

# Water Quality Data Analysis and Review

## Lower Androscoggin River

February 8, 2010

Prepared and Submitted by:  
**Friends of Merrymeeting Bay & Applied Biomonitoring**  
In Accordance with:  
**Public Law 163, LD 330**

### **An Act To Change the Classification of Certain Waters of the State**

**Sec.24. Lower Androscoggin River water quality sampling; report; legislation.** The Department of Environmental Protection, with the assistance of and in consultation with volunteer river monitors, shall establish and implement a water quality sampling program for the lower Androscoggin River from Gulf Island Dam to the line formed by the extension of the Bath-Brunswick boundary across Merrymeeting Bay in a northwesterly direction.

**1. Timing.** The water quality sampling program must occur during the 2009 sampling season.

**2. Purpose.** The purpose of the water quality sampling program implemented under this section is to allow additional water quality data to be collected to determine if the section of the Androscoggin River from Worumbo Dam in Lisbon Falls to the line formed by the extension of the Bath-Brunswick boundary across Merrymeeting Bay in a northwesterly direction meets, or can reasonably be expected to meet, the criteria for reclassification from Class C to Class B...



**Androscoggin River**  
**Water Quality Data Analysis and Review**  
**To Upgrade the Lower Section of River from Class C to Class B**  
**February 8, 2010**

***Introduction***

Clean rivers enhance the local economy and vitality of the communities surrounding them. A clean, healthy river attracts people, new businesses, and increases property value. An upgrade of the Androscoggin will not have an adverse impact on current industrial uses along the river since Class B conditions have been met for years in the course of “business as usual.”

DEP classification proposal submission guidelines state:

***“Maine’s Water Quality Classification System is goal-based. When proposing an upgrade in classification, recommend waters that either presently attain or with reasonable application of improved treatment or Best Management Practices (BMPs), could reasonably be expected to attain, the standards and criteria of a higher proposed class.”***

In accordance with LD 330 Section 24 passed in 2009, additional water quality data were collected on the lower Androscoggin from April-October of 2009 in an effort to better substantiate a classification upgrade proposal for boosting the lower river to Class B from Class C. This Friends of Merrymeeting Bay (FOMB) effort was done in cooperation with DEP partly under the auspices of their Volunteer River Monitoring Program (VRMP).

Intense data gathering and results from 2009 support earlier water quality data gathered in previous years by FOMB on the lower Androscoggin. Excluding heavy precipitation events, data show excellent compliance with Class B standards.

38 M.R.S.A. § 464 (F) (4)

***“When the actual quality of any classified water exceeds the minimum standards of the next highest classification, that higher water quality must be maintained and protected. The board shall recommend to the Legislature that water be reclassified in the next higher classification.”***

While 2009 was one of the wettest summers on record with June and July the wettest months, the National Weather Service also recorded some of the highest temperatures ever for Portland in April and August (and November). USGS daily flow records from their Auburn station show below normal flows for April, May and part of June, higher than mean flows for part of June, July, August and early September and lower than mean flows for the second half of September. Neither lengthy nor expensive flow models nor, awaiting the confluence of low flows and high temperatures, can by law obstruct the timely passage of “goal oriented” upgrades. This method of ratcheting up water quality is fundamental not only to Maine statute but to the Clean Water Act.

Frequent sampling of the lower Androscoggin in 2009 shows water conditions meet Class B standards nearly all of the time. **Analyzed data support and we recommend, an upgrade of water quality classification from Class C to Class B for the lower Androscoggin between Worumbo Dam and Merrymeeting Bay.**

### ***Approach***

Dissolved oxygen (mg/L) and *E. coli* (# colonies/100 ml) water quality data were collected from various locations in the Androscoggin River during 2009. These data, along with collection dates/times, weather conditions, and other notations, were tabularized then analyzed to determine if the waterways meet the criterion to be reclassified as Class B. The criteria for reclassification are:

Dissolved Oxygen:  $\geq 7$ ppm instantaneous reading

*E. coli*: 64 colonies /100 ml geometric mean; 256 colonies/100ml instantaneous reading

The following comparisons were made:

1. *E. coli* methodologies: IDEXX v. Coliscan
2. *E. coli* data v. standard for Class B
  - 2009 data
  - Historical trends (2006 through 2009)
  - Comparison also of all sites
  - Geometric means by station and year for three historical sites
  - Geometric means for all sites, each year, all data and excluding heavy rain events
  - Geometric means by year-all sites combined
3. DO methodologies: Winkler titration v. DO meter data
4. DO data v. standard for Class B
  - 2009 data
  - Historical trends (2003 through 2009)
  - Comparison also of all sites
  - Yearly DO geometric means for combined sites
5. Shore v. mid-stream sample grabs at depth

### ***Results - E. coli***

Two graphs were generated showing the relationship between the IDEXX and Coliscan methodologies. The first compares the values reported by the different methodologies. These are values from all of the sampling sites where the two measurements were made. The first graph shows extreme variability in the paired measurements over time. A correlation was made to determine the level of agreement between the two methods. Results of the analysis, as provided in the second graph, show that the correlation coefficient ( $R^2$ ) is 0.30, suggesting a poor relationship between the two methods. A review of the data showed that the Coliscan data were highly variable, with values ranging from 1 to 6000 colonies/100 ml while the IDEXX data were considerably tighter (ranging from about 5 to 1500 colonies/100 ml; with the majority between 50 and 200 colonies/100 ml). These data suggest that the IDEXX methodology may be more accurate than the Coliscan.

Based on the above analysis, only data collected using IDEXX were evaluated. Eleven (11) sites were sampled during the 2009 season:

Durham Boat Launch (DBL)  
Pejepscot Boat Launch (PBL)  
Fish Park Up [above dam] (FPU)  
Fish Park Down [below dam] (FPD)  
Brunswick Water Works (BWW)  
Brunswick Interstate Ledges (BIL)

Brunswick Canoe Portage (BCP)  
Brunswick Canoe Mooring (BCM) [off BCP]  
Brunswick Water St. Boat Launch (BWS)  
Water St. Mooring (WSM) [off BWS]  
Brunswick Bay Bridge (BBB)

The graphs for these data show the instantaneous values and the geometric mean for the sampling season. The geometric means were calculated both using all data and also excluding data collected within 48 hours of a heavy rain event since the latter are considered a function of combined sewer overflow (CSO) and treated separately from classification. The instantaneous data show excellent compliance with the criterion. Four sites were out of compliance once during the sampling season; one site was out of compliance twice. Most of these events (4) occurred in August in the midst of many days of record heat (Portland Climate Data for the Year 2009, National Weather Service, Gray, Maine). None of the geometric means, either those calculated using all data or only the non-rain event data, were out of compliance. The following table summarizes the number of non-compliance events and the sampling dates for the different sites over the 2009 sampling period:

	<b>2009 <i>E. coli</i> non-compliance events</b>	
	<b><i>Instantaneous</i></b>	<b><i>Geometric mean</i></b>
Durham Boat Launch (DBL)	None	None
Pejepscot Boat Launch (PBL)	None	None
Fish Park Up [above dam] (FPU)	None	None
Fish Park Down [below dam] (FPD)	None	None
Brunswick Water Works (BWW)	None	None
Brunswick Interstate Ledges (BIL)	None	None
Brunswick Canoe Portage (BCP)	1; 8/23/09	None
Brunswick Canoe Mooring (BCM) [off BCP]	1; 8/23/09	None
Brunswick Water St. Boat Launch (BWS)	2; 5/17/09 8/23/09	None
Water St. Mooring (WSM) [off BWS]	1; 8/23/09	None
Brunswick Bay Bridge (BBB)	1; 7/27/09	None

A complete listing of the *E. coli* data collected for these sites during 2009 are provided.

Historical data were available for three sites to evaluate trends over time: Pejepscot Boat Landing, Brunswick Water Street Boat Launch, and Brunswick Bay Bridge. Four types of graph were prepared for these data: the instantaneous data for each site (one site per page), instantaneous data for all sites graphed together, the geometric means for each site over times (all sites on one page), and a summary graph showing the geometric mean by year. The means were calculated using all available data for the year. These graphs show that the majority of the instantaneous data are in compliance, with minor exceptions occurring in 2006 and 2009. None of the geometric means by station and year are out of compliance. Similarly, all of the geometric means (for both all data, and no rain event data) determined for the years 2006 through 2009 are in compliance with both the Class C and Class B criteria.

### ***Results - Dissolved Oxygen***

A comparison of the Winkler titration and DO meter shows very good correlation between the two methodologies. The paired data were graphed and a regression analysis performed. Results of the analysis yield an  $R^2$  value of 0.78. Based on these results both the Winkler and DO meter

data were evaluated. Ten (10) sites were sampled during the 2009 season; no DO measurements were taken at the Brunswick Water Works site.

Durham Boat Launch (DBL)	Brunswick Canoe Portage (BCP)
Pejepscot Boat Launch (PBL)	Brunswick Canoe Mooring (BCM) [off BCP]
Fish Park Up [above dam] (FPU)	Brunswick Water St. Boat Launch (BWS)
Fish Park Down [below dam] (FPD)	Water St. Mooring (WSM) [off BWS]
Brunswick Interstate Ledges (BIL)	Brunswick Bay Bridge (BBB)

The graphs for these data show the instantaneous values for the sampling season. The instantaneous data show excellent compliance with the criterion. Only two measurements were out of compliance: Durham Boat Launch and Brunswick Canoe Mooring, both on 8/23/09 during a period of record breaking heat. The following table summarizes the number of non-compliance events and the sampling dates for the different sites over the 2009 sampling period:

	<b>2009 DO non-compliance events</b>
Durham Boat Launch (DBL)	1; 8/23/09 (6.6ppm)
Pejepscot Boat Launch (PBL)	None
Fish Park Up [above dam] (FPU)	None
Fish Park Down [below dam] (FPD)	None
Brunswick Interstate Ledges (BIL)	None
Brunswick Canoe Portage (BCP)	None
Brunswick Canoe Mooring (BCM) [off BCP]	1; 8/23/09 (6.6ppm)
Brunswick Water St. Boat Launch (BWS)	None
Water St. Mooring (WSM) [off BWS]	None
Brunswick Bay Bridge (BBB)	None

A complete listing of the DO data collected for these sites during 2009 are provided.

Historical data were available for three sites to evaluate trends over time: Durham Boat Launch, Pejepscot Boat Launch, and Pleasant Point. Note 2009 Pleasant Point data were collected after the recommended time of 0800 hrs. and are, therefore, not included in most of our 2009 analyses. [Note: Pleasant Pt., Brunswick Bay Bridge and Brunswick Water St. and Mooring sites are all in tidewater. These sites may not be nearly so affected by diurnal DO fluctuations as sites above Brunswick/Topsham dam may be. At these shallow tidal sites, DO may be reduced more by higher temperatures warming the water during a daytime low tide than by the more typical nighttime sag.] Pleasant Pt. data are provided because this site has already been upgraded to a Class B waterway and they make a good comparison to the sites under evaluation. These graphs show that nearly all of the instantaneous data for each of the sites are in compliance. The exceptions occur at Durham Boat Launch, with three non-compliance events occurring in 2003, and one in fall of 2009. A comparison of the DBL and PBL to a current Class B waterway shows that since 2003 dissolved oxygen concentrations in these three waterways have been consistently similar. The graph comparing averages for all data by year shows that since 2003, the lower Androscoggin River has been in compliance with both Class C and Class B criteria.

### ***Shore v. Mid-stream Sampling***

Mid-stream sampling on a large river adds more time, logistical problems and hazards to a river monitoring program whether sampling from a bridge or a boat. Past FOMB sampling efforts have all been from shore. In 2009 in response to the DEP new VRMP protocols two mooring sites were added off of shore sites. Paired shore and mid-stream sampling were conducted at these two sites during the 2009 sampling season:

Brunswick Canoe Portage (shore) and Brunswick Canoe Mooring (mid-stream)  
Brunswick Water St. Boat Launch (shore) and Water St. Mooring (mid-stream)

Regression analysis of the paired data show excellent correlations between the shore and mid-stream sampling locations:

	<b>E. Coli</b>	<b>DO</b>
BWS vs WSM	9 pairs of data $R^2 = 0.98$	5 pairs of data $R^2 = 0.90$
BCP vs BCM	4 pairs of data $R^2 = 0.92$	2 pairs of data $R^2 = 1.0$

The DO regression for BCP vs BCM must be reviewed with caution because only two pairs of data were available, which always results in an  $R^2$  of 1.0. However, looking at the actual values (7.7 vs 7.6; 9.2 vs 9.2) shows there is excellent correlation between the two monitoring locations. Previous work by FOMB using Acoustic Doppler Current Profilers and salinity meters in a multi-year circulation study of Merrymeeting Bay (Circulation Patterns of Merrymeeting Bay and its Tidal Tributaries, 2009. [www.friendsofmerrymeetingbay.org](http://www.friendsofmerrymeetingbay.org)) indicated thorough mixing of the water column with no evidence of stratification. Since BWS and WSM are tidewater sites, that there is no significant difference in monitoring results comes as no surprise. These results suggest it is not necessary to collect data at both the shore and mid-stream locations for water quality measurements when shore collection is sufficient.

Similarly, a review of the instantaneous data for both *E. coli* and DO suggest that bi-weekly or even monthly monitoring may not be necessary, particularly if samples are collected more than 48 hours after a heavy rain event. A monthly or every-other month approach may be more appropriate, allowing consistent coverage of multiple sites by volunteers without causing the burnout felt by all participants maintaining the intense 2009 schedule.

### ***Sampling Protocols***

In 2009 and all past sampling years FOMB volunteers have trained annually in cooperation with Friends of Casco Bay (FOCB) utilizing DO training and sampling protocols from the FOCB EPA Quality Assurance Program Plan (QAPP). In 2009 FOMB Androscoggin volunteers also participated in and qualified under the DEP Volunteer River Monitoring Program (VRMP) trainings. Working with the DEP, a Sampling and Analyses Plan (SAP) was developed for FOMB. Under the VRMP, FOMB also followed most VRMP SAP Quality Assurance/Quality

Control (QA/QC) protocols for all sampling and for lab procedures in analyses of bacteria samples.

Three sample sites were considered approved by DEP who wanted sampling done in mid-stream, typically either from a bridge or boat. Two of the four bridges in this lower Androscoggin sector occurred immediately below dams and were liable to yield unusually high oxygenated water. Of the other two bridges, one was over very fast moving turbulent water (also likely to be higher in DO) and the fourth was quite high and prone to high-speed traffic possibly endangering volunteers. FOMB chose instead to set two buoyed moorings (BCM and WSM) in more typical mid-stream locations, to which a sampler could tie their boat. A third approved site was at the end of a jetty (BBB) extending towards mid-stream. Other sites were from shore and samplers used poles to extend DO meters further from shore, also a standard operating procedure in areas where wading is not an option.

Standard QA/QC procedures included regular replicate sampling by all monitors, lab splits and lab blanks. Early, mid and end of season split bacteria sample analyses were conducted with Brunswick Wastewater Treatment Plant. Splits showed no significant differences.

