 and 2008 resulted in the expansion of the geographic range of the model. Current analyses and this report rely on a recalibrated 2013 Yukon model developed from a suite of 286 Reference Sites gathered from across the Yukon Territory by Fisheries and Oceans Canada, the Yukon Government and the University of Western Ontario from 2006 to 2012

https://www.researchgate.net/publication/281067514_Revision_of_the_Yukon_CABIN_Invertebrate_Bioassessment_Model_using_2004-12_Reference_Site_Data.

Please note that subsequent to the issuance of the first Draft 2014 Aquatic Health Monitoring Report fixes were made to the model used to produce the site assessment results. As such, the final site assessment reports published here may differ from the draft site assessment results originally distributed.

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 1, 98 sites in Group 2, 44 sites in Group 3, 108 sites in Group 4, and 13 sites in Group 5.

The following is a summary of the general characteristics of each Reference Group:

Group 1. Sites have very low abundance and richness, with a community dominated by Chironomids (34%) which represent over a third of the community with Lumbriculidae and Naidid as the other main characteristic families (4%). However this is a quite variable community. These sites tend to be the lowest altitude and have larger drainage basins. The channels are deeper, velocity slower and have the finest substrate.

Group 2. Also has low abundance but higher taxonomic richness, this is again a community where Chironomids are dominant (39.7%) but Baetid and Heptaegiid mayflies also have high relative abundance (20%). Six families representing the Diptera, Ephemeroptera and Plecoptera characterise this community type. These are streams in the eastern Yukon but tend to be intermediate with regard to their habitat characteristics.

Group 3. These sites have reasonable abundance and have the highest family richness (> 15 families per site). The dominant families are mayflies (Heptageniidae) and stoneflies (Nemouridae) which together

comprise almost 50% of the community, Chironomids are less abundant (15%) but occur at all sites. The same six families as Community 2 characterise this assemblage. These are higher altitude sites in the eastern portion of the study area and with smaller drainage areas, with the highest spring precipitation and also warmer spring temperatures and the largest substrate.

Group 4. This is a more abundant community with 10 times more organisms per sample than communities 1 and 2. The community also has the high taxonomic richness. Chironomids are again the most common family (44%), however the Baetidae are also common (11% relative abundance) and found at more than 80% of the sites. This is the most frequently occurring assemblage (38% of Reference Sites) and also the most variable in terms of habitat attributes.

Group 5. This is a small community representing less than 5% of the Reference Sites. This community has the greatest number of organisms and is again dominated by Chironomids (56%) but Baetid mayflies (22%) are also abundant. These are shallow streams with high stream velocity. They also have the coolest spring and summer temperatures and the least amount of spring precipitation. These sites are located in the northern part of the study area.

Forty sites were sampled under the aquatic health monitoring program in 2013. All sites were in the Yukon River Basin; two of the sites were sampled as potential reference sites, seven were sampled as repeat reference sites, 31 were test sites (the results of reference site revisits are not presented here). Of the test sites sampled in 2013, eight were new and 23 were re-assessments of sites that were sampled in previous years. Our increased focus on revisiting test sites is beginning to allow investigations of temporal trends in site results.

Forty sites were sampled under the aquatic health monitoring program in 2014. All sites were in the Yukon River Basin; 34 were sampled as test sites and 5 were sampled as repeat reference sites and 1 was sampled as a potential reference site (the results of reference site revisits are not presented here). Of the test sites sampled in 2014, 1 was new and 33 were re-assessments of sites that were sampled in previous years. Our increased focus on revisiting test sites is beginning to allow investigations of temporal trends in site assessment results.

The following table summarizes the 2014 test site results.

More detailed information is found in the individual test site assessment reports, which are appended to this report.

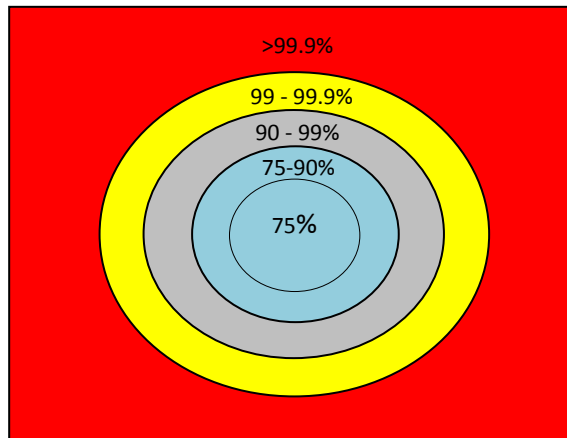
Table 1. 2014 Aquatic Health Monitoring results collected under the Yukon Placer Secretariat's Aquatic Health Monitoring Protocol.

