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2010 Jordan Creek Water Quality Report

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Executive Summary

Jordan Creek, located on the eastern side of Juneau's Mendenhall Valley basin, was listed on the State of Alaska Section 303(d) list of impaired waters in 1998 due to sediment, low dissolved oxygen, and debris. The Juneau Watershed Partnership (JWP) began monitoring water quality on Jordan Creek in 2003 with the goal of maintaining and continuing a long-term data record and assessing stream water quality gains as storm water treatment, culvert replacement, riparian restoration and other stream enhancement projects are completed.

Jordan Creek water quality generally meets state standards, though periods of no flow occasionally yield high water temperatures with low dissolved oxygen, and high storm water runoff or snowmelt will result in high turbidity and suspended sediment values. Groundwater inputs at the Amalga Drive sample site appear naturally low in dissolved oxygen and pH. In 2010, five (5) monitoring results were out of range for state limits for dissolved oxygen, pH, and turbidity (see results and discussion below). Residues (in-stream trash) remain ever-present in both residential and urban reaches. Discharge was measured at a range of stages concurrently with sampling at the Super 8 Motel / Egan Drive (JC-B) sample site for the 2010 period of record. Overall, the 2010 water quality dataset values were similar to long-term 2003-present monitoring results.

Limited additional 2010 monitoring was guided to identify areas of Jordan Creek with highest potential for water quality and habitat improvement. Future JWP Water quality monitoring coupled with ongoing, USFWS-funded storm water outfall mapping will identify locations where improved storm water treatment could significantly contribute to improved water quality and overall stream health. This report will be published in the Fall of 2011.

Project Description and Purpose

In 2010, the Juneau Watershed Partnership (JWP) continued monitoring Jordan Creek water quality throughout the spring and summer seasons, bringing the period of record to six years total. The JWP long-term monitoring program aims to characterize water quality of Jordan Creek, compare water quality to Alaska state standards, and evaluate the effects of urbanization, restoration, and conservation projects on in-stream sediment concentrations. Urbanization and development continue to impact the stream corridor of Jordan Creek, and low-flow periods (including periods of no-flow), increased sediment loads, and declines in fish presence persist. A suite of water quality parameters were monitored bi-monthly at three representative sites on Jordan Creek between March 2010 and August 2010 to document water quality and habitat conditions (detailed discussion below).

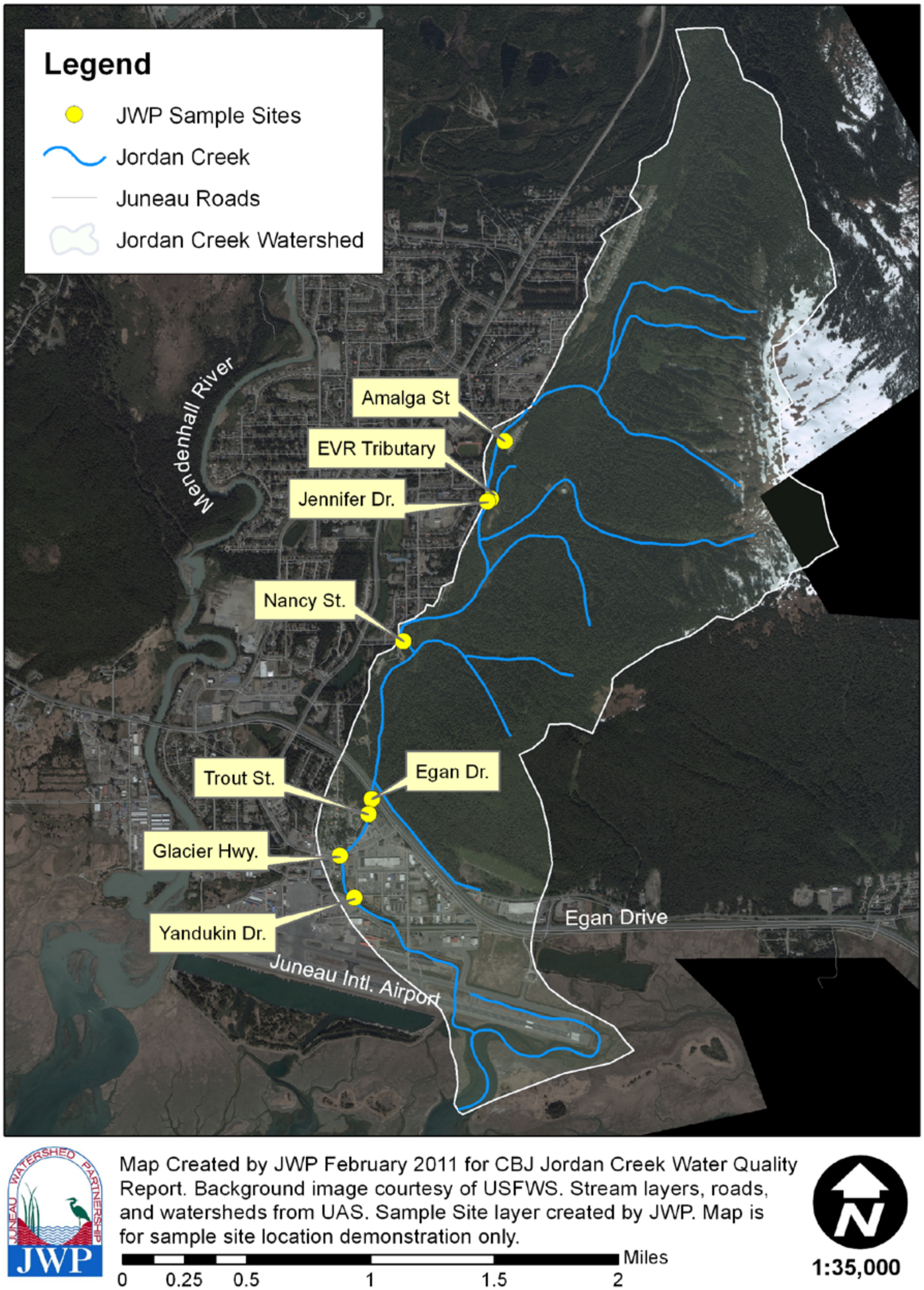
The specific goal of this project was:

- To document existing water quality conditions in Jordan Creek and compare current conditions to historic data.

With a secondary interest:

- To locate general areas of interest where Jordan Creek water quality is most impacted by storm water runoff.

This report covers only the primary goal of maintaining an ongoing water quality record at the three established long-term sample sites on Jordan Creek. An additional report will be published in Fall 2011 outlining the results of periodic storm water specific sampling on Jordan Creek.


Legend
JWP Sample Sites
Jordan Creek
Juneau Roads
Jordan Creek Watershed
Mendenhall River
Amalga St
EVR Tributary
Jennifer Dr.
Nancy St.
Trout St.
Egan Dr.
Glacier Hwy.
Yandukin Dr.
Egan Drive
Juneau Intl. Airport
JWP
Map Created by JWP February 2011 for CBJ Jordan Creek Water Quality Report. Background image courtesy of USFWS. Stream layers, roads, and watersheds from UAS. Sample Site layer created by JWP. Map is for sample site location demonstration only.
Miles
0 0.25 0.5 1 1.5 2
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1:35,000

Project Design and Methods

Adhering to protocols set in the ADEC-approved quality-assurance project plan (QAPP) for Jordan Creek, the following parameters of concern were monitored at three representative sample sites between March 2010 and August 2010: water temperature, specific conductance, pH, turbidity, dissolved oxygen (DO) and suspended sediment concentration (SSC). All parameters, with the exception of SSC, were monitored in-situ using a YSI 556 multi-probe and HACH 2100 portable turbidimeter. Sampling events included one 500 mL grab sample collected from each site, which was then transported to the UAS Bentwood Laboratory for suspended sediment concentration analysis.