### ***Recommendations***

1. Despite better correlation in other programs, Coliscan sample results did not correlate well here with the EPA certified IDEXX E coli tests. **We recommend switching methods to IDEXX although costs are approximately double.**
2. DO sampling method results are quite similar. **While use of a DO meter will be very useful for covering many sites in a short time, the continued use of Winkler Titration is recommended as the program mainstay.** DO meters also have the ability to read Specific Conductivity, but are very costly and can be prone to technical problems. DO meters are typically calibrated by the Winkler Titration method.
3. Mid-stream and shore sampling results are quite similar. The lower Androscoggin is well mixed. Shore sampling is much quicker and safer for volunteers. **In the interests of speed and safety we recommend using only shore sampling since results are not affected.**
4. Distribution of sampling sites provided excellent and improved coverage of the study area. Excluding the two mooring sites there are two sites in tidewater above Merrymeeting Bay at Pleasant Point. There are three sites in the impoundment between the Brunswick-Topsham and Pejepscot dams and two sites in the short impoundment between Pejepscot and Worumbo dams. Durham Boat Launch remains the lower most site between Worumbo and Lewiston Falls. FOMB has one more DO monitor in the Lewiston area (Auburn Boat Launch-2009 DO values ranged from 7.6 in September to 11.6 in October averaging 9.6 overall) and the Androscoggin River Association is sampling at several sites in that area for DO and bacteria. **We recommend continued monitoring of DO and *E. coli* at DBL, PBL, FPU, FPD, BIL, BCP, BWS and BBB.**
5. Sampling bi-weekly does not seem to provide necessary meaningful data and strains the volunteer monitoring network. **Our recommendation is to drop back to the original monthly sampling schedule (plus unusual rain or drought events) while maintaining the increased number of stations noted in # 4.**
6. October data from 2008 and 2009 (not included here) give some indication that termination of chlorination by treatment plants at the end of September could adversely

affect bacteria levels in October. **Considering these data combined with increased late season recreational use of the cleaner river and increased air temperatures, we recommend extending wastewater chlorination procedures through October.**

7. Data show rain events to be largely responsible for breaches of classification standards. **We recommend the accelerated use of Best Management Practices and system upgrades to properly deal with the adverse affects of CSOs.**
8. Intense data gathering and results from 2009 support earlier water quality data gathered in previous years by FOMB on the lower Androscoggin. Excluding heavy precipitation events, data show excellent compliance with Class B standards. There are only occasional samples not meeting Class B criteria and these could indicate unusual anthropogenic sources (i.e. mechanical failure or spill) or as was the case in 2009, record high temperatures. As we noted to the Board on 10/2/08:

“The water quality of the Androscoggin sections proposed for an upgrade, exceed the current classification and meet those of Class B. This request to upgrade from C to B is supported by the State antidegradation policy as quoted below:

38 M.R.S.A. § 464 (F) (4)

*“When the actual quality of any classified water exceeds the minimum standards of the next highest classification, that higher water quality must be maintained and protected. The board **shall recommend** to the Legislature that water be reclassified in the next higher classification.”*

Clean rivers enhance the local economy and vitality of the communities surrounding them. A clean, healthy river attracts people, new businesses, and increases property value. An upgrade of the Androscoggin will not have an adverse impact on current industrial uses along the river since Class B conditions have been met for years in the course of “business as usual.” While higher discharge limits exist for a number of licensees, these artificially high numbers can not be used... to create a ceiling on water quality improvements that prevents reclassification to higher levels already obtained.

In the Department’s own submission guidelines they state:

**“Maine’s Water Quality Classification System is goal-based. When proposing an upgrade in classification, recommend waters that either presently attain or with reasonable application of improved treatment or Best Management Practices (BMPs), could reasonably be expected to attain, the standards and criteria of a higher proposed class.”**

Intense sampling of the lower Androscoggin in 2009 shows water conditions meet Class B standards nearly all of the time. Analyzed data support an upgrade. **We recommend an upgrade of water quality classification from Class C to Class B for the lower Androscoggin between Worumbo Dam and Merrymeeting Bay.**

### ***Acknowledgements***

This work could not have been done without the assistance of many. Thanks to volunteer monitors and laboratory analysts: Sarah Cowperthwaite, Ed Friedman, Misty Gorski, Lin

Hutchins, Ruth Innes, Kathleen McGee, Nancy Murphy, Diane and Douglas Richmond, and Kermit Smyth.

Thanks also to John Lichter and the Bowdoin College Environmental Studies department for lab space, Frank McVey, Jennifer Nicholson, and Greg Thulen of the Brunswick Sewer District (wastewater treatment plant) for cooperating on QA/QC, property owner Josh Francis for access at BIL, Chet Gillis and Steve Pelletier for mooring placement, Marine Warden Dan Devereaux for BCM access, Sandra Salazar of Applied Biomonitoring for analyses and reporting, Peter Milholland and Friends of Casco Bay for recurrent training, Jeff Varricchione, Mary Ellen Dennis, Lisa Vickers and Michele Windsor of the DEP for VRMP training and QAPP (or SAP-Sampling & Analysis Plan) preparation, Dave Jefferson at IDEXX and finally, Bath Savings Institution for funding our IDEXX Colilert system.

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***Appendices:***

1. Legislation –LD330 Section 24
2. Location Map-Lower Androscoggin River (with sample sites)
3. Location Map-Google Earth aerial
4. USGS 2009 Androscoggin Flows-Auburn
5. USGS 2009 Kennebec Flows-North Sidney
6. Portland weather data-National Weather Service
7. DEP/FOMB Sampling Analysis Plan (available in H2O quality section of FOMB web Cybary)

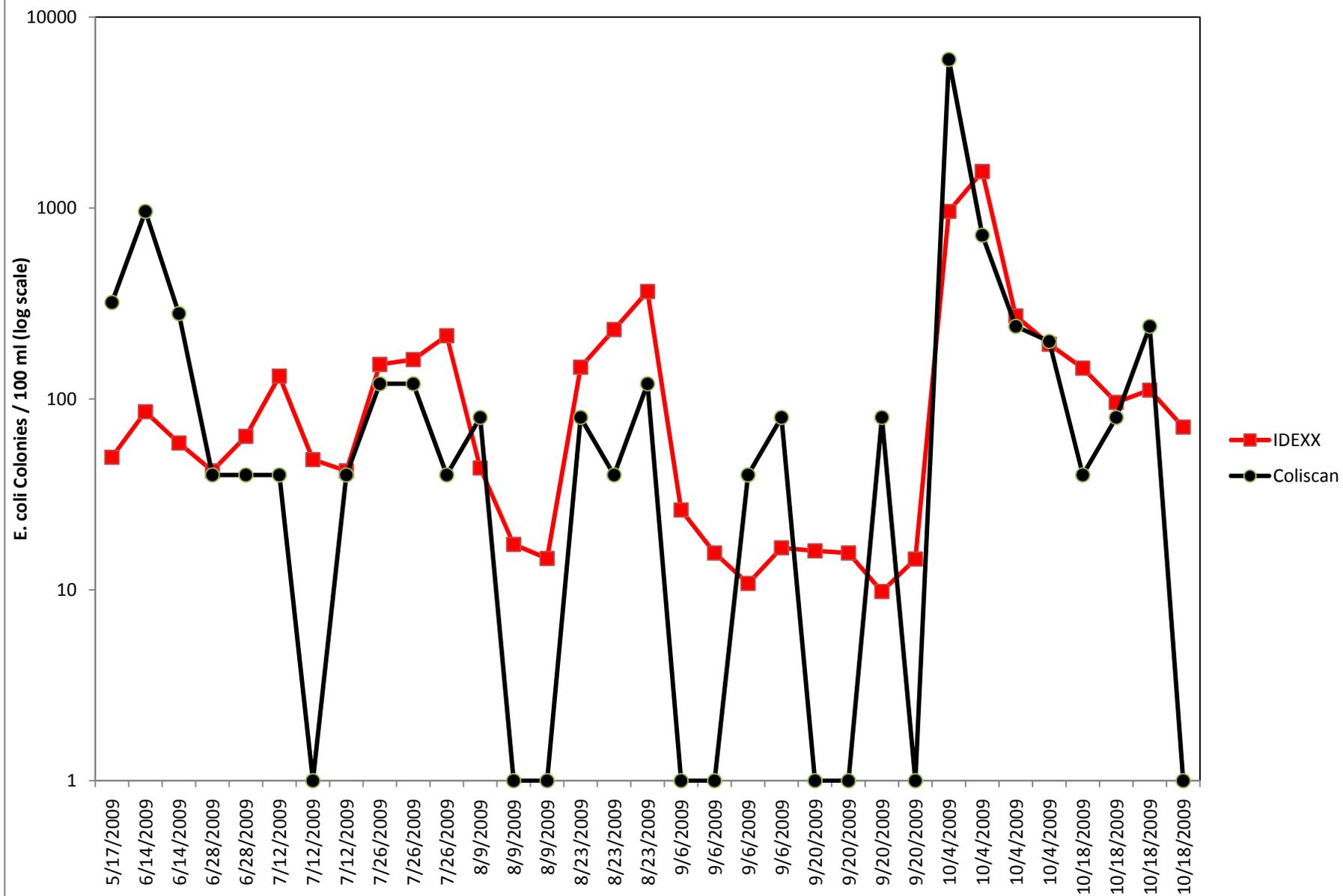
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Lower Androscoggin River**

**Final Graphs & Tables**

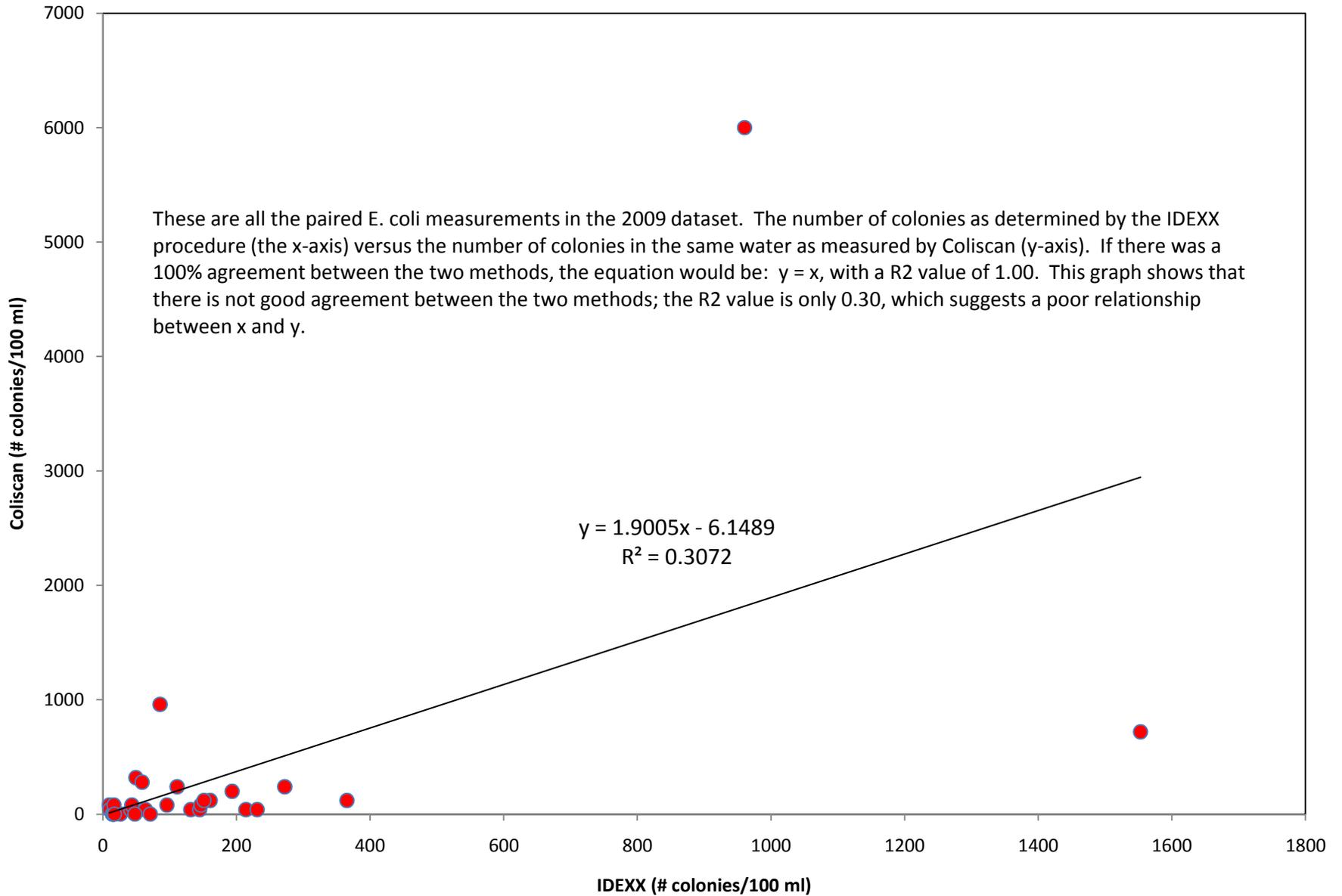
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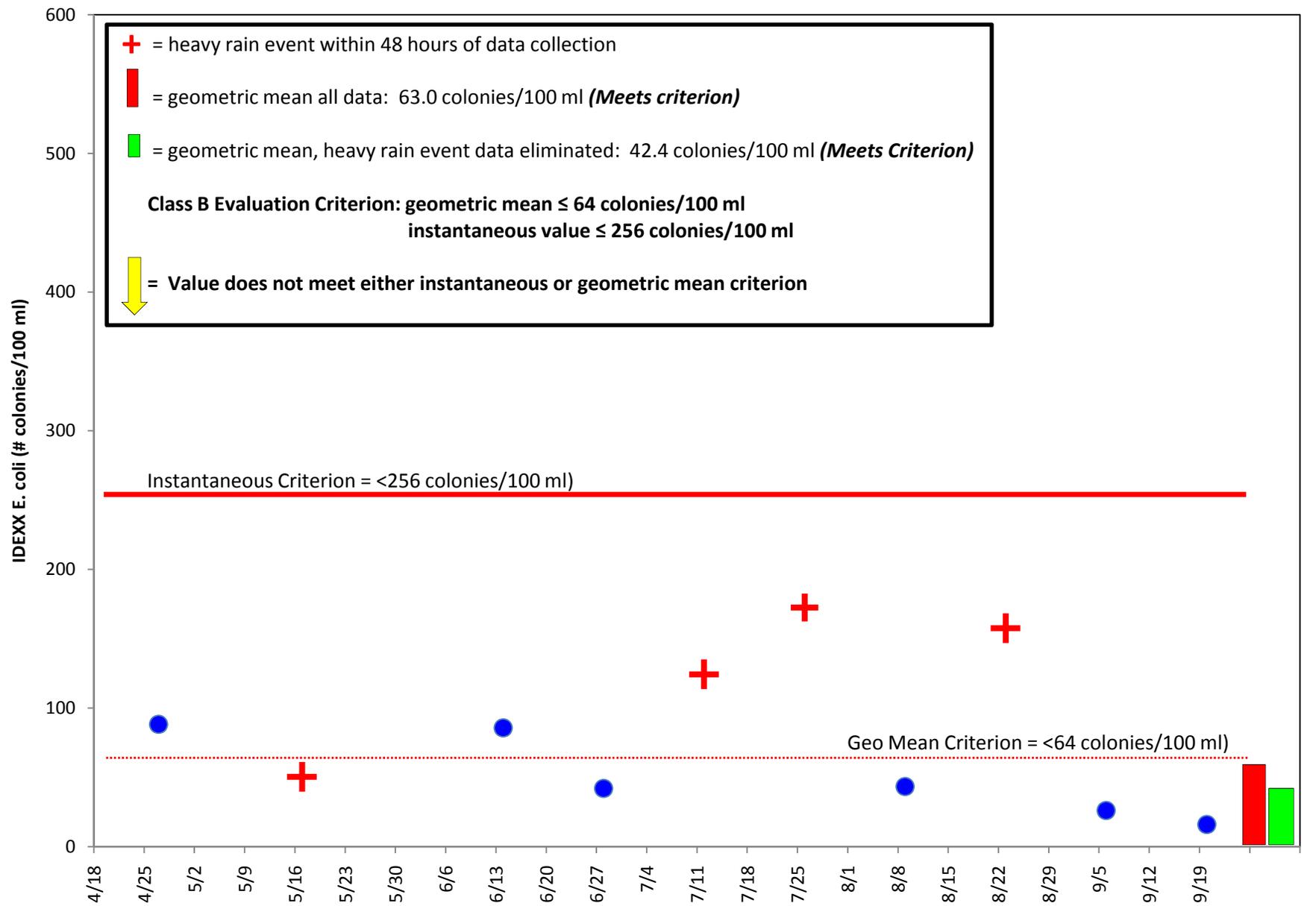
### Lower Androscoggin River 2009: IDEXX vs Coliscan (all data)