Site Code	Group	Group Probability (%)	Watershed	Watercourse	Site Assessment Result	Discussion
YPS-090	2	40.4	Indian River	Indian River	Mildly Divergent from Reference Condition	Richness much lower than expected.
YPS-094	4	45.7	Indian River	Indian River	Mildly Divergent from Reference Condition	Total abundance is low. Richness is very high. Two expected families were absent, one of them characteristic
YPS-105	4	41.6	Klondike River	Allgold Creek	Similar to Reference	
YPS-107	4	46.7	Klondike River	Eldorado Creek	Mildly Divergent from Reference Condition	Total abundance is low. One characteristic family (Simuliidae) had only one individual.
YPS-152	1	43.8	Yukon River North	Frisco Creek	Mildly Divergent from Reference Condition	Two characteristic families were absent (Naididae and Lumbriculidae).
YPS-153	4	42.4	Yukon River North	Henderson Creek	Highly Divergent from Reference Condition	Total abundance was very low. Three expected families were absent (Nemouridae, Heptageniidae, and Sperchontidae). Two Characteristic families were missing (Nemouridae and Heptageniidae).
YPS-164	1	39.0	Yukon River South	Thistle Creek	Mildly Divergent from Reference Condition	Higher than expected richness. Two characteristic families (Naididae and Lumbriculidae) were absent.
YPS-316	4	48.8	White River	Nansen Creek	Similar to Reference	
YPS-317	4	42.7	White River	Victoria Creek	Mildly Divergent from Reference Condition	Higher than expected richness. Two families expected to occur were absent (Tipulidae and Simuliidae). One family characteristic of the group was absent (Simuliidae).
YPS-323	5	41.9	White River	Klaza Creek	Mildly Divergent from Reference Condition	Total abundance was low. Three families expected to occur were absent. One family characteristic of the group was absent (Simuliidae).
YPS-325	3	58.4	Big Salmon River	Livingstone Creek	Similar to Reference	
YPS-326	3	61.2	Big Salmon River	Marten Creek	Similar to Reference	

Site Code	Group	Group Probability (%)	Watershed	Watercourse	Site Assessment Result	Discussion
YPS-350	2	45.4	Klondike River	Leotta Creek	Similar to Reference	
YPS-372	3	50.8	Big Salmon River	Cottoneva Creek	Similar to Reference	
YPS-373	3	64.0	Big Salmon River	South Big Salmon River	Similar to Reference	
YPS-375	2	42.7	Fortymile River	Maiden Creek	Similar to Reference	
YPS-378	2	39.6	Fortymile River	Marten Creek	Divergent from Reference Condition	Total abundance was low. Six families expected to occur were absent. Four families characteristic of the group were absent (Heptageniida, Nemouridae, Chloroperlidae and Baetidae).
YPS-379	2	33.6	Fortymile River	Bruin Creek	Mildly Divergent from Reference Condition	Of the six families characteristic of the group to which this site was predicted, two (Nemouridae and Spermantidae) were absent.
YPS-411	4	48.1	Big Creek	Mechanic Creek	Mildly Divergent from Reference Condition	Total abundance was low for characteristic families, particularly Baetidae and Nemouridae. Three families expected to occur were absent.
YPS-412	4	38.5	Big Creek	Big Creek	Highly Divergent from Reference Condition	Total abundance was very low for all families present. Three families expected to occur were absent.
YPS-413	4	51.2	Big Creek	No Name Creek	Mildly Divergent from Reference Condition	Total abundance is below average. Total number of families was much higher than expected.
YPS-414	4	48.3	Big Creek	Seymour Creek	Mildly Divergent from Reference Condition	Total abundance was low particularly for characteristic families Chironomidae, Nemouridae and Simuliidae. Two families expected to occur were absent.
YPS-427	4	54.3	Stewart River	Rosebud Creek	Mildly Divergent from Reference Condition	Total abundance was low, particularly across characteristic families. Richness was much higher than expected.
YPS-428	2	37.5	Stewart River	Black Hills Creek	Similar to Reference	
YPS-430	1	35.8	Stewart River	Maisy May Creek	Similar to Reference	

Site Code	Group	Group Probability (%)	Watershed	Watercourse	Site Assessment Result	Discussion
YPS-431	4	35.6	Stewart River	Scroggie Creek	Mildly Divergent from Reference Condition	Total abundance is low. Three expected families were missing, including one characteristic of the group.
YPS-433	4	36.0	Stewart River	Brewer Creek	Divergent from Reference Condition	Total abundance was low, particularly for characteristic families. One characteristic family was missing.
YPS-435	2	33.2	Stewart River	Clear Creek	Similar to Reference	
YPS-481	4	46.5	Indian River	Australia Creek	Similar to Reference	
YPS-534	4	47.7	Yukon River South	Kirkman Creek	Similar to Reference	
YPS-535	1	63.5	Yukon River South	Thistle Creek	Mildly Divergent from Reference Condition	Abundance and richness are above average. One family expected to occur was absent. Two families characteristic of the group were absent (Naididae and Lumbriculidae).
YPS-544	2	43.0	Klondike River	Hunker Creek	Divergent from Reference Condition	Total abundance and richness are low. 6 families expected to occur were absent and 5 characteristic families were missing.
YPS-547	2	42.5	Indian River	Dominion Creek	Similar to Reference	
YPS-570	4	41.2	Yukon River South	Ballarat Creek	Mildly Divergent from Reference Condition	Total abundance was low for all characteristic families.

Probability bands and legend for the test sites results
(as determined from site assessment graphs - see detailed site assessments)



Highly Divergent from Reference Condition = outside 99.9% probability band

Divergent from Reference Condition = between 99% and 99.9% probability band

Mildly Divergent from Reference Condition = between 90% and 99% probability band

Similar to Reference Condition = inside the 90% & 75% probability band