Jordan Creek Sampling Sites: 2010

Site Name	Site Description	Lattitude	Longitude
JC-A	Jordan Ck at Amalga St	58.387289	-134.563367
	East Valley Reservoir Tributary	58.383572	-134.564383
	Jordan Ck at Jennifer Dr.	58.383283	-134.564617
	Jordan Ck at Nancy St.	58.375333	-134.574153
JC-B	Jordan Ck at Egan Drive	58.365950	-134.577803
	Jordan Ck at Trout St.	58.365131	-134.578269
	Jordan Ck at Glacier Hwy	58.363011	-134.580867
JC-C	Jordan Ck at Yandukin Dr.	58.360183	-134.579689

The following discussion includes only data gathered at the three traditional, primary sampling sites on Jordan Creek: Amalga St. (JC-A), Egan Dr. (JC-B, also known as "Super 8"), and Yandukin Dr. (JC-C). Samples collected at the supplemental sites were used for identifying storm water inputs; while data from these supplemental sites are currently available by request, they are not expressly discussed in this report, as they are still preliminary at this time as part of a larger study.

Data and Results

1) Water Quantity: Discharge

Stream discharge was measured at the Egan Drive sampling location (JC-B) with a standard pygmy meter and AquaCalc Pro for five sampling events to create a rudimentary rating curve. Staff gage readings were also simultaneously read from the staff gage at Trout Street for all sampling events. The range of measured flows was between 3.4 cubic feet per second, or cfs, (3/22 and 5/25/2010) and 12.6 cfs (4/20/2010). Discharge estimates for sample events where no discharge measurement was collected were created using a simple regression rating curve and the staff gage reading at Trout Street.

Date	Time	Stage (ft)	Discharge (cfs)
3/22/2010	17:46	1.30	3.40
3/23/2010	14:49	1.41	3.88
4/20/2010	14:56	2.10	12.67
5/5/2010	15:46	1.48	4.93
5/15/2010	15:41	1.62	6.27
5/25/2010	15:03	1.28	3.40
6/22/2010	11:33	0.50	0.00
6/23/2010	10:20	1.70	6.52
8/10/2010	11:50	1.39	3.92
8/23/2010	13:46	1.60	5.53

Historic USGS discharge data from decommissioned gage #15052475 demonstrate that Jordan Creek mean monthly discharge at Egan Drive varies from less than 1 cfs (August) to over 23 cfs (October). High flows are associated with spring snowmelt (April and May) and fall storms (September-October). Low flows occur during winter months (November-March) and in mid-summer (June-August).

During the 2010 period of record, some areas of Jordan Creek were dry or stagnant with low flow during the June 22nd field visits, including sites between Trout Street (just below JC-B) and Yandukin Drive (JC-C). Areas upstream of Egan Drive had flowing water during all sampling events.

2) **Water Quality**

   a. **Dissolved Oxygen.** Dissolved oxygen (D.O.) is a measure of oxygen content in water, expressed in units of milligrams per liter (mg/L). Introduced by aquatic plants and moving water, D.O. is essential to aquatic organism health. D.O. levels fluctuate throughout the day and with water temperature. Dissolved oxygen is consumed by microorganisms in the breakdown of organic wastes; low D.O. levels may indicate upstream inputs from wastewater, storm water runoff, or failing septic systems.

   The state water quality criteria for designated uses sets allowable levels of dissolved oxygen to be in the range of 7.0 to 17.0 mg/L. Only two sampling events yielded D.O. levels lower than 7.0 mg/L (3/22/2009 and 3/23/2009), which we attribute to frozen surface conditions upstream and storm water runoff generated by a rain-on-snow event on 3/23/2009. These spring sampling dates demonstrated no pattern to D.O. levels regarding location along the creek; summer sampling dates generally exhibited consistently higher D.O. values downstream of Amalga Drive. Amalga Dr. flows are primarily composed of groundwater-fed headwater flows, and thus likely to be lower in D.O. than downstream surface waters. The highest D.O. values were recorded in April and May, during peak cold-water discharges.

   It is apparent from previous years of sampling that D.O. plunges in winter months due to ice cover, low plant-oxygen contributions, and low flows; future D.O. sampling may focus on locating "overwintering" habitat and monitoring D.O. at those locations throughout winter to determine the most suitable overwintering habitats for safeguarding.

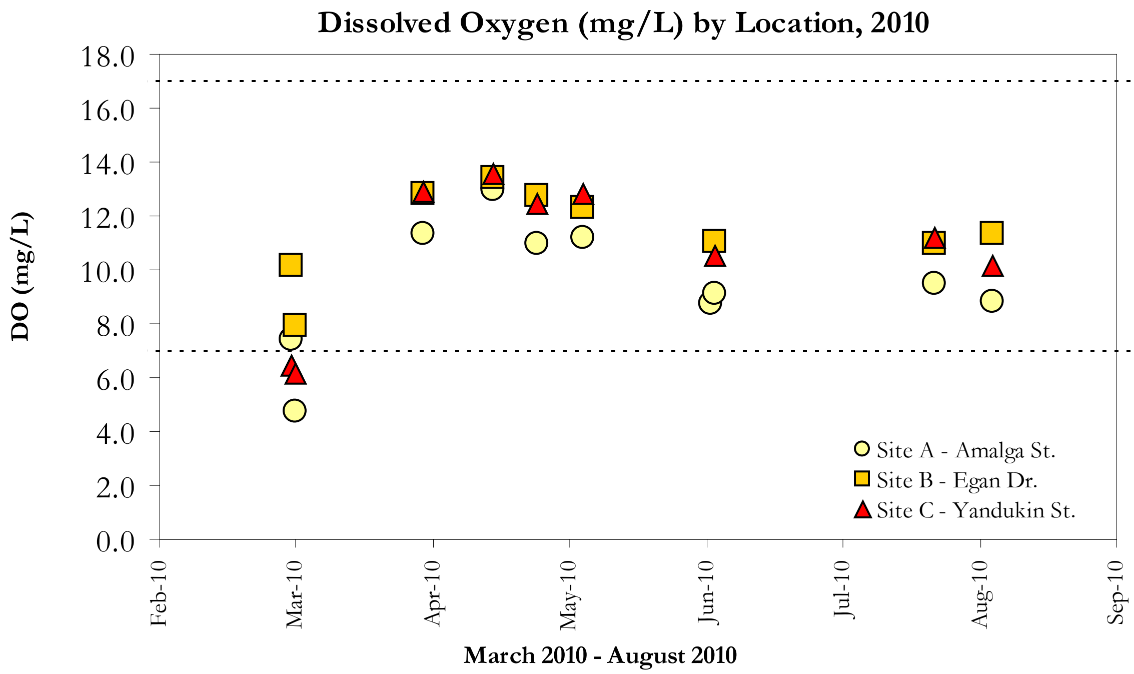


Figure 1: Dissolved Oxygen by location for the period of record. Note the dashed lines indicate minimum (7 mg/L) and maximum (17 mg/L) allowable levels according to state standards for aquaculture.

b. Conductivity. Conductivity is a measure of ionic content of a solution and is indicative of total dissolved inorganic solids in a water sample. This type of measurement is not ion-specific. Conductivity is monitored for background purposes; an unusually high measurement may indicate a failing septic system upstream, while an unusually low measurement may indicate an oil spill upstream. Water temperature is positively correlated to conductivity, i.e. higher water temperature results in higher conductivity.