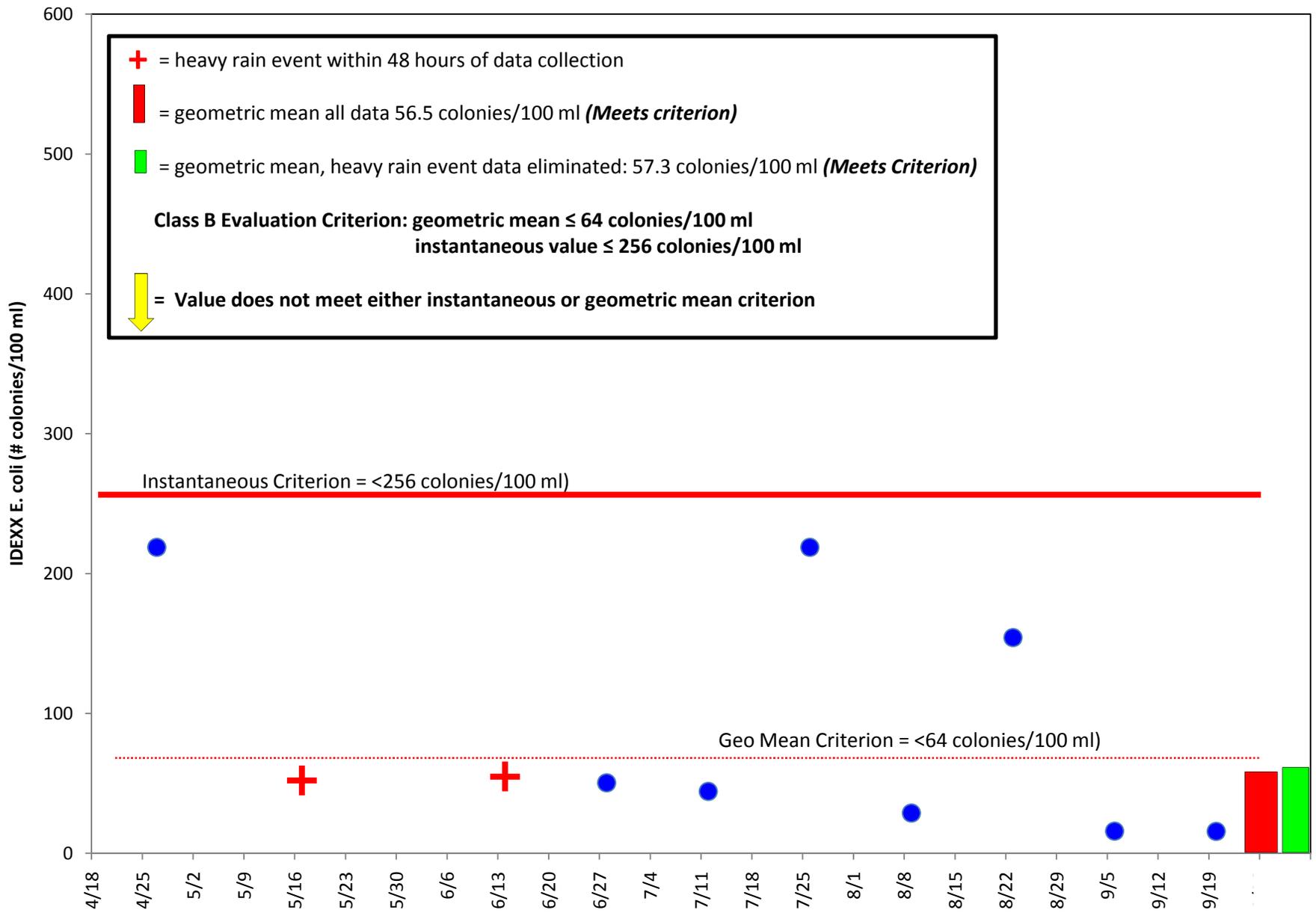
## Lower Androscoggin River 2009: E. coli data IDEXX vs Coliscan



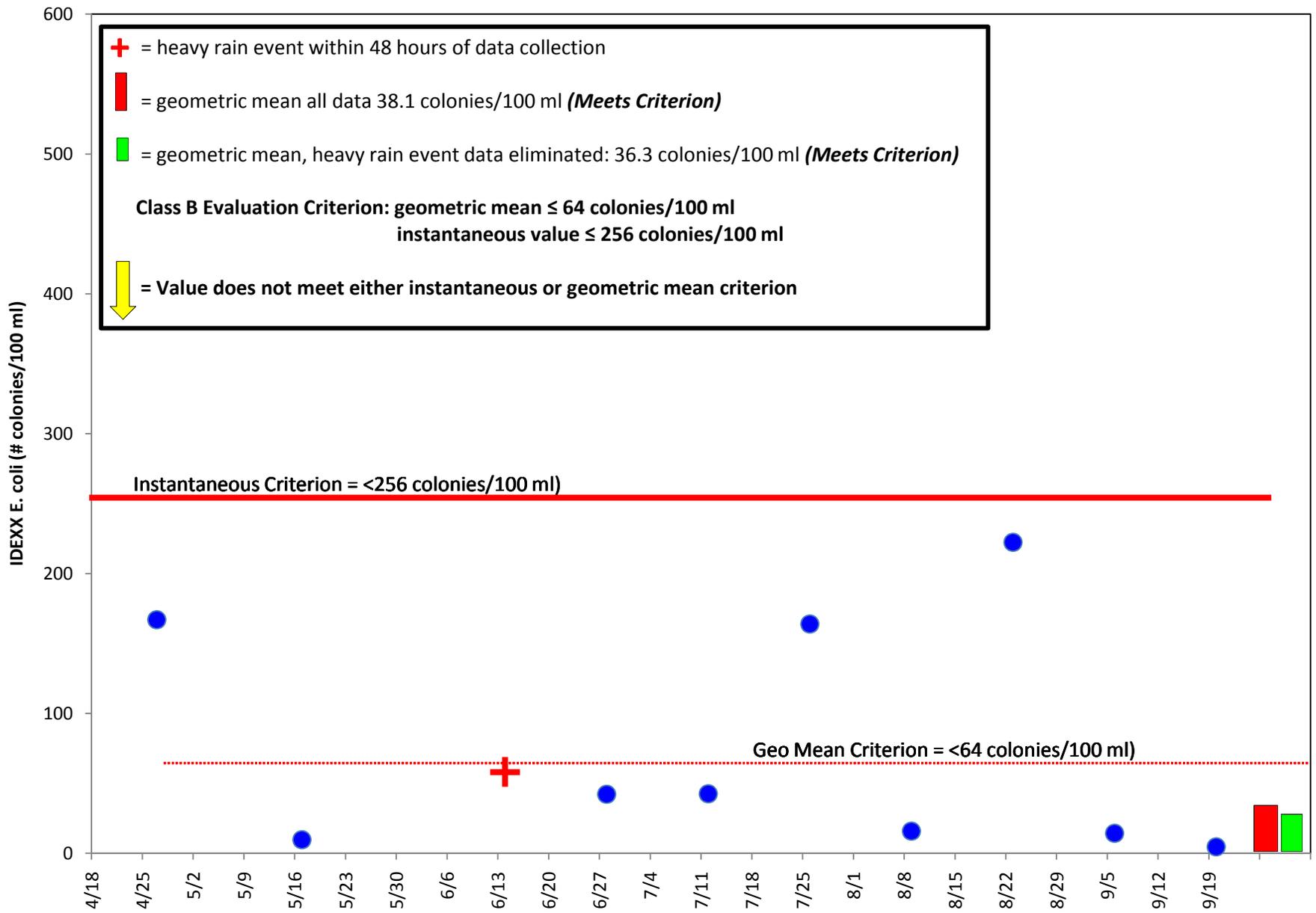
## Lower Androscoggin River 2009 *E. coli* (IDEXX) - Durham Boat Launch (Apr - Sep)



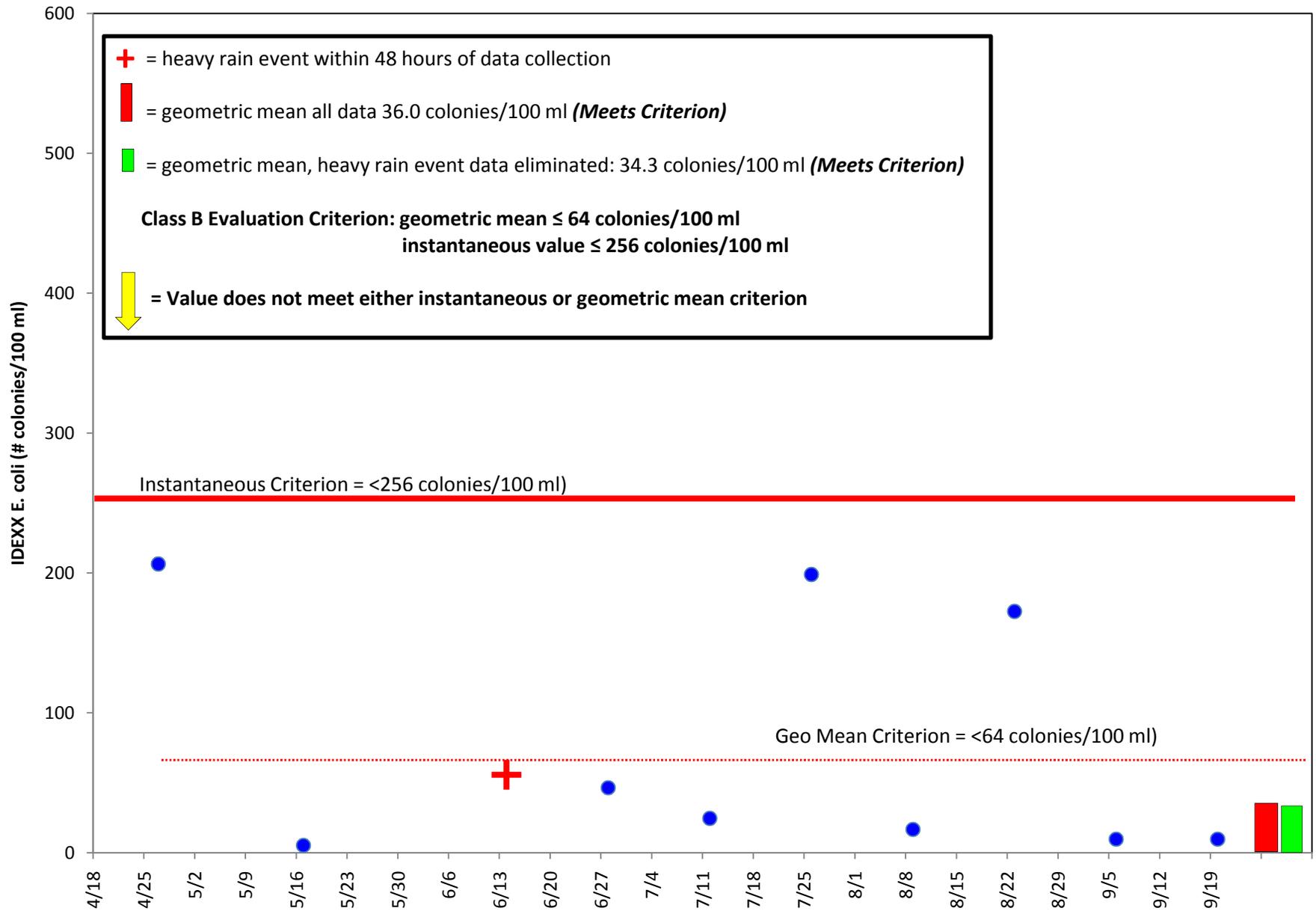
## Lower Androscoggin River 2009 *E. coli* (IDEXX) - Pejepscot Boat Launch (Apr - Sep)



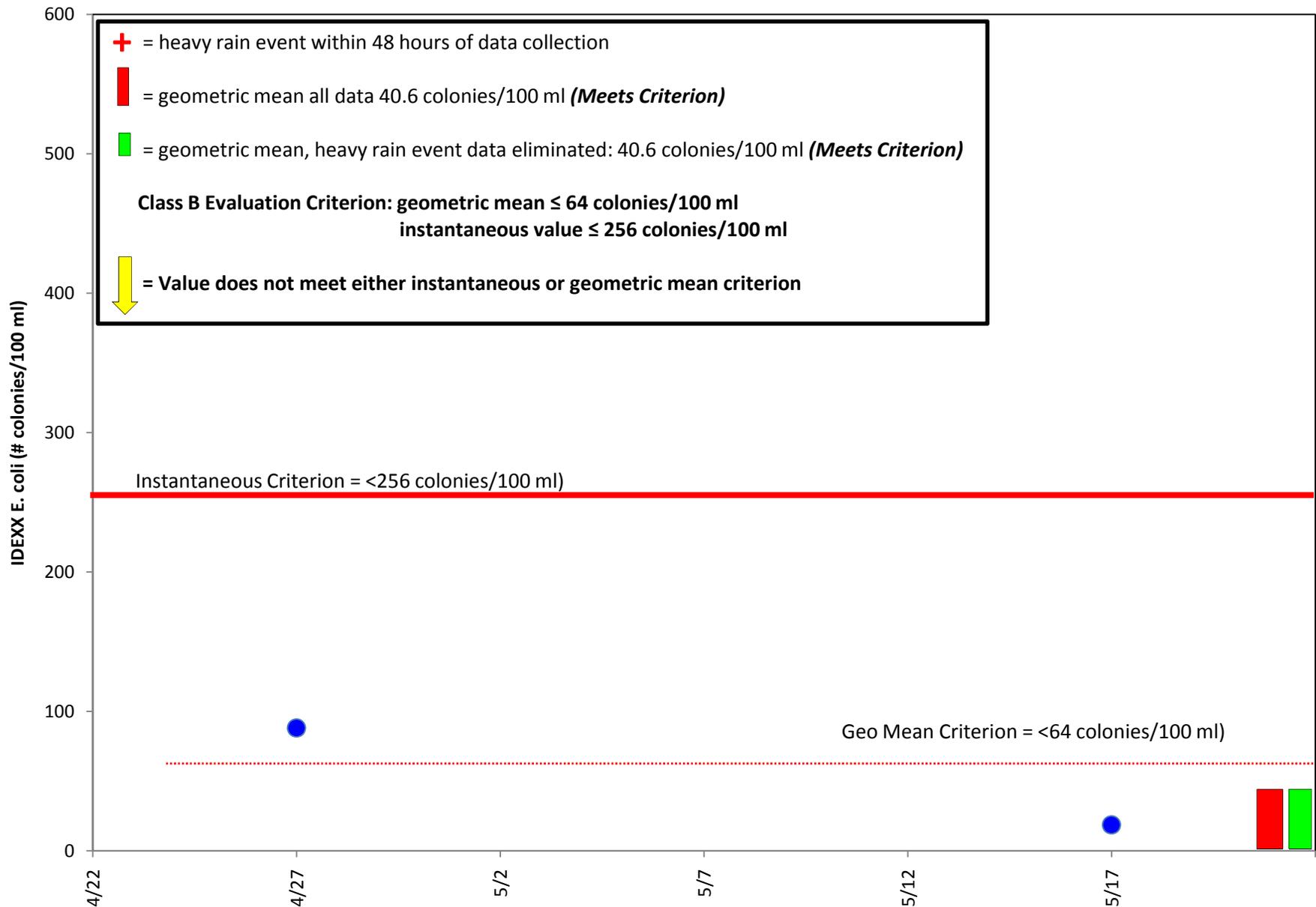
## Lower Androscoggin River 2009 E. coli (IDEXX) - Fish Park Above Dam (Apr - Sep)



