

Water Quality Objective Monitoring, Indian River Watershed, 2010

Hydrologic and Geomorphic Characteristics of the Indian River Drainage Basin

The Indian River, a major tributary to the Yukon River, drains an area of approximately 2220 square kilometers and has an overall channel length of approximately 120 km. The drainage basin is located 60 km south of Dawson.

Indian River, a gravel bed stream, lies within the Klondike Plateau, a gently sloping upland south of Tintina Trench consisting of accordant summits (e.g., King Solomon Dome, Australia Mountain). The present flood plain descends about 53 m over a distance of 33 km with an overall gradient of about 1.6 m/km between the confluences of Dominion Creek and Ruby Creek.

The Water Survey of Canada (WSC) gauging station (09EB003) is located 1.5 km from the confluence of the Indian River with the Yukon River.

Topographical drainage Basin	2220 Sq. Kilometers
Area of Lakes	0%
Area of Forest	85%
Channel Length	120 Kilometers
Terrain	non-glaciated

In 2010, water samples were collected at 13 different sites in the Indian River basin. Sampling commenced on June 17th, 2010 and a total of 226 samples were collected up until the end of the season on September 28th, 2010. A combination of automatic composite sampling and grab sampling methods were used in the basin.

Atmospheric data was collected using three portable weather stations; one located near the mouth of the Indian River, the second downstream of Quartz Creek on the Indian River and the last at a background site on the Indian River.

Blitz sampling events took place in the Indian River basin on June 24th, August 4th and August 31st, 2010. Samples were taken every two kilometres along the main stem of the Indian River as well as on Sulphur Creek, Dominion Creek and Australia Creek, which form the headwaters of the Indian River.

Basin total flow data was provided by the Water Survey of Canada station located near the mouth of the Indian River. Flow data for the individual tributaries to the Indian River was collected at the time of using the methodology outlined in the Yukon Placer Secretariat's Water Quality Monitoring Protocol.

Site Codes and Global Position of Water Quality Sampling Locations in the Indian River Watershed

Site Code	Alias	Location	Latitude	Longitude
IN01	IND 01	Indian River near mouth	63.777940	-139.709270
IN02	IND 02	Indian River upstream of Nine Mile Creek and downstream of Ophir Creek	63.773370	-139.348880
IN03	IND 03	Indian River downstream of Ruby Creek	63.768520	-139.315890
IN04	IND 04	Indian River downstream of Quartz Creek	63.747620	-139.161730
IN05	IND 05	Indian River downstream of Gimlex bridge	63.737354	-139.074389
IN06	IND 06	Indian River downstream of Montana Creek	63.696830	-138.965500
IN07	IND 07	Indian River downstream of Eureka Creek	63.693850	-138.931630
IN08	IND 08	Indian River at bridge over to Eureka Creek	63.612540	-138.715710
IN_AU01	IND AUS 01	Australia Creek mouth	63.623270	-138.694340
IN_DO01	IND DOM 01	Dominion Creek mouth and upstream of confluence with Sulphur Creek	63.623630	-138.693770
IN_DO_GO01	IND DOM 02	Gold Run Creek mouth	63.691515	-138.597240
IN_DO_GR01	IND DOM 03	Grant Pup Creek mouth	63.704450	-138.577702
IN_DO2	IND DOM 04	Dominion Creek upstream of Gold Run Creek and downstream of Burnham Creek	63.716858	-138.545231
IN_DO_BU01	IND DOM 05	Burnham Creek mouth	63.728813	-138.529141
IN_DO03	IND DOM 06	Dominion Creek upstream of Burnham Creek and downstream of Arkansas Creek	63.733491	-138.524963
IN_DO_AR01	IND DOM 07	Arkansas Creek mouth	63.744987	-138.514673
IN_DO_KE01	IND DOM 08	Kentucky Creek mouth	63.759397	-138.513487
IN_DO_JE01	IND DOM 09	Jensen Creek mouth	63.771492	-138.534945
IN_DO_NE01	IND DOM 10	Nevada Creek mouth	63.804718	-138.606575
IN_DO_CHAM01	IND DOM 11	Champion Pup Creek mouth	63.827433	-138.683608
IN_DO_CHAP01	IND DOM 12	Chapman Pup Creek mouth	63.830909	-138.694871
IN_DO_EI01	IND DOM 13	Eight below Pup Creek mouth	63.833499	-138.713244
IN_DO_TR01	IND DOM 14	Troublesome Pup Creek mouth	63.835000	-138.749908
IN_DO_AL01	IND DOM 15	Almeda Pup Creek mouth	63.839048	-138.784138
IN_DO_CA01	IND DOM 16	Caribou Creek mouth	63.842940	-138.800540
IN_DO_MU01	IND DOM 17	Mummie Pup Creek mouth	63.857055	-138.853518
IN_DO_LO01	IND DOM 18	Lombard Pup Creek mouth	63.856770	-138.853470
IN_DO04	IND DOM 19	Dominion Creek background	63.852570	-138.896580
IN_EU01	IND EUR 01	Eureka Creek below all mining	63.604833	-138.830993
IN_MO01	IND MON 01	Montana Creek mouth	63.697020	-138.977510
IN_NI01	IND NIN 01	Nine Mile Creek mouth	63.795330	-139.409880
IN_QU01	IND QUA 01	Quartz Creek mouth	63.742620	-139.140030
IN_QU02	IND QUA 02	Quartz Creek at dredge	63.753330	-139.124450
IN_RU01	IND RUB 01	Ruby Creek mouth	63.762500	-139.245833
IN_SU01	IND SUL 01	Sulphur Creek mouth upstream of confluence with Dominion Creek	63.624270	-138.695450
IN_SU02	IND SUL 02	Sulphur Creek upstream of large culverts	63.656320	-138.676130
IN_SU03	IND SUL 03	Sulphur Creek at Brimstone Gulch	63.740235	-138.848909
IN_SU04	IND SUL 04	Sulphur Creek background	63.819990	-138.934230