The state has not outlined specific water quality objectives for conductivity. The apparent outlier, Yandukin Drive on March 23, 2010, cannot be tied expressly to storm water runoff, as this site can be tidally influenced. The sample was collected on a rising tide and salinity was recorded at 0.07 parts per trillion, indicating potential saltwater mixing. In general, Amalga St. conductivity was consistent throughout the sampling period, due to groundwater-fed stream flow and a lack of storm water runoff at that location. Yandukin and Egan Drive samples were typically similar in conductivity and were more closely linked to discharge than values found at

Amalga St.

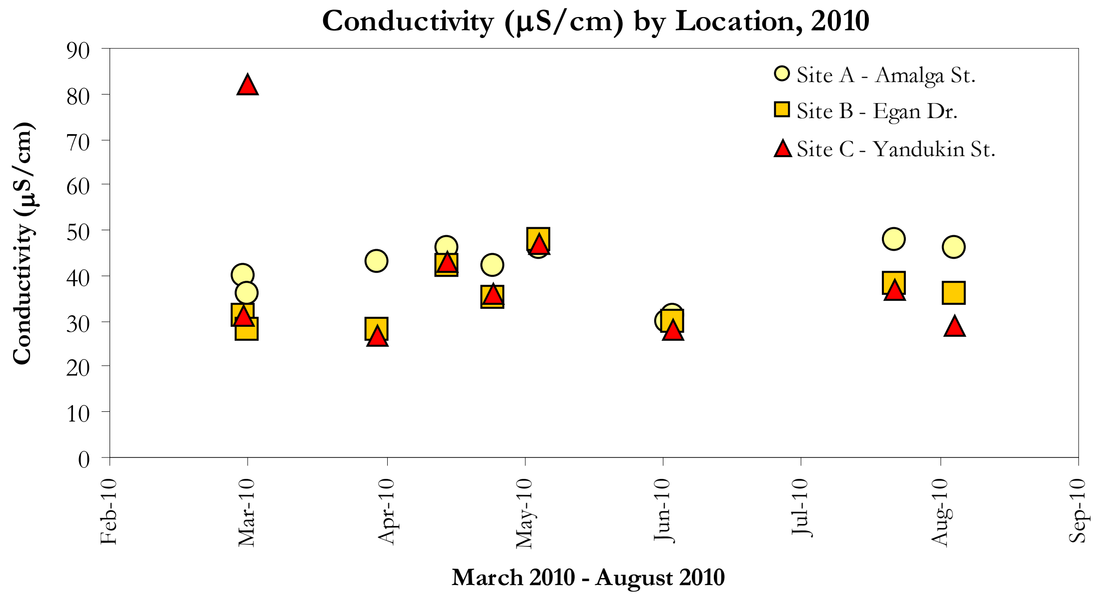


Figure 2: Conductivity by location for the period of record.

c. pH. pH is indicative of the alkalinity or acidity of a water sample, usually in the range of 6.5 to 8.5 (essentially unitless). Acidity increases as the pH gets lower. Low pH values (less than 6.5) may be indicative of sub-optimal fish habitat and/or conditions where toxic substances become available to fish and plants and harm aquatic species diversity.

The state water quality criteria for designated uses sets an allowable pH range of 6.5 to 8.5 for growth and propagation of fish and shellfish. For the 2010 period of record, only two event samples didn't meet minimums (Amalga St., 8/10 and 8/23/2010), and all samples were below the maximum allowable pH threshold. The Amalga St. samples were probably very low in pH due to groundwater-origin and low flow, and were likely the result of a natural phenomenon.

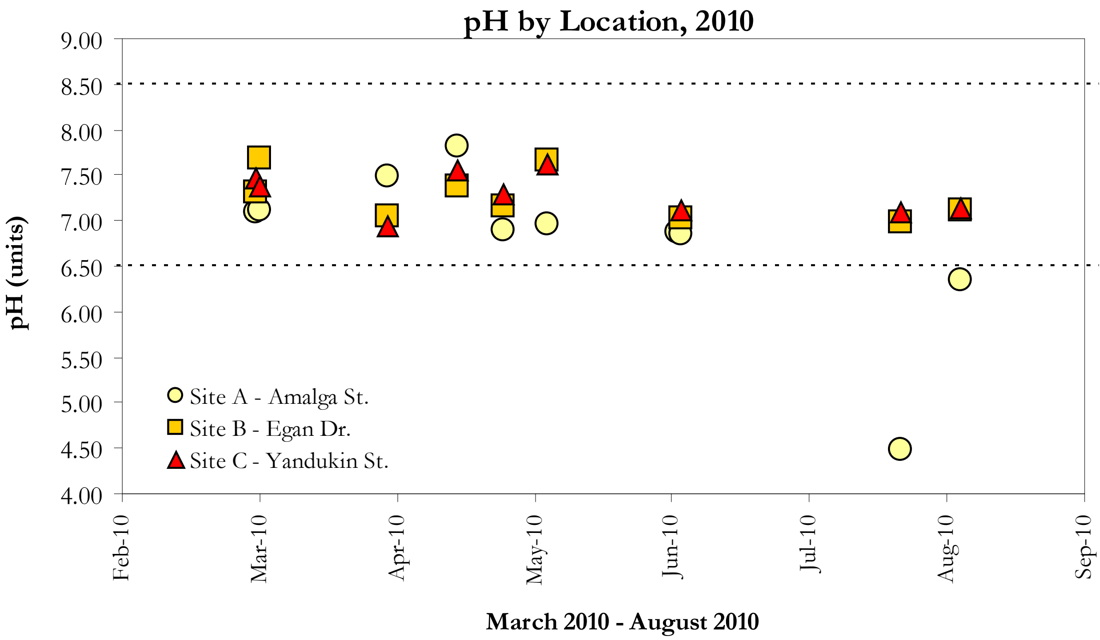


Figure 3: pH by location for the period of record. Note the dashed lines indicate acceptable state water quality minimum (6.5) and maximum (8.5) for the designated use of growth and propagation of fish, shellfish, other aquatic life, and wildlife.

d. **Turbidity.** Turbidity measurements (measured in NTU's, or nephelometric turbidity units) are indicative of the fraction of fines, both organic and inorganic, suspended in the water column and may closely parallel suspended solids data, depending on the size distribution of suspended sediments. In-stream turbidity is usually 1-10 NTU's with some values in the 100's if measured during a runoff event in an urban watershed. High in-stream turbidity may contribute to high water temperature, low dissolved oxygen, lower photosynthesis rates in plants, to the camouflage of prey or egg burial, and decrease interstitial dissolved oxygen levels, all of which may result in low aquatic species diversity. High turbidity, common in developed watersheds where impermeable surfaces quickly transport rainfall and runoff to streams, may be indicative of erosion, construction, or poor storm water management upstream. State of Alaska water quality standards are set based on water use criteria. **Turbidity standards for fish and wildlife protection (designated use) indicate that turbidity may not exceed 25 nephelometric turbidity units (NTUs) above natural background conditions.**

The state water quality criteria for designated uses sets maximum allowable levels of turbidity above "natural background" conditions. For the purposes of this study, Amalga St. monitoring data were used for "background level" data. Only one sample exceeded the allowable maximum of 25 NTU above background levels (Yandukin Dr., 3/23/2010) for the growth and propagation of aquatic organisms. This exceedence was probably due to saltwater mixing during a rising tide and is probably not a result of concern. Several samples exceeded the more strict allowable maximum of 5 NTU above background levels for contact recreation, all of which were associated with stormwater runoff due to rainfall greater than 0.5 inches in a 24-hour period. The trend appears to demonstrate decreasing turbidity levels over time, despite greater rainfall accumumlations in late summer.