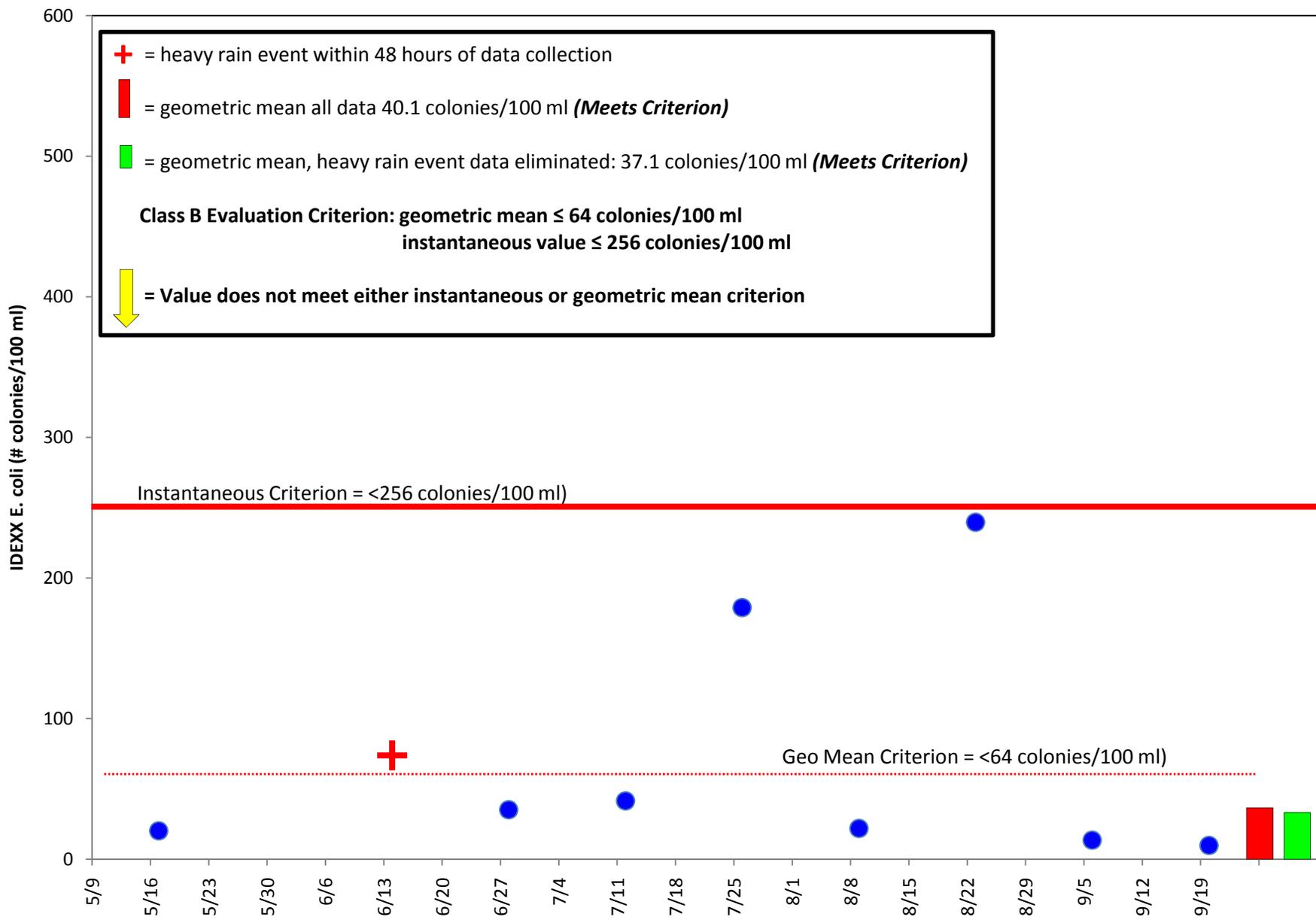
## Lower Androscoggin River 2009 *E. coli* (IDEXX) - Fish Park Below Dam (Apr - Sep)



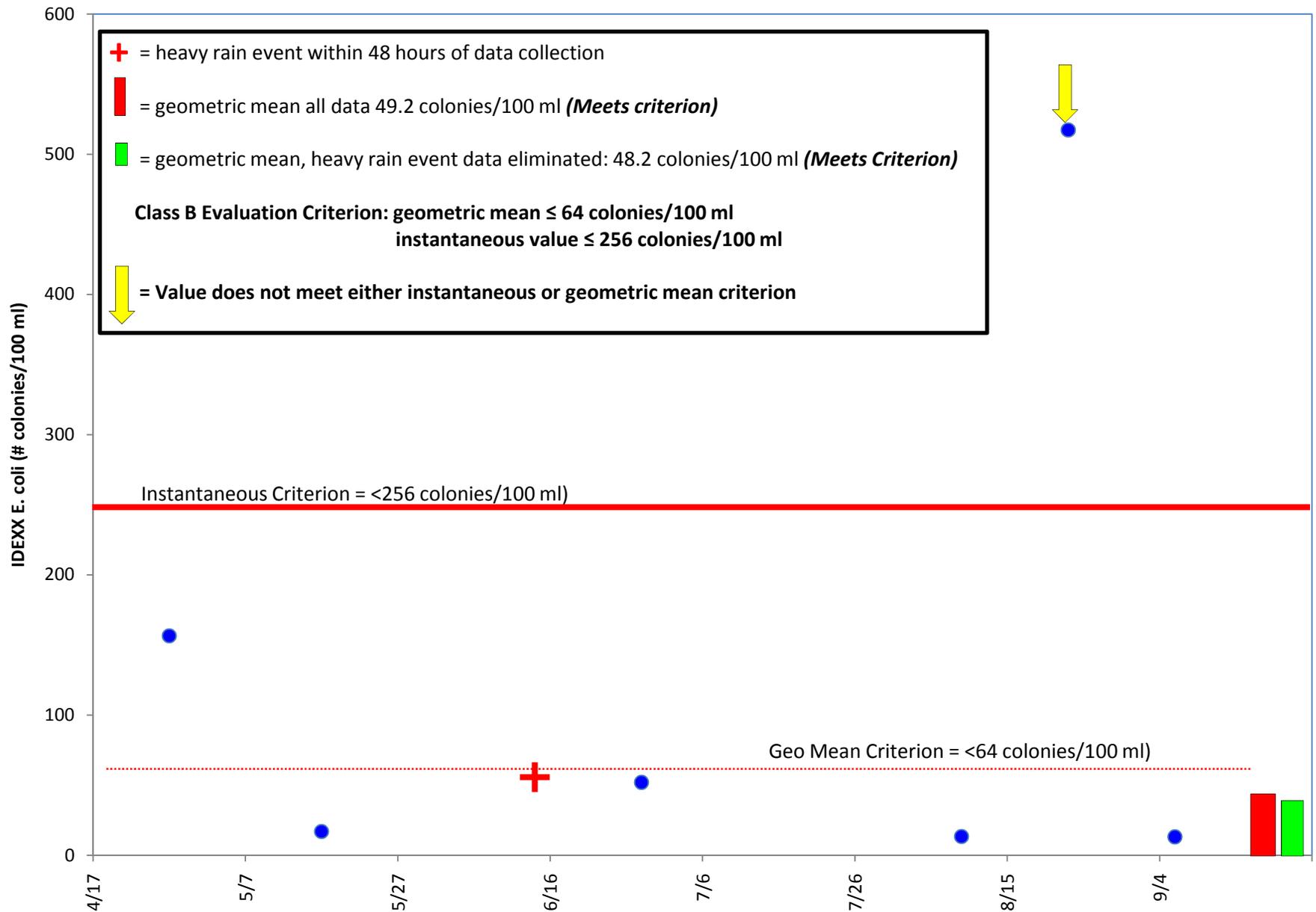
## Lower Androscoggin River 2009 *E. coli* (IDEXX) - Brunswick Water Works (Apr - Sep)



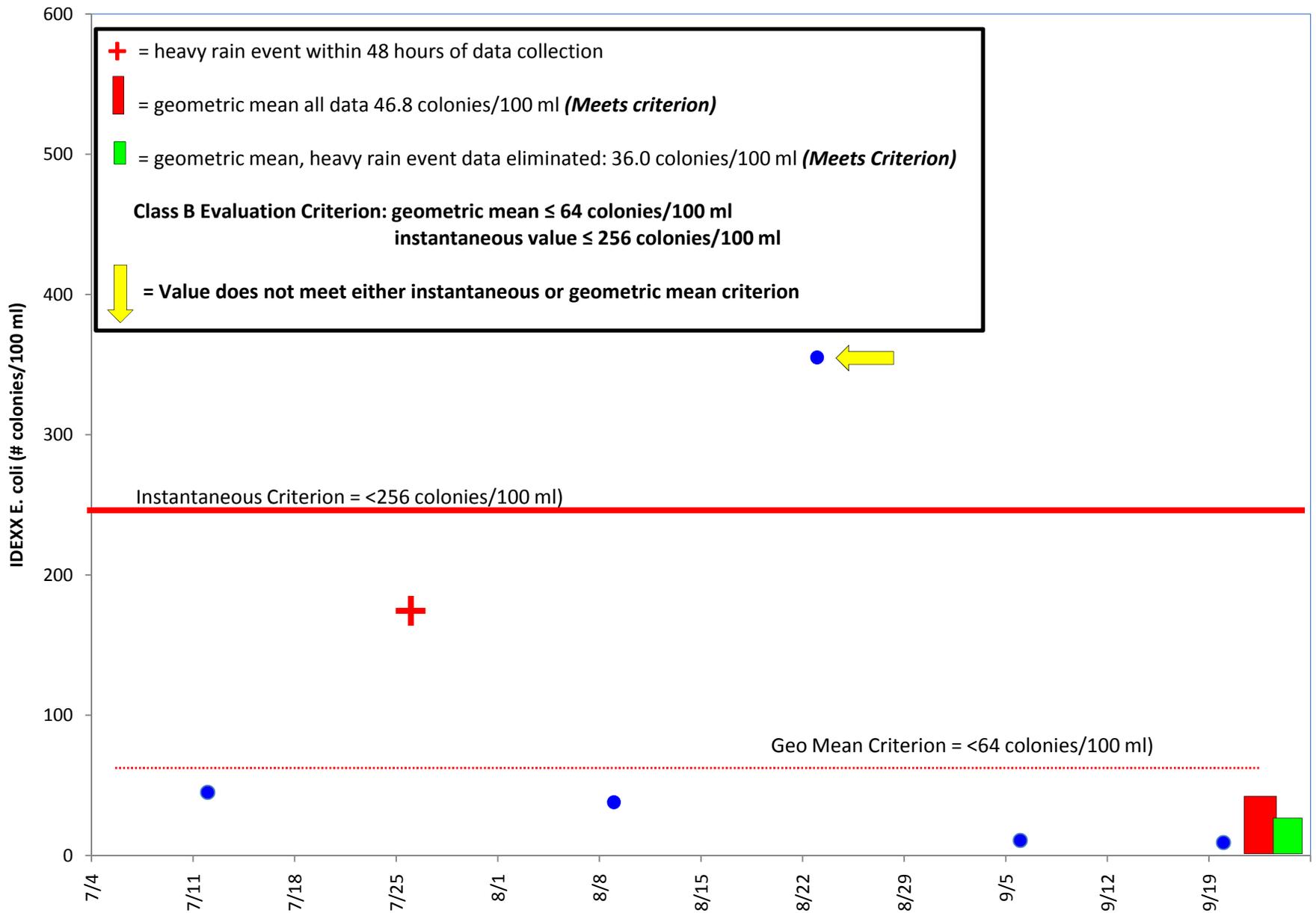
## Lower Androscoggin River 2009 *E. coli* (IDEXX) - Brunswick Interstate Ledges (Apr - Sep)



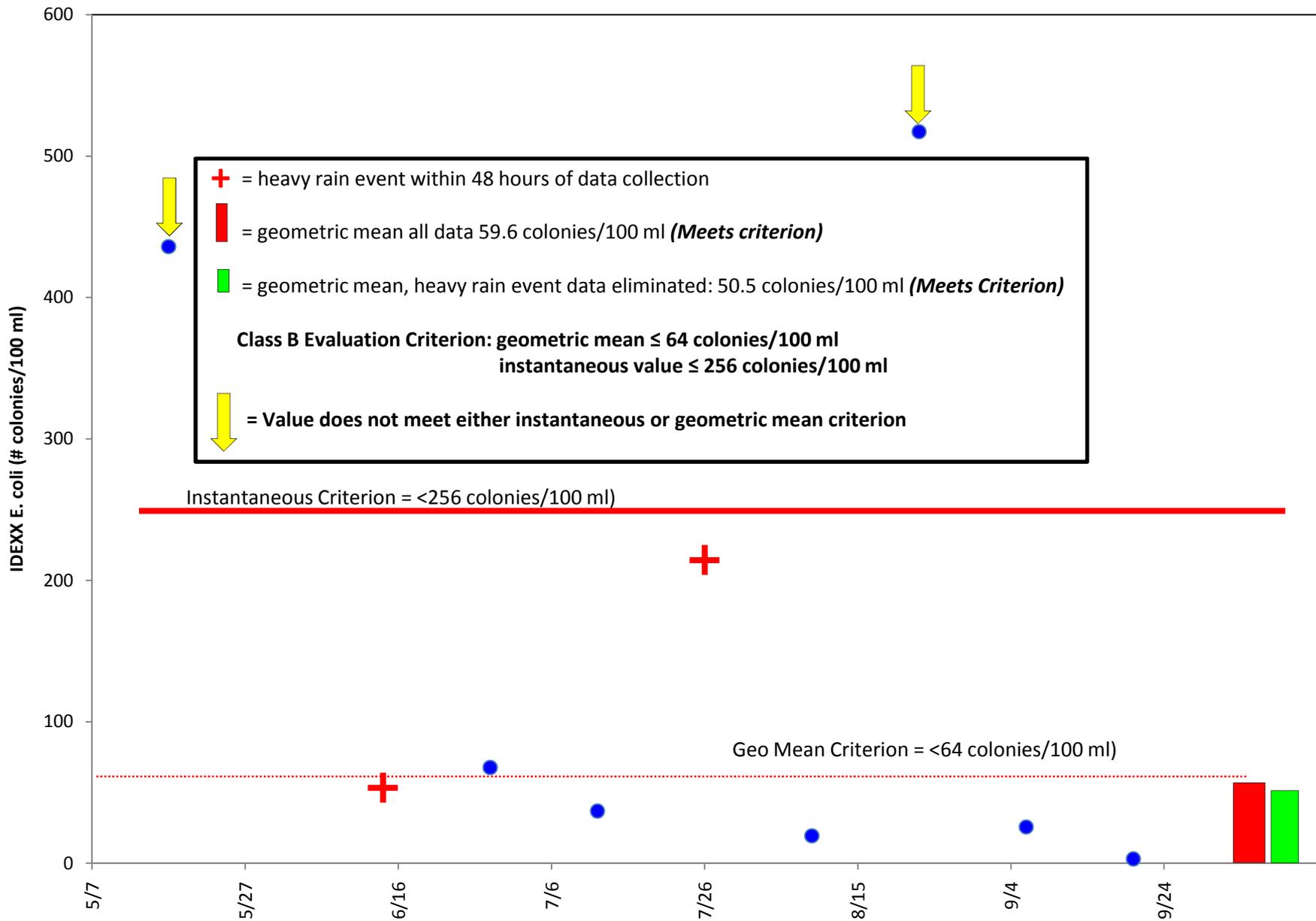
## Lower Androscoggin River 2009 *E. coli* (IDEXX) - Brunswick Canoe Portage (Apr - Sep)



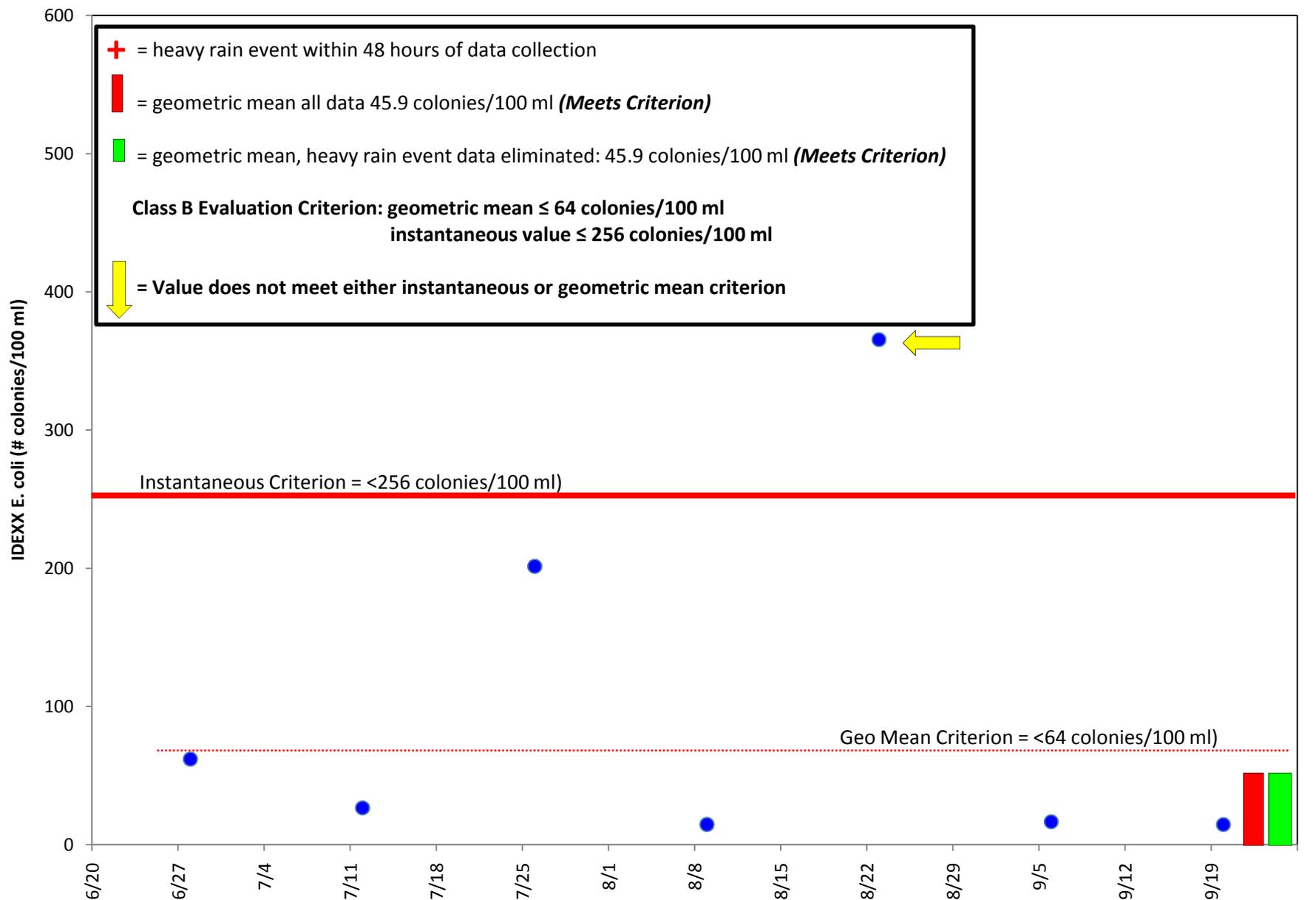
## Lower Androscoggin River 2009 *E. coli* (IDEXX) - Brunswick Canoe Mooring (Apr - Sep)