Water Quality Objective monitoring, Indian River Watershed – Summary

This basin has been extensively monitored for the past 7 years by many different organisations providing us with an immense amount of information regarding the state of the water quality in a historically mined watershed. The Indian River basin is a heavily diverse watershed, with vast areas of active mining as well as inactive, reclaimed and partially reclaimed, sections. Placer activities in this watershed have remained consistent over the last decade. Due to the great interest in the area, and recent changes in mining locations and levels of activity, the Indian River Watershed was designated an important watershed for monitoring in 2010. This meant that a major proportion of the monitoring effort was spent in the basin, and that the monitoring schedule included many repeat visits throughout the season.

Two automatic water sampling station and two weather stations were set up and maintained from June 17th, 2010 until shutdown on September 28th, 2010. From the data obtained by these instruments and through on-site visits and sampling conducted by employees of the Department of Energy, Mines and Resource's Client Services and Inspections Branch, the following observations regarding the water quality in the basin can be made:

The overall water quality in the basin, met the minimum objectives set under the *Fish Habitat Management System* throughout the monitoring season. On average, the Total Suspended Solids concentrations, from water samples collected at water quality monitoring sites were below 100 mg/L TSS all season however higher than last years seasonal average of <25 mg/L.

Low stream flows resulting in less suspension / resuspension of sediment in the water combined with average seasonal rainfall led to a slight increase in the amount of additional sediment entering the watercourse through runoff. This in conjunction with already reduced effluent discharge volumes and effluent sediment concentrations improved the overall water quality in the Indian River watershed for 2010.

**The Fish Habitat Management System - Indian River Watershed (Category B)
Sample Results that Exceed Water Quality Objectives for 2010**

Sampling Station	IN01	IN02	IN04	IN08
Location Description	Mouth	u/s IN_NI01	d/s IN_QU01	Background
Sample Type	Auto/Grab	Grab	Grab	Auto/Grab
Lat Y	63.77819	63.78168	63.74484	63.61254
Long X	-139.70947	139.38811	-139.18355	-138.71571
Habitat Classification	Moderate-M	Low	Low	Low
Water Quality Objective (mg/L)	100	300	300	300
Date of Sampling				
25-Jun-10	118.4			118.0
29-Jun-10	242.1			227.3
30-Jun-10	279.8			187.0
1-Jul-10	100.7			90.0
17-Jul-10	126.4			11.0
19-Jul-10	147.7			5.5
23-Jul-10	501.7			109.0
24-Jul-10	412.3			51.8
25-Jul-10	261.3			24.8
26-Jul-10	145.0			16.3
1-Aug-10	150.3			8.3
6-Aug-10	188.0			41.7
7-Aug-10	433.0			49.7
19-Aug-10	100.0			111.2
20-Aug-10	297.6			79.8
21-Aug-10	134.2			40.2
3-Sep-10	112.0			144.6
4-Sep-10	146.3			71.0
5-Sep-10	195.3			35.2
19-Sep-10	106.3			9.8
Total Seasonal Average TSS (mg/L) by site	75.3	57.3	83.8	35.3
Number of days sampled	93	2	2	91

Legend Not continuously monitored
Water Samples that are: Above / Below the Water Quality Objective