In-stream peak turbidity is closely linked to initiation of runoff after rainfall begins, and the timing of periodic sampling is rarely adequate to characterize high turbidity levels in Jordan Creek. The 2010 monitoring results indicate that turbidity was higher downstream of our "background" site during rainfall events, probably due to increased flows re-suspending sediment and fines, and the introduction of sediment and fines via storm water flows. To better characterize turbidity and sediment loading relative to precipitation and runoff in Jordan Creek watershed, future studies should focus on continuous turbidity and sediment sampling from initiation of rainfall until rainfall ceases for a limited number of events, coupled with stream discharge data.

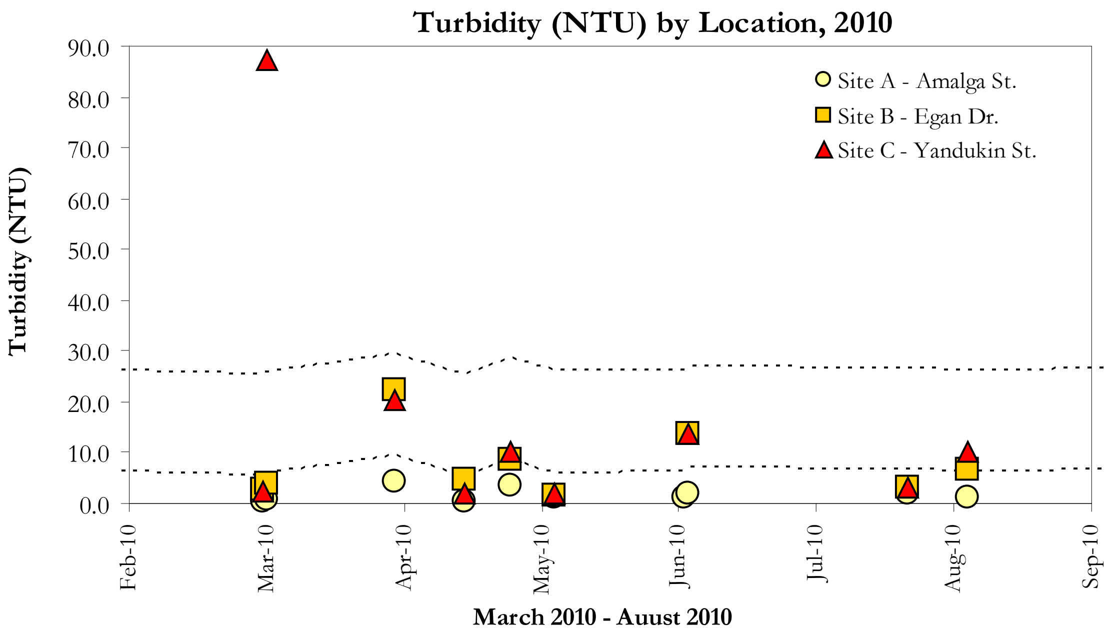
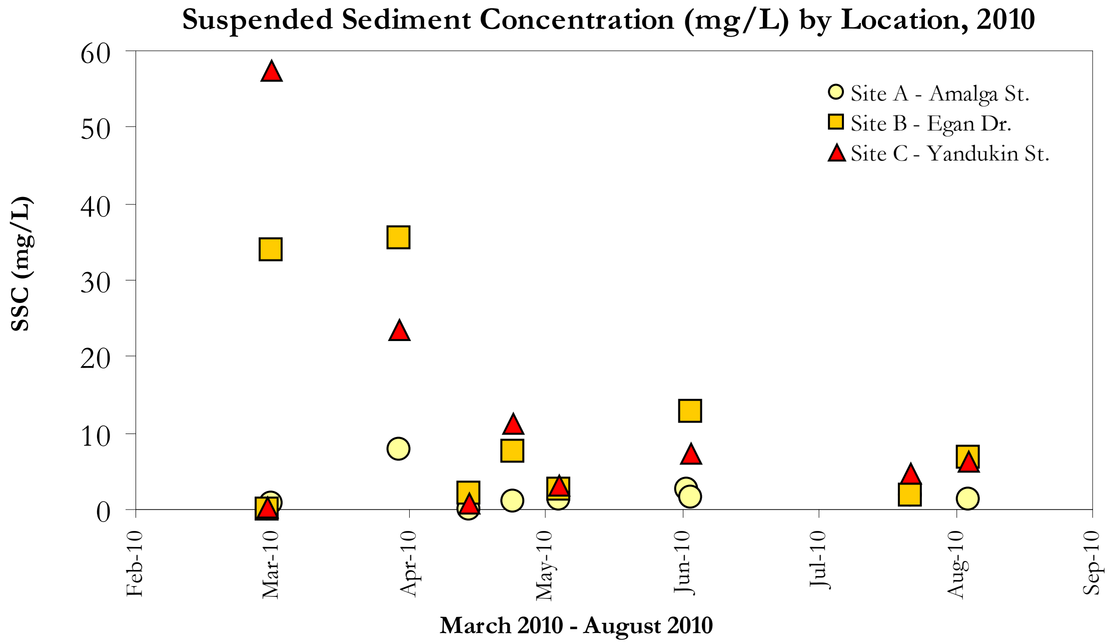


Figure 4: Turbidity by location for the period of record. Note: the dashed lines indicate the maximum allowable turbidity relative to "background levels" (Amalga St.) in accordance with two designated uses. The lower dashed line is representative of the maximum allowable turbidity of 5 NTU above background levels for contact recreation. The upper dashed line represents the maximum allowable turbidity of 25 NTU above background levels for the growth and propagation of fish, shellfish, other aquatic life, and wildlife.

e. **Suspended Sediment Concentration (SSC).** Suspended Sediment Concentration (measured in mg/L) refers to solids that are not dissolved in solution and can be removed by filtration (2 microns and greater diameter). Suspended solids include organic and inorganic particles and can adversely impact water clarity, conductivity, temperature and turbidity. High SSC values in stream water may raise water temperature, harming aquatic life suited to lower temperatures, as well as impact cellular water balance within small aquatic organisms, affecting their hydration and buoyancy.