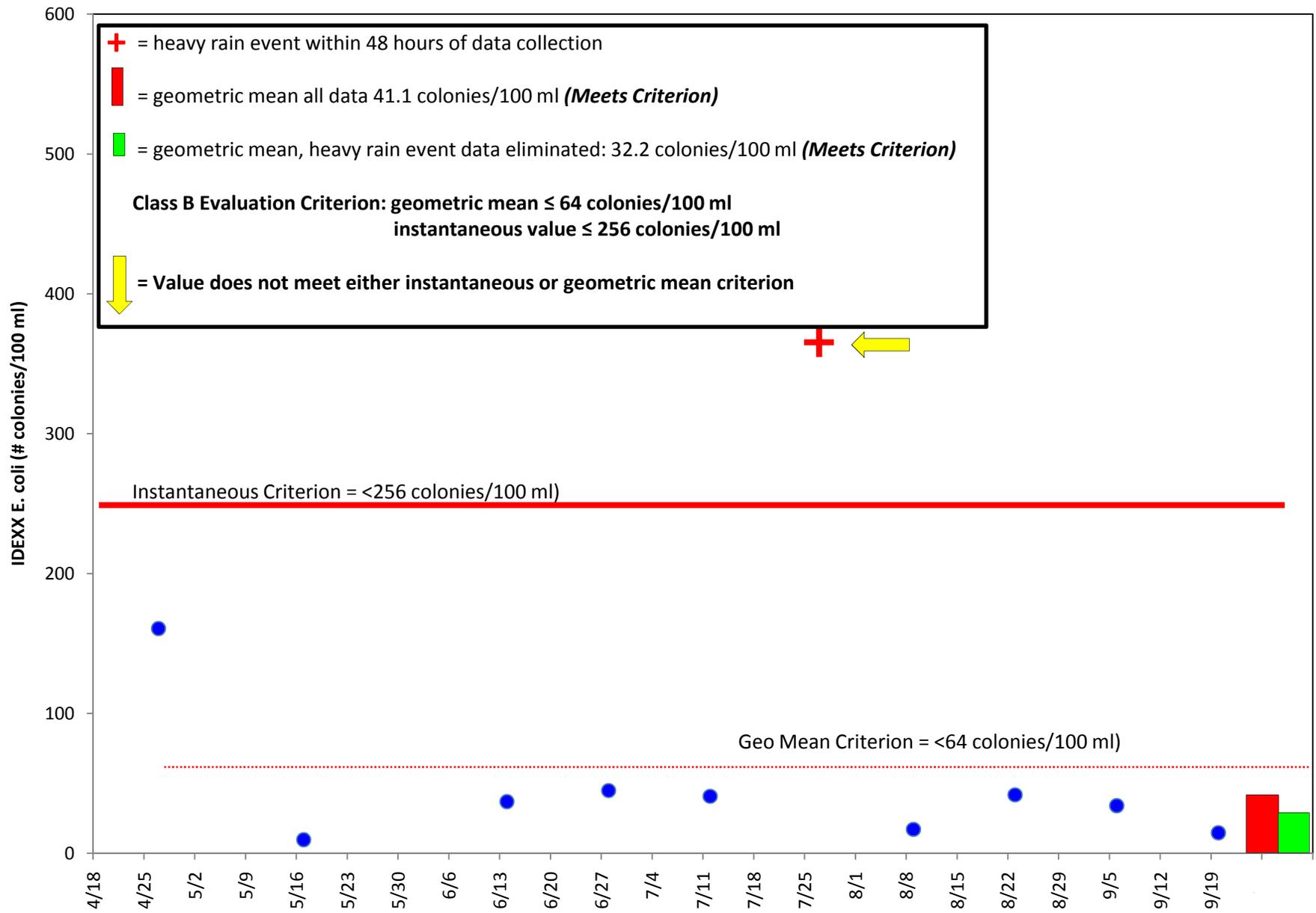
### Lower Androscoggin River 2009 *E. coli* (IDEXX) - Bruns Water St. Boat Launch (Apr - Sep)



## Lower Androscoggin River 2009 *E. coli* (IDEXX) - Water St. Mooring (Apr - Sep)



## Lower Androscoggin River 2009 *E. coli* (IDEXX) - Brunswick Bay Bridge (Apr - Sep)



**Lower Androscoggin River 2009 E.coli**  
**Class B Criterion: geomean  $\leq$  64 colonies/ml; instantaneous  $\leq$  256 colonies/ml**  
 (\* = value not used; taken during heavy rain event)

<span style="background-color: yellow;">■</span> = does not meet criterion; out of compliance				IDEXX <i>E. coli</i> (colonies/100 ml)			Coliscan <i>E. coli</i> (colonies/100 ml)		Temp		Notes
Date	Sample Time	Weather	Adversities (precip last 48 hrs)	All Data (Mean of Reps)	Replicate Data	Heavy Rain Data Excluded	All Data	Heavy Rain Data Excluded	Air (C°)	Water (C°)	
<b>Durham Boat Launch</b>											
4/27/2009	9:00 AM	overcast	P-low	88.25	83.3, 93.2	88.25					
5/17/2009	8:00 AM	dournour	P-heavy	50.4		*					
6/14/2009	8:10 AM	dournour	P-moderate	85.7		85.7	960	960			
6/28/2009	7:55 AM	overcast	P-low	42		42	40	40	16.5	18.5	
7/12/2009	8:00 AM	overcast	P-heavy	124.3	131.7, 116.9	*	40	*	16	17	heavy rain previous night
7/26/2009	7:35 AM	fog/haze	P-heavy	172.5	151.5, 193.5	*	120	*	17.5	19.5	heavy rain two nights before sample
8/9/2009	8:00 AM	clear		43.5		43.5	80	80	13.5	20.5	
8/23/2009	7:55 AM	clear	P-heavy, B	157.6		*			22.5	24	3 boats launched before sample
9/6/2009	8:00 AM	clear	B	26.2		26.2	1	1	11	18	boats
9/20/2009	8:00 AM	clear		16		16	1	1	6	15.5	
<b>DBL Geometric mean</b>				<b>63.01</b>		<b>42.38</b>	<b>28.36</b>	<b>19.84</b>			
<b>Pejepscot Boat Launch</b>											
4/27/2009	8:45 AM	overcast	P-low	218.7		218.7					
5/17/2009	10:30 AM	overcast	P-heavy	52	49.5, 54.5	*	320	*			
6/14/2009	8:40 AM	drizzle	P-heavy	54.8		*					
6/28/2009	8:35 AM	overcast	P-low	50.4		50.4			17.5	19.3	
7/12/2009	7:00 AM	overcast	P-low	44.25	48.1, 40.4	44.25	1	1	16.5	17.6	sampled DO in flow and eddy- same reading
7/26/2009	7:35 AM	overcast	P-moderate	218.7		218.7			18	19.8	DO 1 at .5m; DO 2 at 1m; H2O temp at .5m: 20.1; SC at .5m: 65.4
8/9/2009	6:40 AM	clear		28.8		28.8			13	21.3	
8/23/2009	6:35 AM	clear/overcast		154.15	146.7, 161.6	154.15	80	80	23.6	25.6	air temp from DO meter; bacteria sample by hand direct to bottle- no throw bucket
9/6/2009	6:55 AM	clear		15.8	15.6, 16	15.8	1	1	8	20	lowest water of season, 1m depth
9/20/2009	7:00 AM	clear		15.6		15.6	1	1	4	17	
<b>PBL Geometric mean</b>				<b>56.52</b>		<b>57.33</b>	<b>7.61</b>	<b>2.99</b>			

**Lower Androscoggin River 2009 E.coli**  
**Class B Criterion: geomean  $\leq$  64 colonies/ml; instantaneous  $\leq$  256 colonies/ml**  
 (\* = value not used; taken during heavy rain event)

 = does not meet criterion; out of compliance				IDEXX <i>E. coli</i> (colonies/100 ml)			Coliscan <i>E. coli</i> (colonies/100 ml)		Temp		Notes
Date	Sample Time	Weather	Adversities (precip last 48 hrs)	All Data (Mean of Reps)	Replicate Data	Heavy Rain Data Excluded	All Data	Heavy Rain Data Excluded	Air (C°)	Water (C°)	
<b><i>Fish Park Up [above dam]</i></b>											
4/27/2009	9:25 AM	overcast	P-low	167		167					
5/17/2009	10:55 AM	overcast	P	9.7		9.7					
6/14/2009	8:10 AM	drizzle	P-heavy	58.05	58.8, 57.3	*	280	*			
6/28/2009	8:00 AM	overcast	P-low	42.2		42.2			16.5	19.6	high water; 3'
7/12/2009	7:40 AM	overcast	P-low	42.5		42.5			16.5	17.8	sampling depth - 1m
7/26/2009	8:05 AM	overcast	P-moderate	163.85	160.7, 167	163.85	120	120	18	20.7	WT at surface: 10
8/9/2009	7:10 AM	clear		15.8		15.8			13	21.8	sample at 1m
8/23/2009	7:15 AM	partly cloudy		222.4		222.4			22.2	25.4	N. wind
9/6/2009	7:35 AM	clear		14.2		14.2			11	20.3	1m sample
9/20/2009	7:30 AM	clear		4.65	5.2, 4.1	4.65			5	17.6	WT- 8.8
<b>FPU Geometric mean</b>				<b>38.08</b>		<b>36.34</b>	<b>183.30</b>	<b>120.00</b>			
<b><i>Fish Park Down [below dam]</i></b>											
4/27/2009	9:37 AM	overcast	P-low	206.4		206.4					
5/17/2009	11:15 AM	overcast	P-low	5.2		5.2					
6/14/2009	8:00 AM	overcast	P-heavy	55.7		*					
6/28/2009	7:45 AM	overcast	P-low	46.4		46.4			16.2	19.5	high water
7/12/2009	7:50 AM	overcast	P-low	24.6		24.6			16.4	17.8	sampling depth- .5m
7/26/2009	8:25 AM	fog/haze	P-moderate	198.9		198.9			18.5	20.6	sample at .5m
8/9/2009	7:25 AM	clear		16.65	17.3, 16	16.65	1	1	12.5	21.7	WT Surface: 8.2, 8.6, 8.8
8/23/2009	7:25 AM	overcast		172.5		172.5			23.3	25.4	no waves
9/6/2009	7:50 AM	clear		9.7		9.7			11.5	20.7	.5m sample depth
9/20/2009	7:45 AM			9.7		9.7			5	17.5	
<b>FPD Geometric mean</b>				<b>36.01</b>		<b>34.31</b>	<b>1.00</b>	<b>1.00</b>			

**Lower Androscoggin River 2009 E.coli**  
**Class B Criterion: geomean  $\leq$  64 colonies/ml; instantaneous  $\leq$  256 colonies/ml**  
 (\* = value not used; taken during heavy rain event)

<span style="background-color: yellow;">■</span> = does not meet criterion; out of compliance				IDEXX <i>E. coli</i> (colonies/100 ml)			Coliscan <i>E. coli</i> (colonies/100 ml)		Temp		Notes
Date	Sample Time	Weather	Adversities (precip last 48 hrs)	All Data (Mean of Reps)	Replicate Data	Heavy Rain Data Excluded	All Data	Heavy Rain Data Excluded	Air (C°)	Water (C°)	
<b>Bruns. Water Works</b>											
4/27/2009	9:55 AM	overcast	P-low	88.2		88.2					
5/17/2009	11:45 AM	overcast	P-low	18.7		18.7					
<b>BWW Geometric mean</b>				<b>40.61</b>		<b>40.61</b>					
<b>Bruns. Interstate Ledges</b>											
5/17/2009	12:15 PM	overcast	P	20.1		20.1					
6/14/2009	7:25	drizzle	P-heavy	73.8		*					
6/28/2009	7:20 AM	overcast	P-low	35.1	39.3, 30.9	35.1			16.5	19.6	
7/12/2009	8:10 AM	overcast	P-low	41.4		41.4			18.5	17.85	
7/26/2009	8:40 AM	fog/haze	P-moderate	178.9		178.9			18.5	20.6	small amount of foam across river; readings taken at .5m and 1m. Results the same
8/9/2009	7:55 AM	clear		21.8		21.8			14.5	21.7	light foam; low water
8/23/2009	7:50 AM	partly cloudy		239.55	231, 248.1	239.55	40	40	23.1	25.4	low water
9/6/2009	8:10 AM	clear		13.5		13.5			13	20.3	1m sample depth
9/20/2009	8:30 AM	clear		9.8		9.8			9	17.5	
<b>BIL Geometric mean</b>				<b>40.07</b>		<b>37.13</b>	<b>40.00</b>	<b>40.00</b>			
<b>Bruns. Canoe Portage</b>											
4/27/2009	10:20 AM	overcast	P-low	156.5		156.5					
5/17/2009	12:40 PM	overcast		16.9		16.9			10	13	
6/14/2009	6:53 AM	drizzle	P-heavy	55.7		*			15.6	18.8	
6/28/2009	6:50 AM	overcast	P-low	52		52			16.5	19.6	high water
8/9/2009	7:30 AM	clear		13.4		13.4					
8/23/2009	8:05 AM	overcast		517.2		517.2					in eddy
9/6/2009	8:40 AM	clear		13.1		13.1			13	20.1	.5m depth
<b>BCP Geometric mean</b>				<b>49.18</b>		<b>48.17</b>					

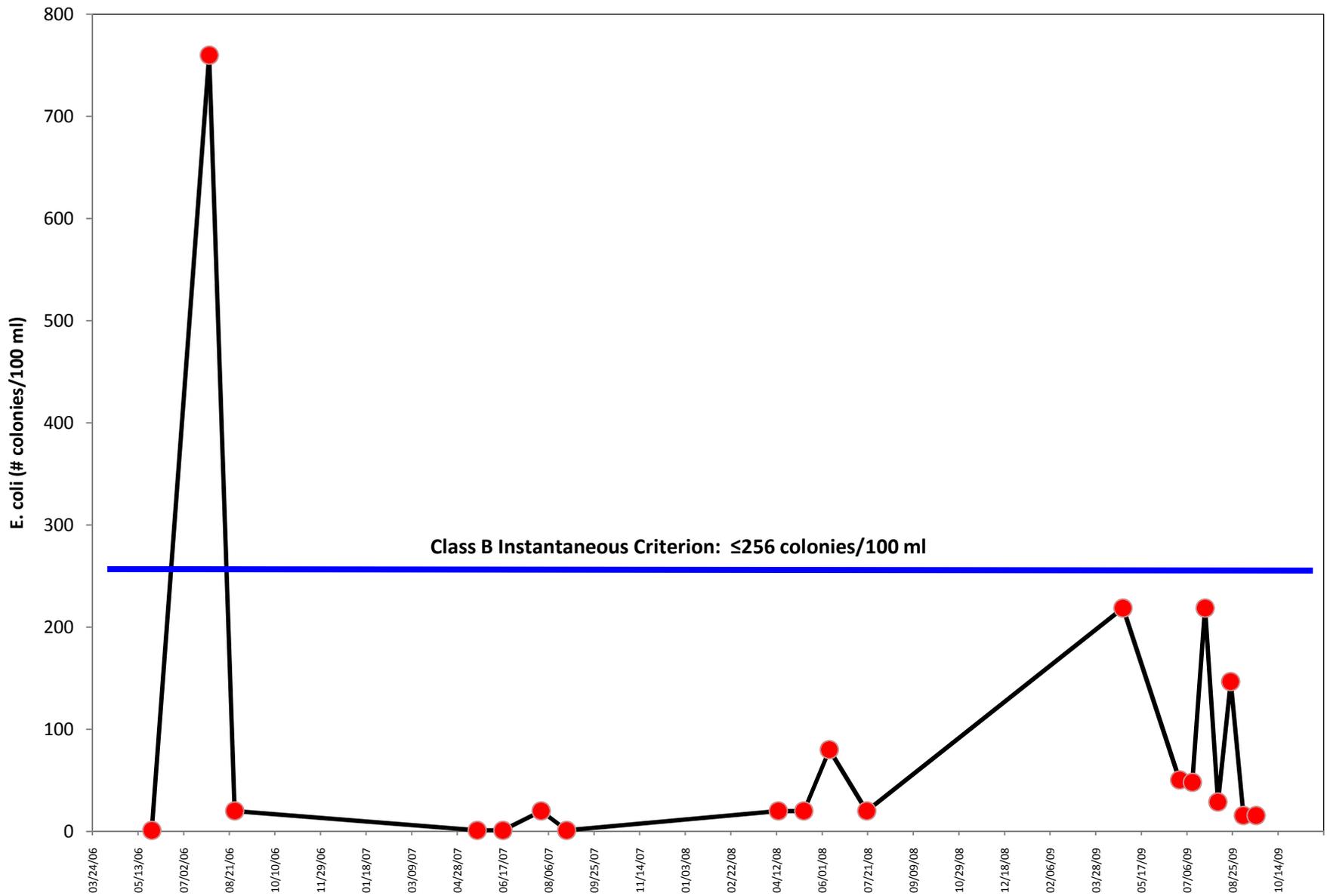
**Lower Androscoggin River 2009 E.coli**  
**Class B Criterion: geomean  $\leq$  64 colonies/ml; instantaneous  $\leq$  256 colonies/ml**  
 (\* = value not used; taken during heavy rain event)

 = does not meet criterion; out of compliance				IDEXX <i>E. coli</i> (colonies/100 ml)			Coliscan <i>E. coli</i> (colonies/100 ml)		Temp		Notes
Date	Sample Time	Weather	Adversities (precip last 48 hrs)	All Data (Mean of Reps)	Replicate Data	Heavy Rain Data Excluded	All Data	Heavy Rain Data Excluded	Air (C°)	Water (C°)	
<b>Bruns. Canoe Mooring [off BCP]</b>											
7/12/2009	7:30 AM	overcast	P-low	45	42, 48	45	40	40		18	bacteria-surface sample 9"
7/26/2009	7:30 AM	overcast	P-heavy	174.45	150, 198.9	*			21	20.8	1 boat and several ducks
8/9/2009	7:30 AM	clear	M, W	38	18.7, 57.3	38			18	21.8	a lot of effluent-very foamy
8/23/2009	8:00 AM	overcast	W	355.1	344.8, 365.4	355.1			24	25	W-ducks
9/6/2009	9:05 AM	clear		10.8		10.8	40	40		20.3	2.5m sample depth
9/20/2009	6:55 AM	clear	W	9.2	9.8, 8.6	9.2	80	80	11.4	17.1	beaver, heron
<b>BCM Geometric mean</b>				<b>46.81</b>		<b>35.98</b>	<b>50.40</b>	<b>50.40</b>			
<b>Bruns. Water St. Boat Launch</b>											
5/17/2009	10:15 AM	overcast	P	436		436					
6/14/2009	9:15 AM	Steady Rain	P-heavy	53.3	28.2, 78.4	*					
6/28/2009	9:35 AM		P-moderate	67.7		67.7			16.7	10	2+ boats
7/12/2009	9:20 AM	overcast	P-moderate	36.9		36.9			14.4	18	2+ boats
7/26/2009	7:55 AM	overcast/fog	P-heavy	214.3		*	40	*	18.3	15.6	boat
8/9/2009	7:40 AM	clear	P-moderate	19.3	23.8, 14.8	19.3			14.4	21	DO- Ed
8/23/2009	8:05 AM	overcast		517.2		517.2					in shore eddy
9/6/2009	7:45 AM	clear		25.6		25.6			8.9	19.9	DO-KMC
9/20/2009	9:20 AM	clear		3		3			11.7		
<b>BWS Geometric mean</b>				<b>59.63</b>		<b>50.48</b>	<b>40.00</b>	<b>na</b>			

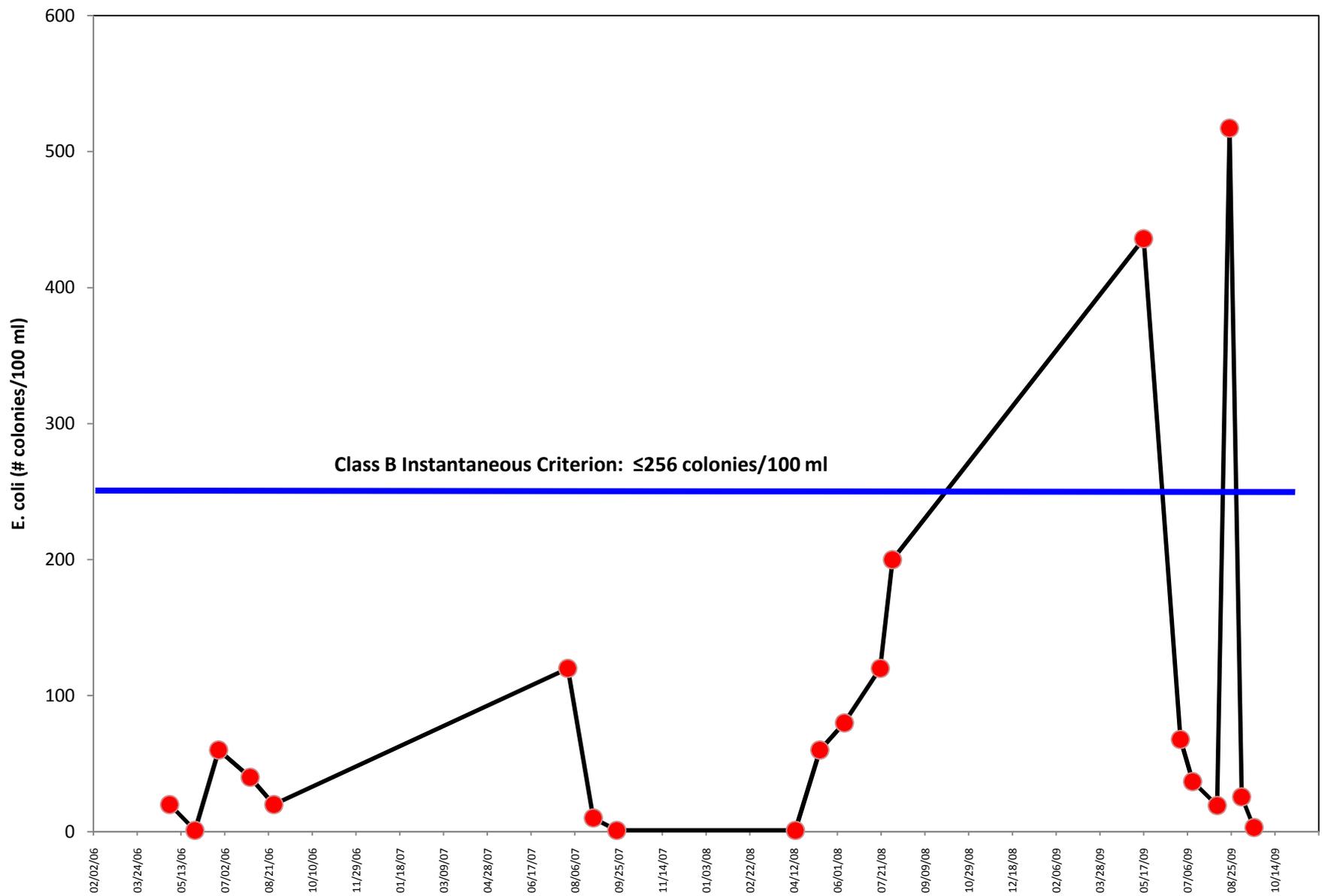
**Lower Androscoggin River 2009 E.coli**  
**Class B Criterion: geomean  $\leq$  64 colonies/ml; instantaneous  $\leq$  256 colonies/ml**  
 (\* = value not used; taken during heavy rain event)

 = does not meet criterion; out of compliance				IDEXX <i>E. coli</i> (colonies/100 ml)			Coliscan <i>E. coli</i> (colonies/100 ml)		Temp		Notes
Date	Sample Time	Weather	Adversities (precip last 48 hrs)	All Data (Mean of Reps)	Replicate Data	Heavy Rain Data Excluded	All Data	Heavy Rain Data Excluded	Air (C°)	Water (C°)	
<b>Water St. Mooring [off BWS]</b>											
6/28/2009	7:50 AM	overcast	P-low	61.95	63.7, 60.2	61.95	40	40		19.4	DO taken at 7' (8.8 DO recorded at shore)
7/12/2009	7:45 AM	overcast	P-low	26.6		26.6				17.9	sample at 7'
7/26/2009	8:40 AM	fog/haze	P-moderate	201.4		201.4				20.5	WT at surface: 8.4, 8.4, 8.6; DO meter at surface: 8.5
8/9/2009	7:50 AM	clear		14.6		14.6	1	1		21.8	
8/23/2009	7:55 AM			365.4		365.4	120	120		25.3	
9/6/2009	8:00 AM	clear		16.6		16.6	80	80		20.4	2.5m sample depth
9/20/2009	7:59 AM	clear		14.5		14.5	1	1	11.4	17.6	
<b>WSM Geometric mean</b>				<b>45.85</b>		<b>45.85</b>	<b>13.09</b>	<b>13.09</b>			
<b>Brunswick Bay Bridge</b>											
4/27/2009	10:50 AM	clear	P-low	160.7		160.7					
5/17/2009	10:00 AM	drizzle	P-low	9.7		9.7					High Tide
6/14/2009	8:00 AM	drizzle	P-moderate	36.9		36.9					
6/28/2009	8:50 AM	overcast	P-moderate	44.8		44.8				18.6	
7/12/2009	8:40 AM	overcast	P-moderate	40.8		40.8				17.7	
7/27/2009	8:20 AM	overcast	P-high	365.4		*					
8/9/2009	7:00 AM			17.1		17.1				20.9	bacteria sample taken at 1:50pm
8/23/2009	7:20 AM			41.8	40.8, 42.8	41.8				25	
9/6/2009	7:10 AM	clear		34.05	34.5, 33.6	34.05				19.7	.5 m sample
9/20/2009	7:25 AM	clear		14.6		14.6			12.2	17.5	
<b>BBB Geometric mean</b>				<b>41.07</b>		<b>32.21</b>	<b>#NUM!</b>	<b>#NUM!</b>			

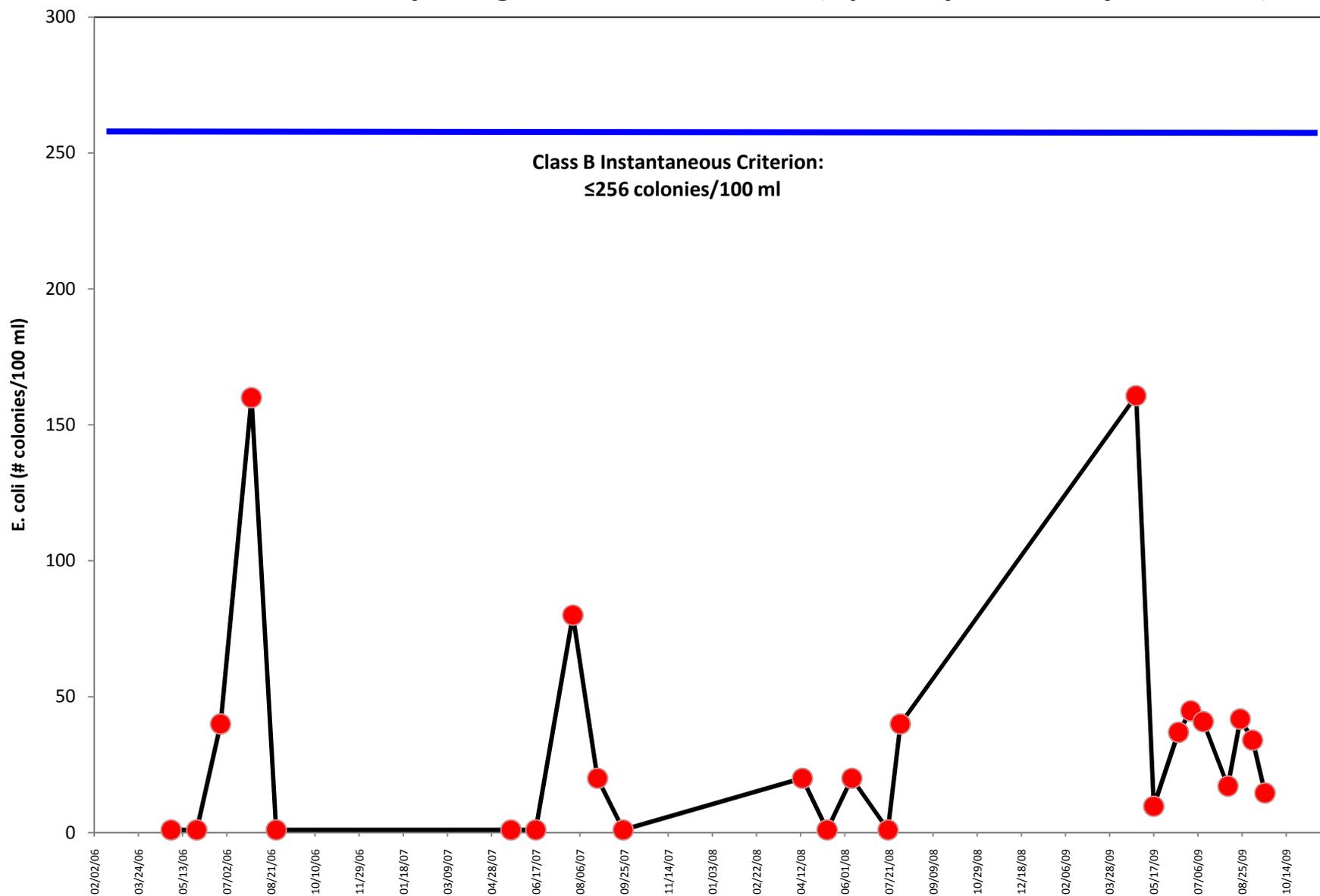
Pejepscot Boat Landing *E. coli* 2006 - 2009 (Apr - Sep; no heavy rain data)