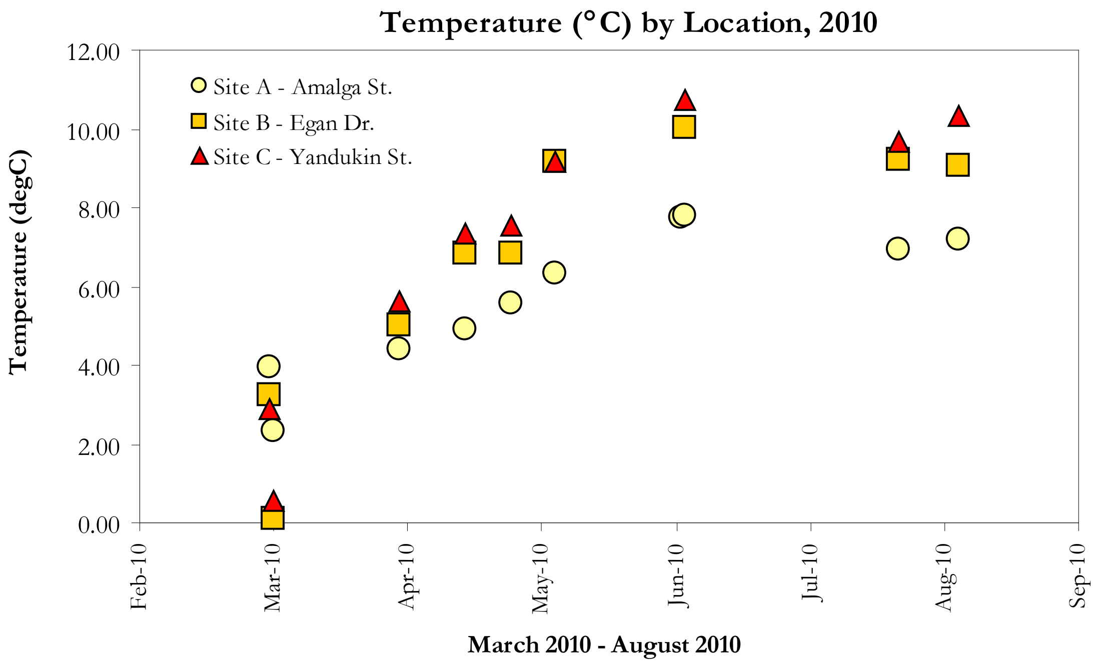
The state has not outlined specific water quality objectives for suspended sediment concentration.



f. Water Temperature. Temperature (measured in degrees Celcius) determines the oxygen content of water (as temperature increases, oxygen content dwindles). Optimum habitat for aquatic species is dependent on water temperature. Water temperature naturally fluctuates throughout a surface water body depending on stream or lake width, depth, and discharge. In riparian areas, vegetation and plant cover lowers stream temperatures, as will groundwater and seep water in areas of emergence. Higher water temperatures impact photosynthesis, metabolic rates of organisms (good and bad organisms), and the mobility or uptake potential of toxic substances in water. Long-term changes in water temperature may determine the ability of non-native species to invade local water bodies.

All samples collected in 2010 were below the state maximum allowable temperature of 13 ˚C for the designated use of growth and propagation of fish, shellfish, and other aquatic life and wildlife (the most stringent spawning, rearing, and egg incubation specification).

Spring temperatures were relatively low downstream of Amalga St. due to very cold rain-on-snow storm water runoff entering Jordan Creek. Temperatures were consistently lower at Amalga Street for the remainder of monitoring, probably due in part to that location's close proximity to creek headwaters and groundwater sources. Storm water runoff elevates stream temperatures during periods of heavy rainfall.

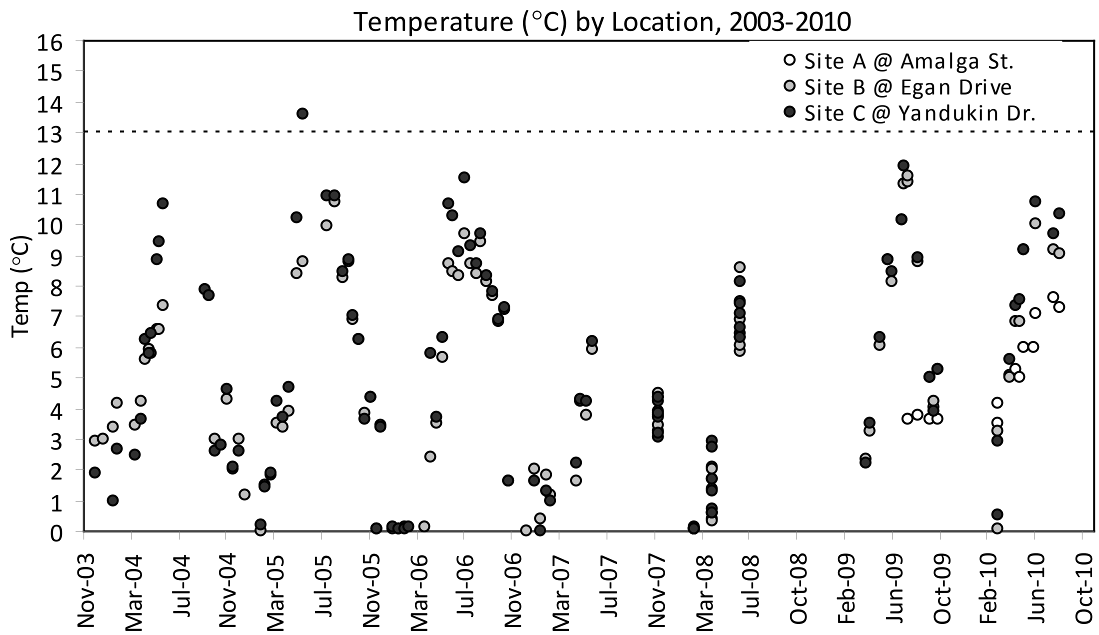


Long-Term Monitoring – Brief Summary Including 2010 Results

Long-term trends in temperature, pH, conductivity, turbidity, dissolved oxygen, and suspended sediment are shown in figures below. Data collected in 2010 are similar to long-term record values, though mean turbidity and suspended sediment concentration were higher, with greater suspended sediment peaks, than in years past. This is probably due to the focus on gathering samples during storm runoff and snowmelt events in 2010. It is also possible, however, that the 2010 turbidity and sediment measurements reflect higher sediment inputs due to erosion, upstream development, or storm water inputs. The higher apparent temperature is certainly due to a lack of early spring and late winter sampling in 2010. In the future, for long term analysis at a yearly scale to be reasonable, we must sample at least bi-monthly every month. Conductivity values were lower across the board in 2010. This may be due to a difference in probes used from year-to-year, calibration errors, calibration check solution contamination, or could be an actual conductivity difference from previous years. At this point, we may not be able to determine the source of the difference or error, but will watch for mean conductivity differences during 2011 sampling, and will use two different methods or probes to determine conductivity in the field to double-check our method and avoid future confusion.

Year 2010 and Long Term (2003-2010) Mean Parameter Values

	2010 Mean	2003-2010 Mean
Temperature (°C)	6.47	4.88
Conductivity (µS/cm)	49	83
pH	7.1	6.9
Dissolved Oxygen (mg/L)	10.52	11.6
Turbidity (NTU)	8.7	3.1
TSS (mg/L)	8.6	3.2