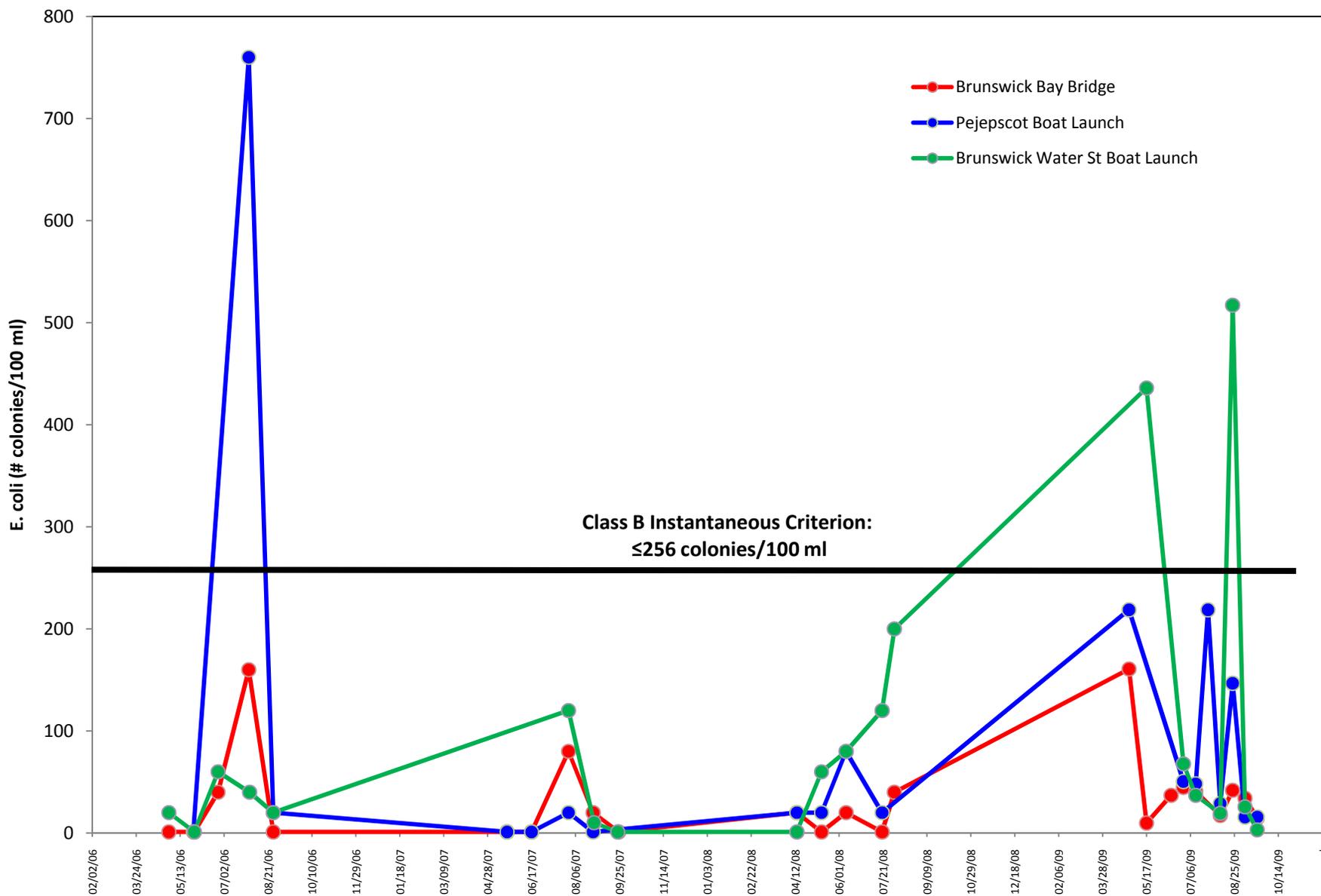
**Brunswick Water Street Boat Launch *E. coli* 2006 - 2009 (Apr - Sep; no heavy rain data)**



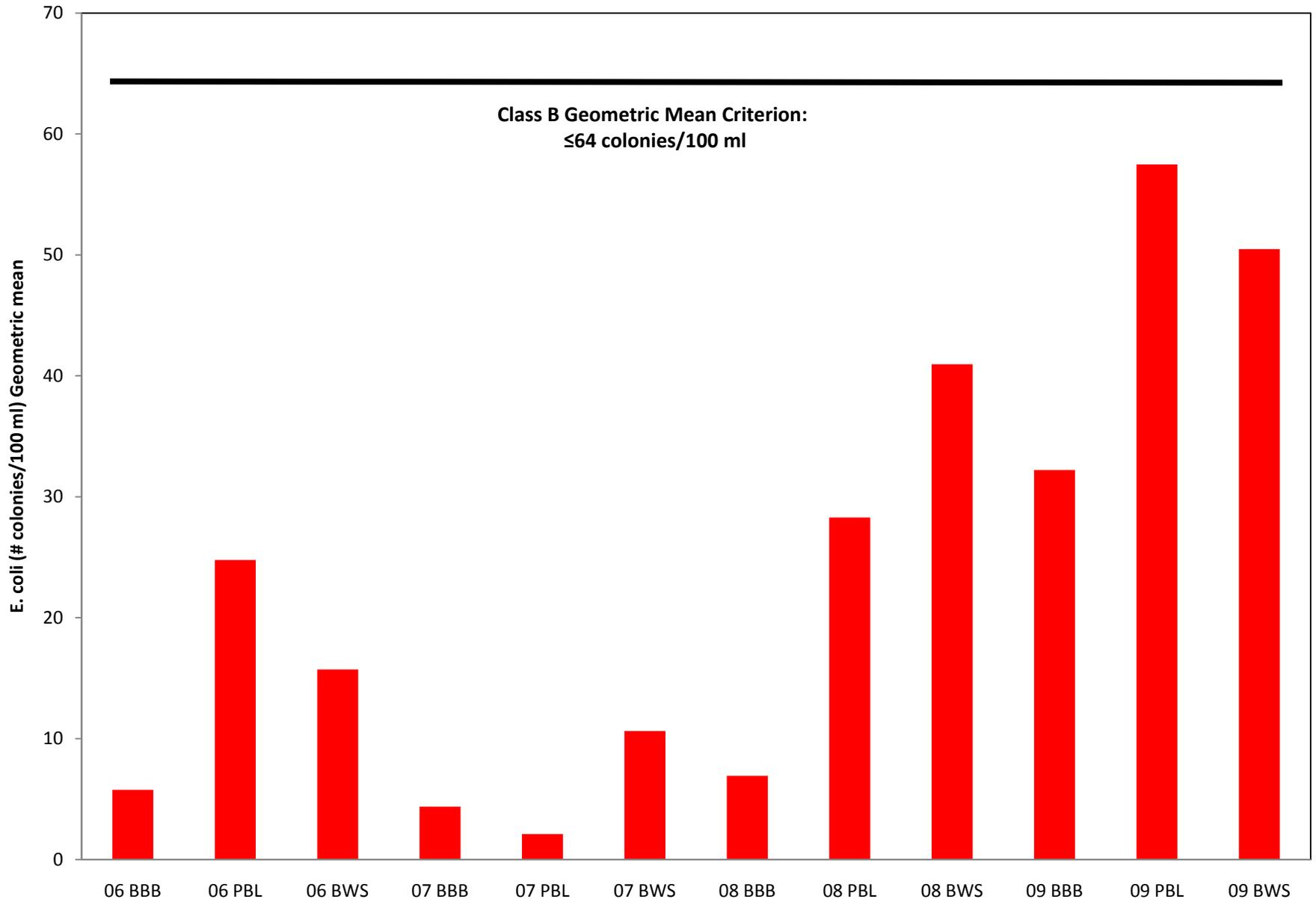
### Brunswick Bay Bridge *E. coli* 2006 - 2009 (Apr - Sep; no heavy rain data)



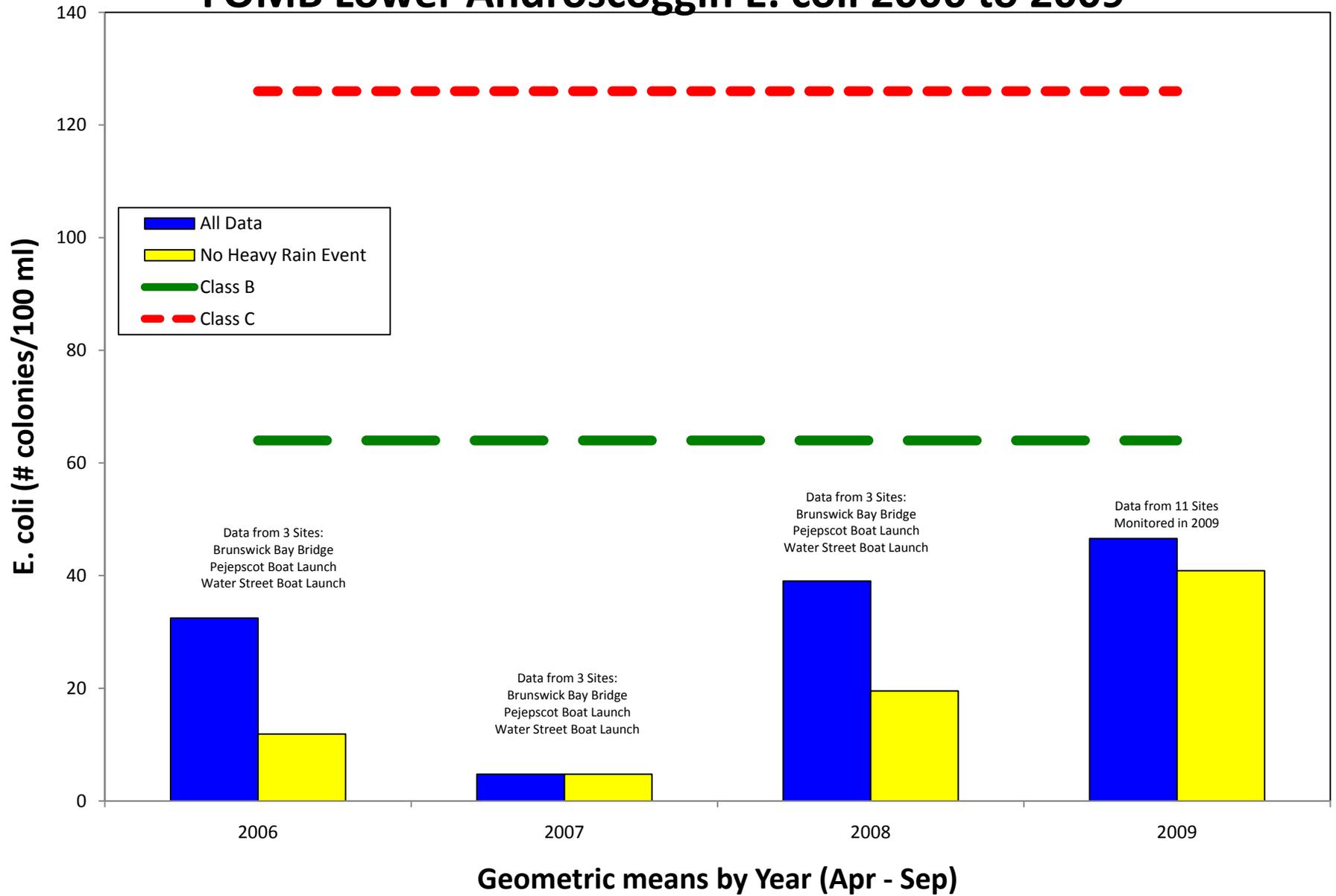
### Lower Androscoggin River - E. coli 2006 to 2009 (Apr - Sep; no heavy rain data)



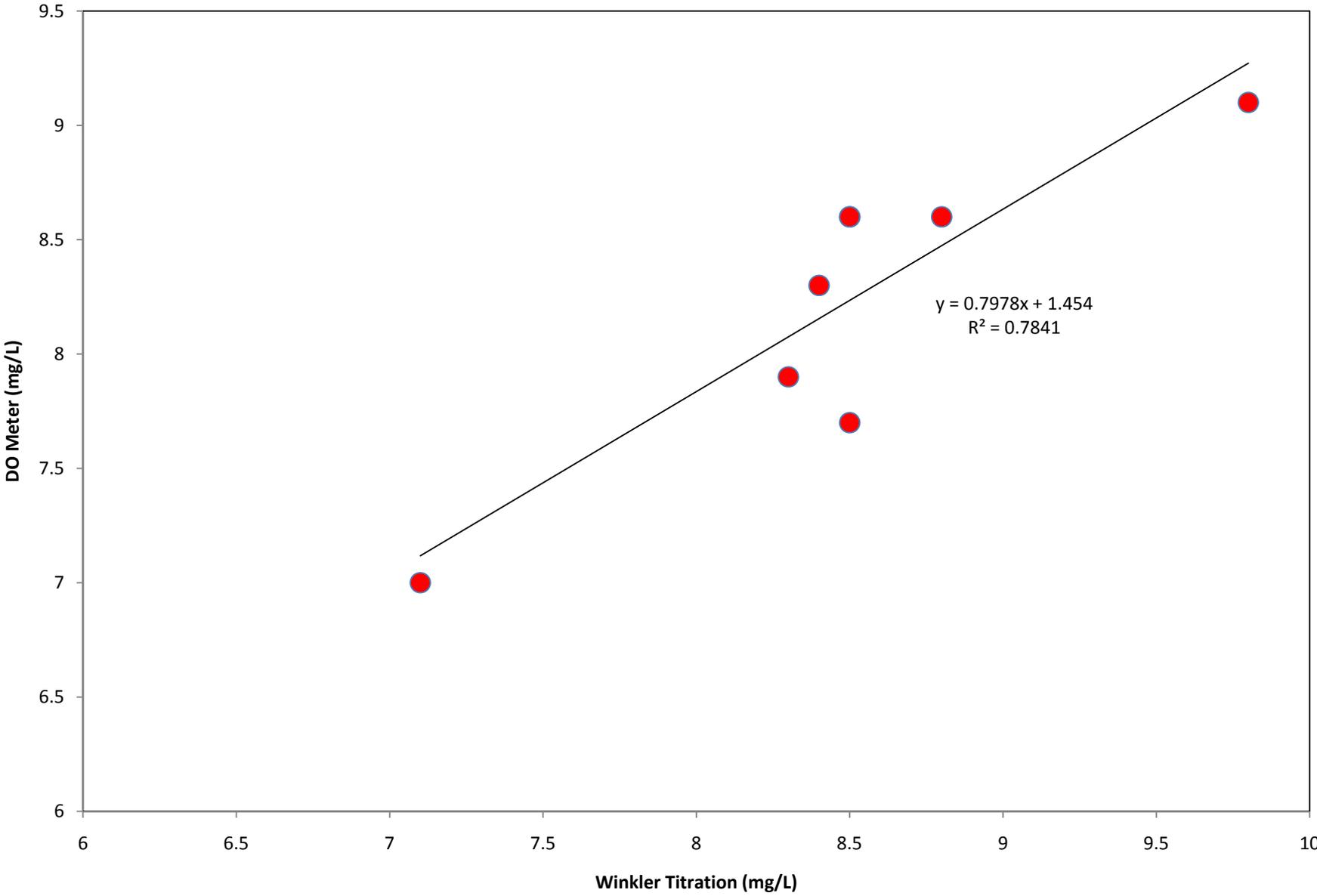
**Lower Androscoggin River - *E. coli* GeoMeans by Station and Year (Apr - Sep; no heavy rain events)**



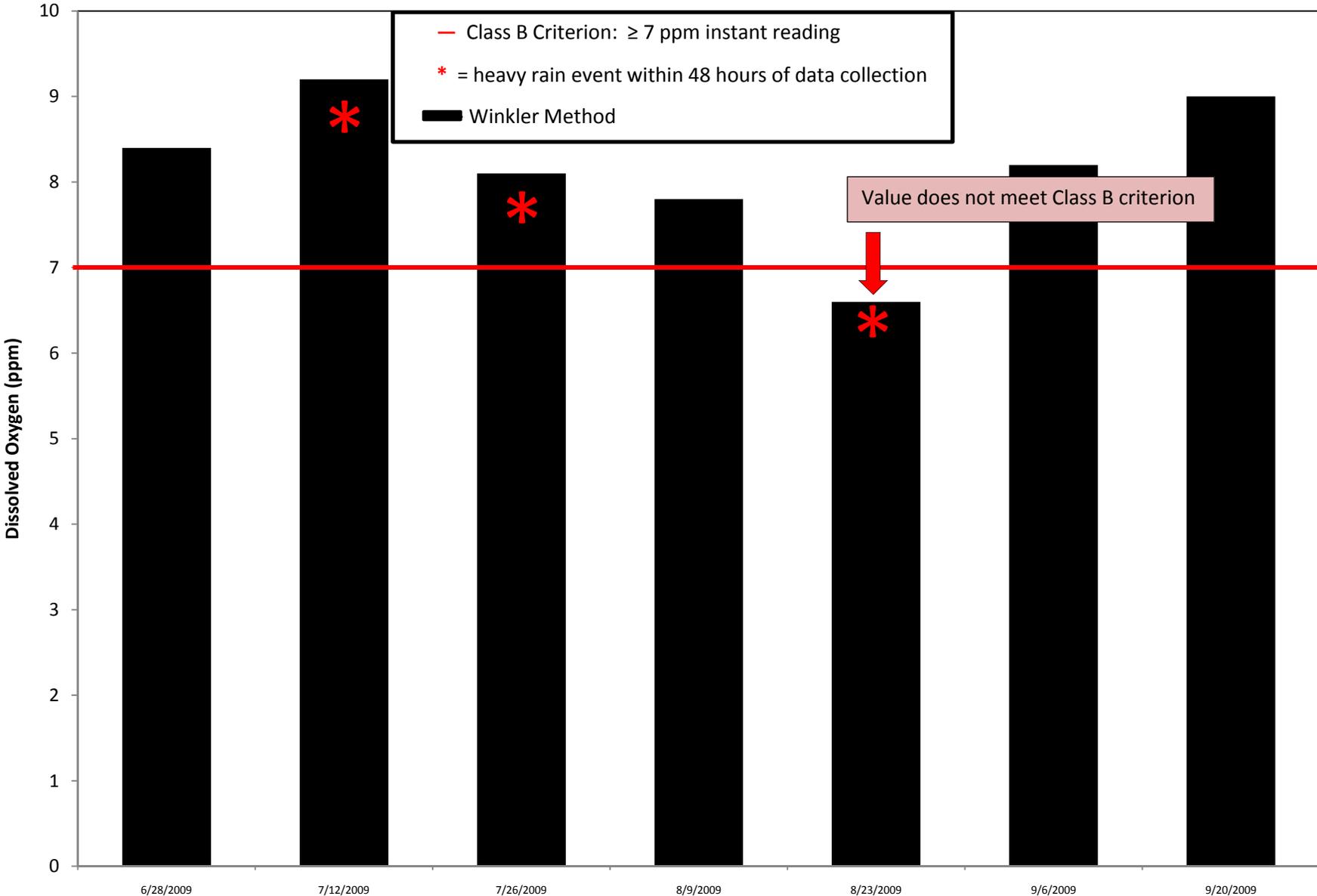
# FOMB Lower Androscoggin E. coli 2006 to 2009