Temperature (°C) by Location, 2003-2010
Site A @ Amalga St.
Site B @ Egan Drive
Site C @ Yandukin Dr.
Temp (°C)
Nov-03
Mar-04
Jul-04
Nov-04
Mar-05
Jul-05
Nov-05
Mar-06
Jul-06
Nov-06
Mar-07
Jul-07
Nov-07
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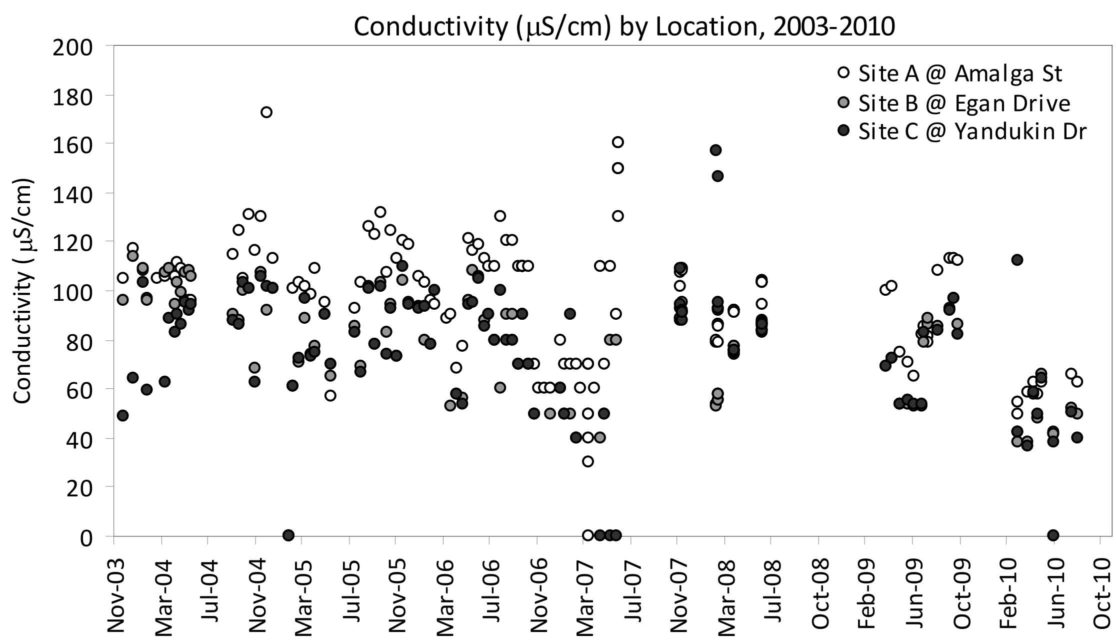
Feb-10
Jun-10
Oct-10


Conductivity (μS/cm) by Location, 2003-2010
Site A @ Amalga St
Site B @ Egan Drive
Site C @ Yandukin Dr
Conductivity (μS/cm)
Nov-03
Mar-04
Jul-04
Nov-04
Mar-05
Jul-05
Nov-05
Mar-06
Jul-06
Nov-06
Mar-07
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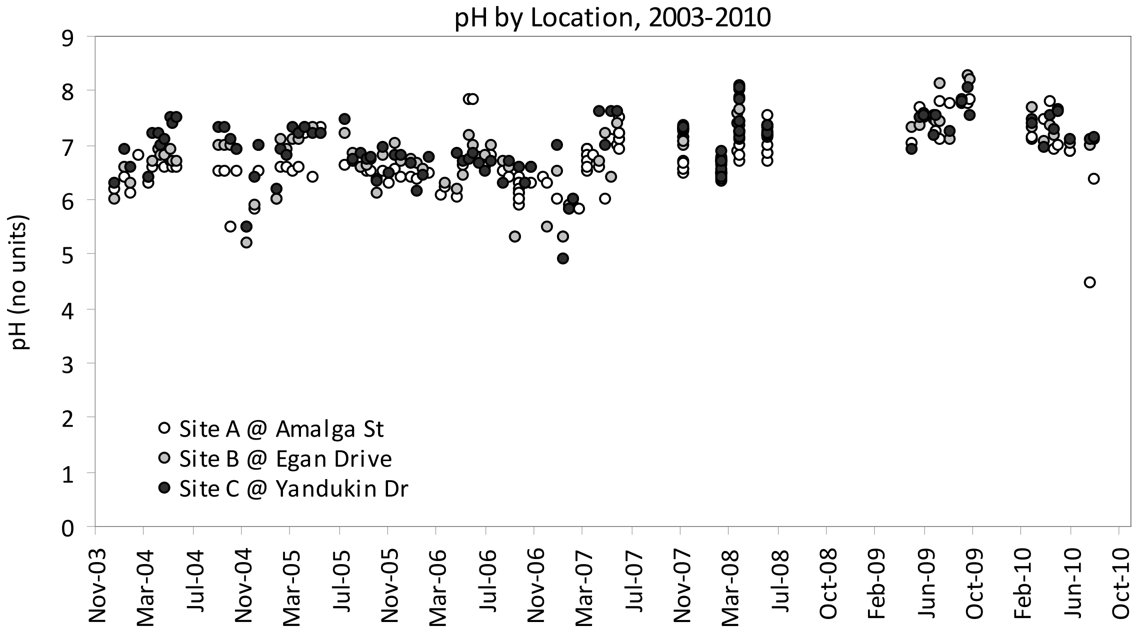
Feb-10
Jun-10
Oct-10


pH by Location, 2003-2010
pH (no units)
Site A @ Amalga St
Site B @ Egan Drive
Site C @ Yandukin Dr
0
1
2
3
4
5
6
7
8
9
Nov-03
Mar-04
Jul-04
Nov-04
Mar-05
Jul-05
Nov-05
Mar-06
Jul-06
Nov-06
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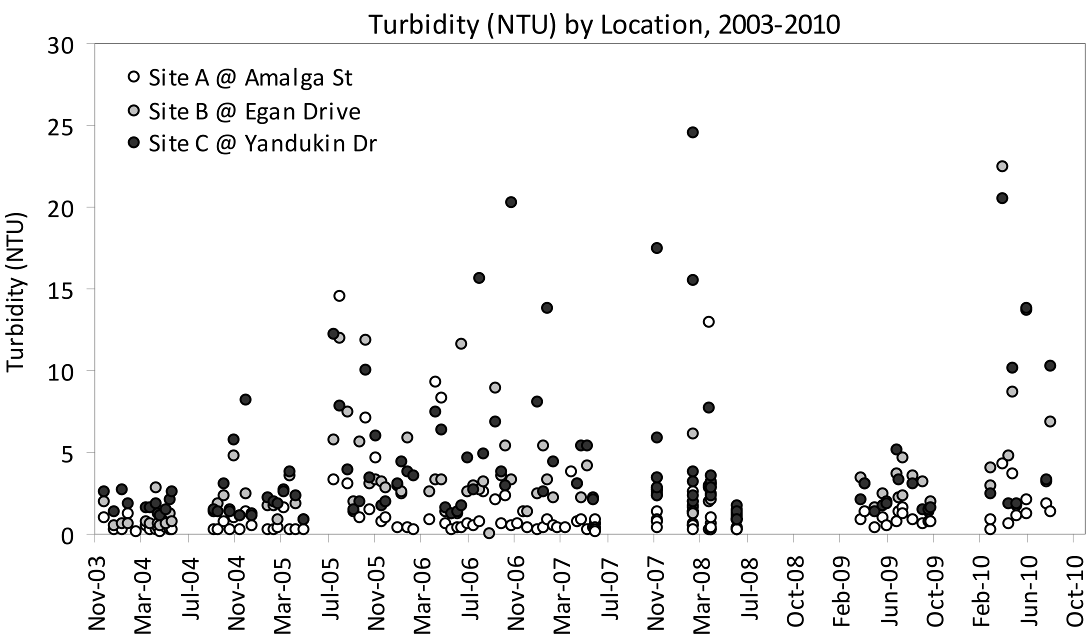
Turbidity (NTU) by Location, 2003-2010
Turbidity (NTU)
Site A @ Amalga St
Site B @ Egan Drive
Site C @ Yandukin Dr
0
5
10
15
20
25
30
Nov-03
Mar-04
Jul-04
Nov-04
Mar-05
Jul-05
Nov-05
Mar-06
Jul-06
Nov-06
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Feb-10
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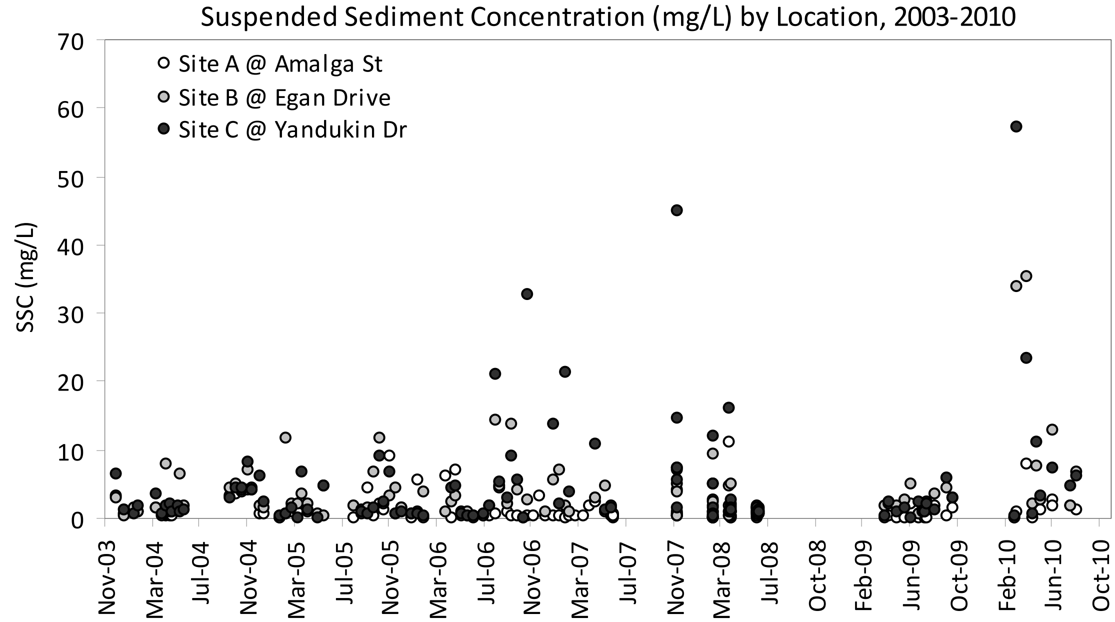
Oct-10



Conclusion and Recommendations

Water Quality in Jordan Creek met state water quality criteria at JWP sample sites for the dates/times sampled in 2010. Exceptions were probably due to natural conditions.

The 2010 monitoring activities added another year to the continuous Jordan Creek water quality dataset, as well as capturing data for a couple of high Spring and Summer runoff events to guide future stormwater and runoff treatment work. Jordan Creek habitat and water quality are excellent in many reaches upstream of Egan Drive. Periods of low flow, freezing, and stormwater runoff occasionally compromise Jordan Creek habitat and water quality.

Future study in Jordan Creek would benefit from a more scientific approach adopting specific questions answerable by monitoring. For example, re-establishing a discharge record should remain a high priority, as it will aid in future studies of stream capacity and pollutant loading. JWP mapping of stormwater inputs (outfalls, swale and ditch “tributaries,” surface sheet flow into riparian areas) is underway now, sponsored by the U.S. Fish and Wildlife Service. Once finished, the stormwater mapping project should be complemented with monitoring end-of-pipe water quality during several storms to demonstrate whether or not a stormwater retrofit or BMP plan specific to Jordan Creek watershed is necessary or needs consideration in locations where stream water quality may be compromised. Results of this 2010 monitoring effort have narrowed a specific list of outfall locations where monitoring for additional parameters, including PAH, oil and grease, and some metals will aid in identifying pollutant “hot spots” where additional BMP work could best improve water quality in Lower Jordan Creek. JWP is interested in expanding monitoring and mapping efforts within the Jordan Creek Watershed and welcomes CBJ input on project scope and partnership opportunities in the future.

Acknowledgements

JWP wishes to thank the City and Borough of Juneau for ongoing project and financial support that made this work possible. Eran Hood and Sonia Nagorski, at the University of Alaska Southeast, provided muchappreciated guidance, laboratory space, monitoring equipment, and advice to get this sampling effort under way. Thanks also to Terry Schwarz at Alaska DNR, who generously loaned JWP his extra discharge measurement equipment. The GIS software used to prepare project maps was provided by the ESRI Conservation Grant program.

Related Documents

Alaska Department of Environmental Conservation, 2009. 18 AAC 70 Water Quality Standards as amended through September 19, 2009. http://www.dec.state.ak.us/water/wqsar/wqs/pdfs/18_AAC_70%20_Amended_September_19_2009.pdf

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Nagorski, S., E. Hood, L. Hoferkamp, E. Neal, J. Hudson, 2006. Watershed Protection and Recovery for Jordan Creek, Juneau, AK. Prepared for the Alaska Department of Environmental Conservation.

Nagorski, S., L. Hoferkamp, 2007. Watershed Protection and Recovery for Jordan Creek, Juneau, AK. Prepared for the Alaska Department of Environmental Conservation.

Nagorski, S., 2008. Watershed Protection and Recovery for Jordan Creek, Juneau, AK. Prepared for the Alaska Department of Environmental Conservation.

Appendix A: State Water Quality Criteria for Designated Uses
Taken from *ADEC 18 AAC 70, Water Quality Standards – Amended as of July 1, 2008.*

Temperature	
Water Recreation: Contact	May not exceed 30° C
Growth and Propagation of Fish, Shellfish, Other Aquatic Life and Wildlife	May not exceed 20° C at any time. The following maximum temperatures may not be exceeded, where applicable: Migration routes 15° C Spawning areas 13° C Rearing areas 15° C Egg & fry incubation 13° C For all other waters, the weekly average temperature may not exceed site-specific requirements needed to preserve normal species diversity or to prevent appearance of nuisance organisms.
Turbidity	
Water Recreation: Contact	May not exceed 5 NTU above natural conditions when the natural turbidity is 50 NTU or less, and may not have more than 10% increase in turbidity when the natural turbidity is more than 50 NTU, not to exceed a maximum increase of 15 NTU. May not exceed 5 NTU above natural turbidity for all lake waters.
Water recreation: Secondary	May not exceed 10 NTU above natural conditions when natural turbidity is 50 NTU or less, and may not have more than 20% increase in turbidity when the natural turbidity is greater than 50 NTU, not to exceed a maximum increase of 15 NTU. For all lake waters, turbidity may not exceed 5 NTU above natural turbidity.
Growth and Propagation of Fish, Shellfish, Other Aquatic Life and Wildlife	May not exceed 25 NTU above natural conditions. For all lake waters, may not exceed 5 NTU above natural conditions.
pH	
Water Recreation: Contact	May not be less than 6.5 or greater than 8.5. If the natural condition pH is outside this range, substances may not be added that cause an increase in the buffering capacity of the water.
Growth and Propagation of Fish, Shellfish, Other Aquatic Life and Wildlife	May not be less than 6.5 or greater than 8.5. May not vary more than 0.5 pH unit from natural conditions.
Sediment	
Water Recreation: Contact	No measurable increase in concentration of

	settleable solids above natural conditions, as measured by the volumetric Imhoff cone method (see note 11).
Growth and Propagation of Fish, Shellfish, Other Aquatic Life and Wildlife	The percent accumulation of fine sediment in the range of 0.1 mm to 4.0 mm in the gravel bed of waters used by anadromous or resident fish for spawning may not be increased more than 5% by weight above natural conditions (as shown from grain size accumulation graph). In no case may the 0.1 mm to 4.0 mm fine sediment range in those gravel beds exceed a maximum of 30% by weight (see notes 3 and 4). In all other surface waters no sediment loads (suspended or deposited) that can cause adverse effects on aquatic animal or plant life, their reproduction or habitat may be present.

3. Wherever criteria for fine sediments are provided in this chapter, fine sediments must be sampled by the method described in *An Improved Technique for Freeze Sampling Streambed Sediments*, by William J. Walkotten, United States Department of Agriculture, United States Forest Service, Forest Service Research Note PNW-281, October 1976, adopted by reference, or by the technique found in *Success of Pink Salmon Spawning Relative to Size of Spawning Bed Materials*, by William J. McNeil and W.H. Ahnell, United States Department of the Interior, United States Fish and Wildlife Service, Special Scientific Report - Fisheries No. 469, January 1964, pages 1 - 3, adopted by reference.

4. Wherever criteria for fine sediments are provided in this chapter, percent accumulation of fine sediments will be measured by the technique found in the *Manual on Test Sieving Methods*, *Guidelines for Establishing Sieve Analysis Procedures*, by the American Society for Testing and Materials (ASTM), STP 447A, 1972 edition,

11. Volumetric measurements of settleable solids must be determined according to the following procedure: first, an Imhoff cone must be filled to the one-liter mark with thoroughly mixed sample; second, the sample must settle for 45 minutes; third, the sides of the cone must be gently stirred with a rod or by spinning; fourth, the sample must settle 15 minutes longer, and the volume of settleable matter in the cone must be recorded as milliliters per liter; fifth, if the settled matter contains pockets of liquid between large settled particles, the volume of these pockets must be estimated and subtracted from the volume of settled matter

Appendix B: 2010 Jordan Creek Water Quality Data

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Turbidity

	Site A - Amalga St.		*Site B - Egan Dr.*		*Site C - Yandukin Dr.*	
Date	Time	Turbidity (NTU)	Time	Turbidity (NTU)	Time	Turbidity (NTU)
3/22/2010	17:28	0.3	17:46	2.9	18:39	2.4
3/23/2010	14:25	0.9	14:49	4.0	16:15	87.2
4/20/2010	13:46	4.2	14:56	22.4	17:01	20.5
5/5/2010	14:48	0.6	15:46	4.8	16:30	1.8
5/15/2010	14:11	3.7	15:11	8.6	14:42	10.1
5/25/2010	13:42	1.1	14:43	1.7	14:28	1.8
6/22/2010	10:03	1.3				
6/23/2010	8:36	2.1	9:57	13.6	9:33	13.8
8/10/2010	10:47	1.8	11:50	3.1	12:08	3.3
8/23/2010	12:17	1.3	13:46	6.8	13:08	10.2

Temperature

	Site A - Amalga St.		*Site B - Egan Dr.*		*Site C - Yandukin Dr.*	
Date	Time	Temp (degC)	Time	Temp (degC)	Time	Temp (degC)
3/22/2010	17:28	3.96	17:46	3.25	18:39	2.91
3/23/2010	14:25	2.35	14:49	0.09	16:15	0.54
4/20/2010	13:46	4.40	14:56	5.01	17:01	5.60
5/5/2010	14:48	4.91	15:46	6.83	16:30	7.32
5/15/2010	14:11	5.55	15:11	6.85	14:42	7.56
5/25/2010	13:42	6.31	14:43	9.18	14:28	9.15
6/22/2010	10:03	7.74				
6/23/2010	8:36	7.8	9:57	10.02	9:33	10.71
8/10/2010	10:47	6.93	11:50	9.19	12:08	9.67
8/23/2010	12:17	7.17	13:46	9.06	13:08	10.32

Conductivity (specific conductance)

	Site A - Amalga St.		*Site B - Egan Dr.*		*Site C - Yandukin Dr.*	
Date	Time	Conductivity (mS/cm)	Time	Conductivity (mS/cm)	Time	Conductivity (mS/cm)
3/22/2010	17:28	40	17:46	31	18:39	31
3/23/2010	14:25	36	14:49	28	16:15	82
4/20/2010	13:46	43	14:56	28	17:01	27
5/5/2010	14:48	46	15:46	42	16:30	43
5/15/2010	14:11	42	15:11	35	14:42	36
5/25/2010	13:42	46	14:43	48	14:28	47
6/22/2010	10:03	30				
6/23/2010	8:36	31	9:57	30	9:33	28
8/10/2010	10:47	48	11:50	38	12:08	37
8/23/2010	12:17	46	13:46	36	13:08	29

pH

Date	Site A - Amalga St.		Site B - Egan Dr.		Site C - Yandukin Dr.	
	Time	pH	Time	pH	Time	pH
3/22/2010	17:28	7.10	17:46	7.31	18:39	7.47
3/23/2010	14:25	7.12	14:49	7.69	16:15	7.38
4/20/2010	13:46	7.48	14:56	7.05	17:01	6.94
5/5/2010	14:48	7.81	15:46	7.37	16:30	7.55
5/15/2010	14:11	6.90	15:11	7.16	14:42	7.28
5/25/2010	13:42	6.97	14:43	7.66	14:28	7.61
6/22/2010	10:03	6.87				
6/23/2010	8:36	6.86	9:57	7.03	9:33	7.11
8/10/2010	10:47	4.48	11:50	6.99	12:08	7.09
8/23/2010	12:17	6.35	13:46	7.11	13:08	7.14

Suspended Sediment Concentration (SSC)

Date	Site A - Amalga St.		Site B - Egan Dr.		Site C - Yandukin Dr.	
	Time	SSC (mg/L)	Time	SSC (mg/L)	Time	SSC (mg/L)
3/22/2010	17:28	0	17:46	0	18:39	0.3
3/23/2010	14:25	0.8	14:49	33.9	16:15	57.3
4/20/2010	13:46	7.8	14:56	35.4	17:01	23.4
5/5/2010	14:48	0.0	15:46	2.0	16:30	0.7
5/15/2010	14:11	1.1	15:11	7.5	14:42	11.1
5/25/2010	13:42	1.3	14:43	2.7	14:28	3.1
6/22/2010	10:03	2.6				
6/23/2010	8:36	1.7	9:57	12.9	9:33	7.4
8/10/2010	10:47	1.7	11:50	1.7	12:08	4.7
8/23/2010	12:17	1.3	13:46	6.7	13:08	6.2

Dissolved Oxygen (DO)

Date	Site A - Amalga St.		Site B - Egan Dr.		Site C - Yandukin Dr.	
	Time	DO (mg/L)	Time	DO (mg/L)	Time	DO (mg/L)
3/22/2010	17:28	7.4	17:46	10.2	18:39	6.4
3/23/2010	14:25	4.8	14:49	7.9	16:15	6.2
4/20/2010	13:46	11.4	14:56	12.8	17:01	12.9
5/5/2010	14:48	13.0	15:46	13.4	16:30	13.5
5/15/2010	14:11	11.0	15:11	12.8	14:42	12.5
5/25/2010	13:42	11.2	14:43	12.3	14:28	12.9
6/22/2010	10:03	8.7				
6/23/2010	8:36	9.1	9:57	11.1	9:33	10.5
8/10/2010	10:47	9.5	11:50	11.0	12:08	11.2
8/23/2010	12:17	8.9	13:46	11.4	13:08	10.1

Grab samples were 500mL (entire sample analyzed)
6/22/2010 - no flow at Trout St. and Yandukin St. sites