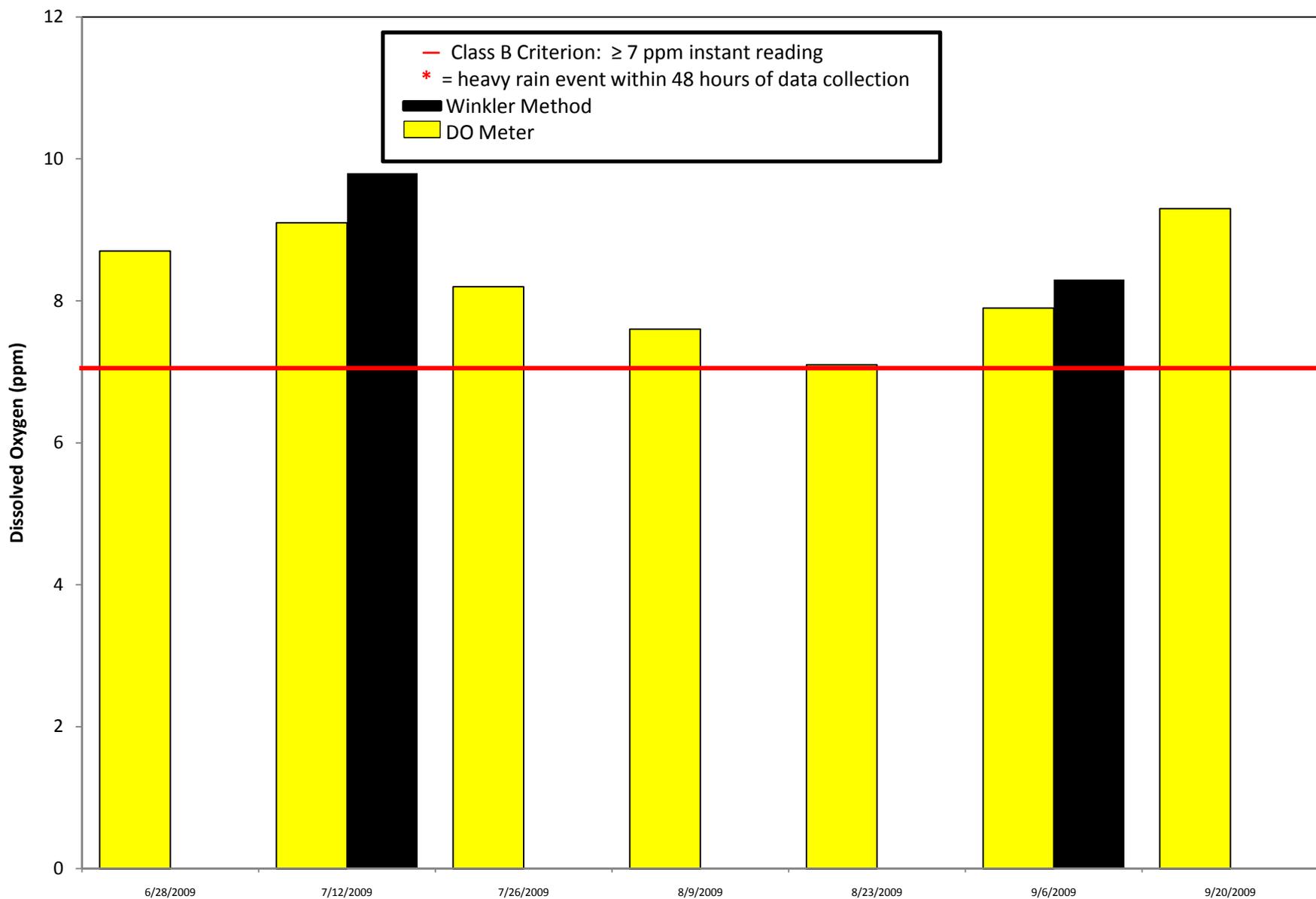
# Comparison of DO Meter & Winkler Titration for DO



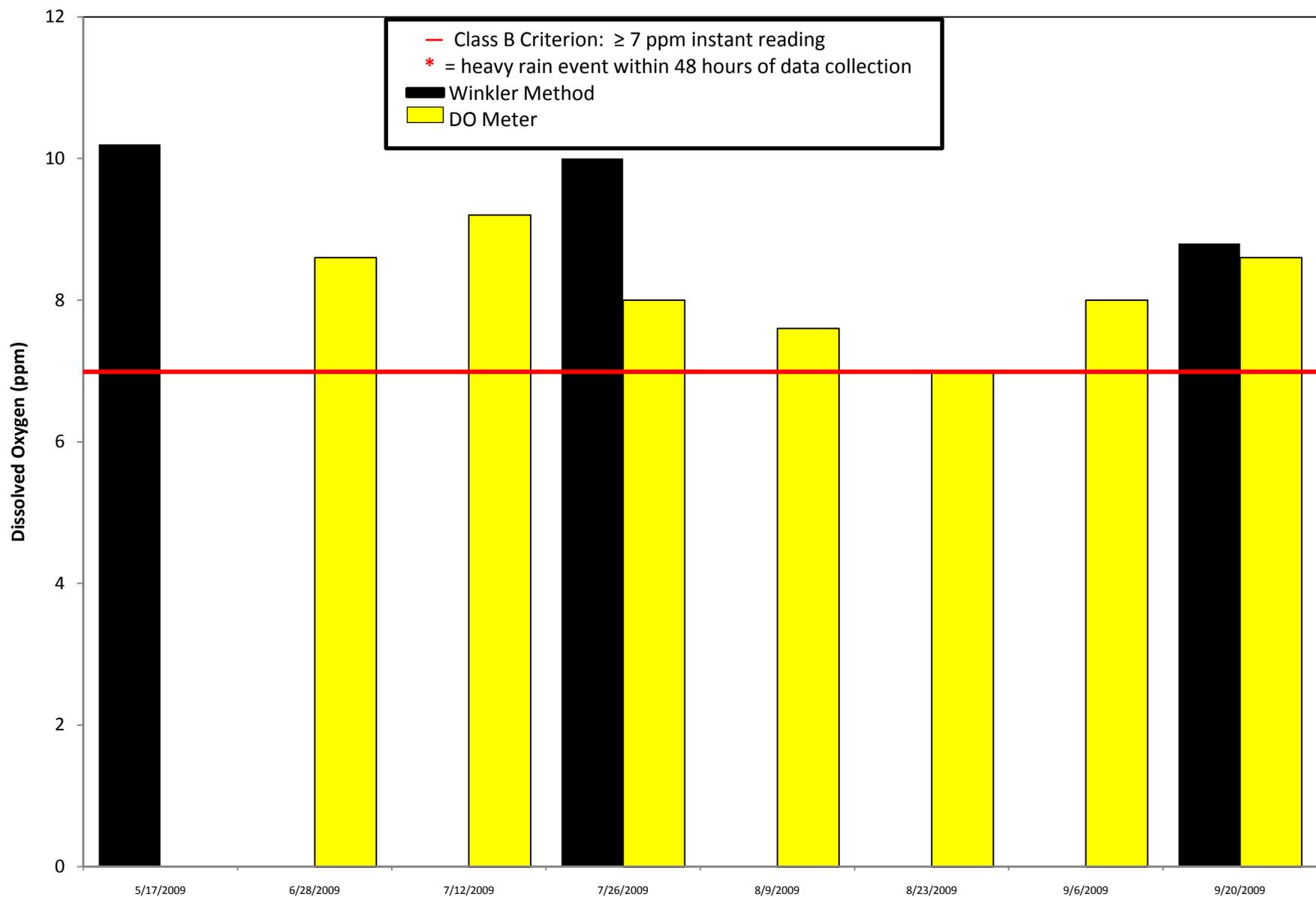
# Lower Androscoggin River 2009 DO - Durham Boat Launch (Apr - Sep)



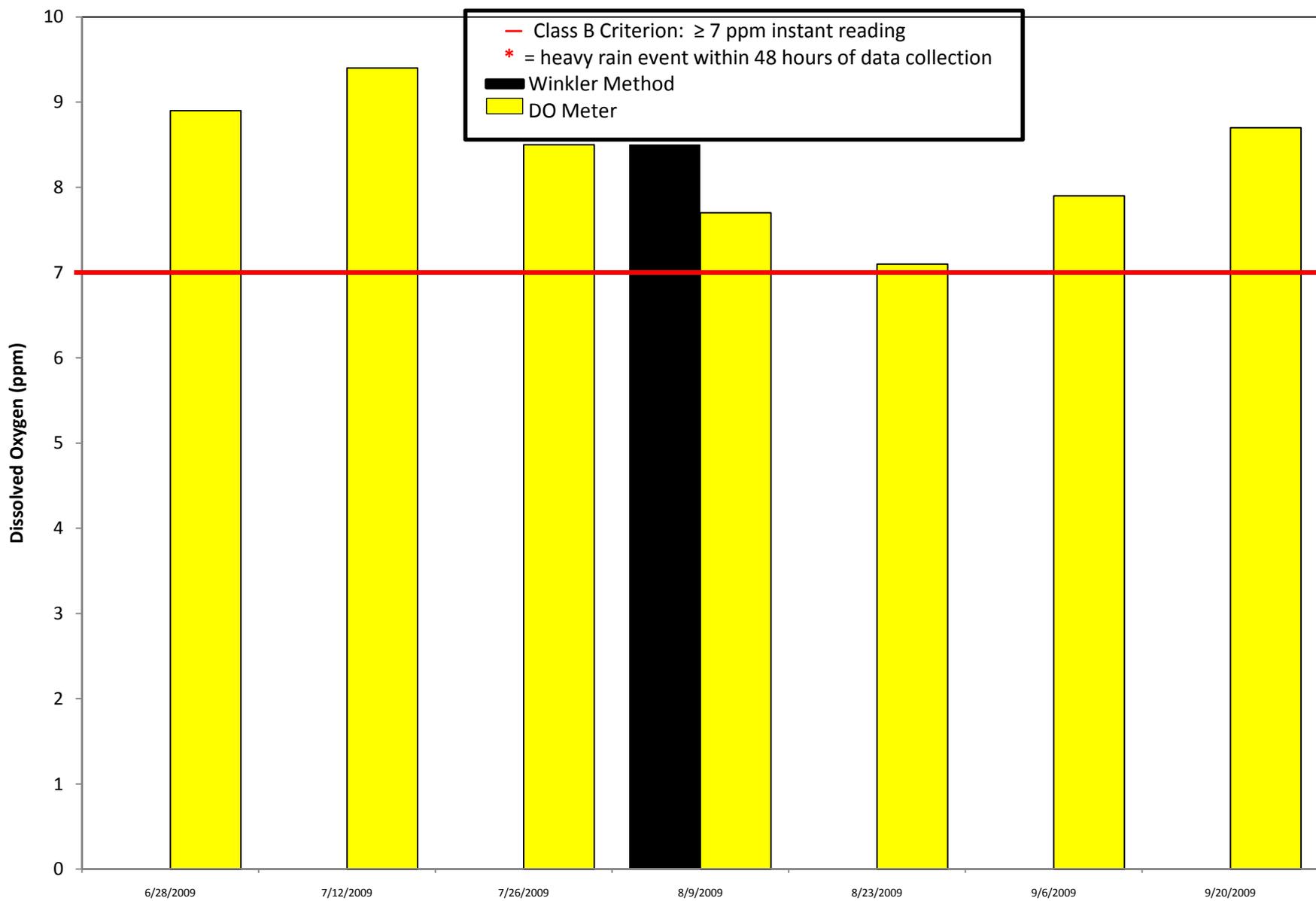
## Lower Androscoggin River 2009 DO - Pejepscot Boat Launch (Apr - Sep)



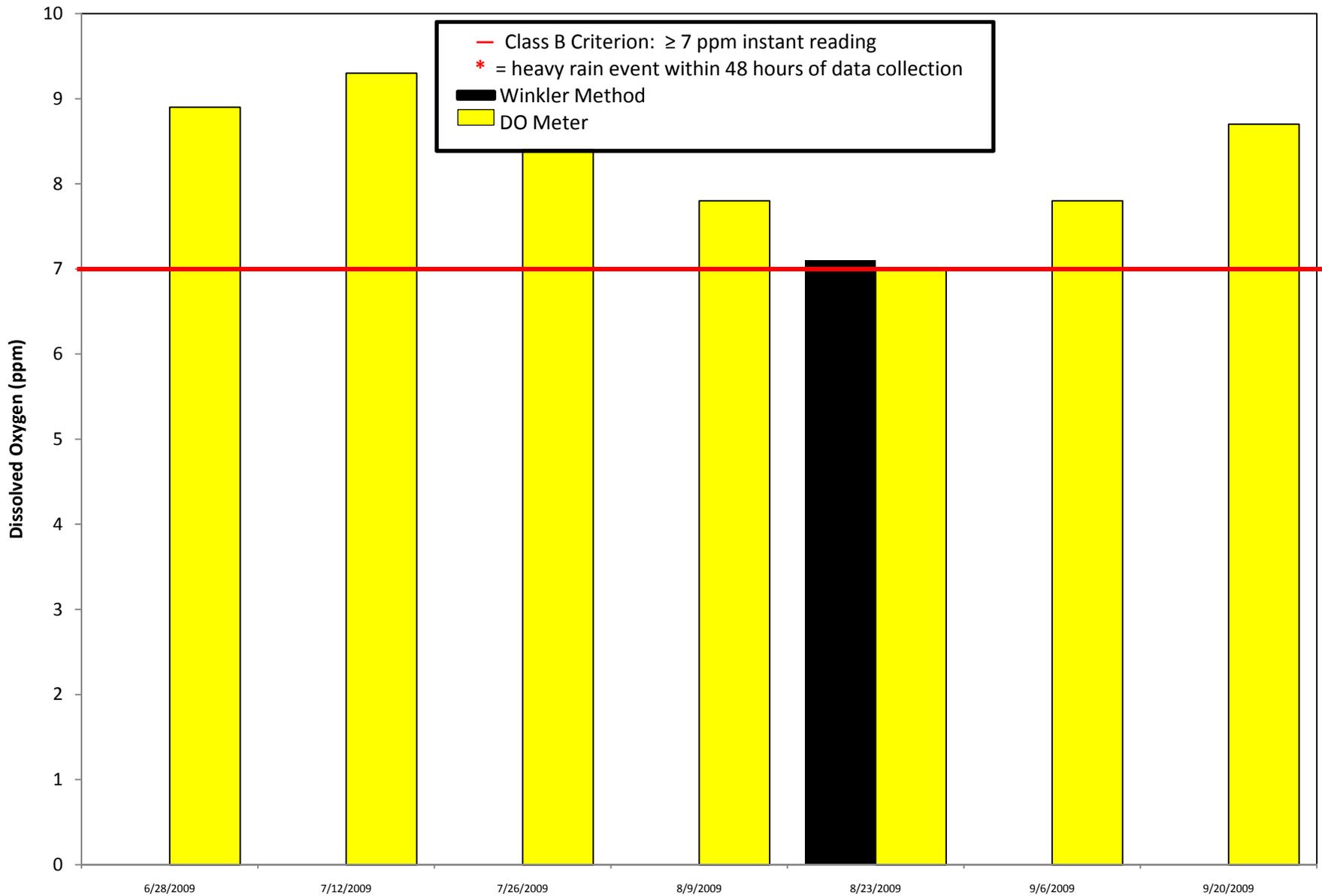
## Lower Androscoggin River 2009 DO - Fish Park Above Dam (Apr - Sep)



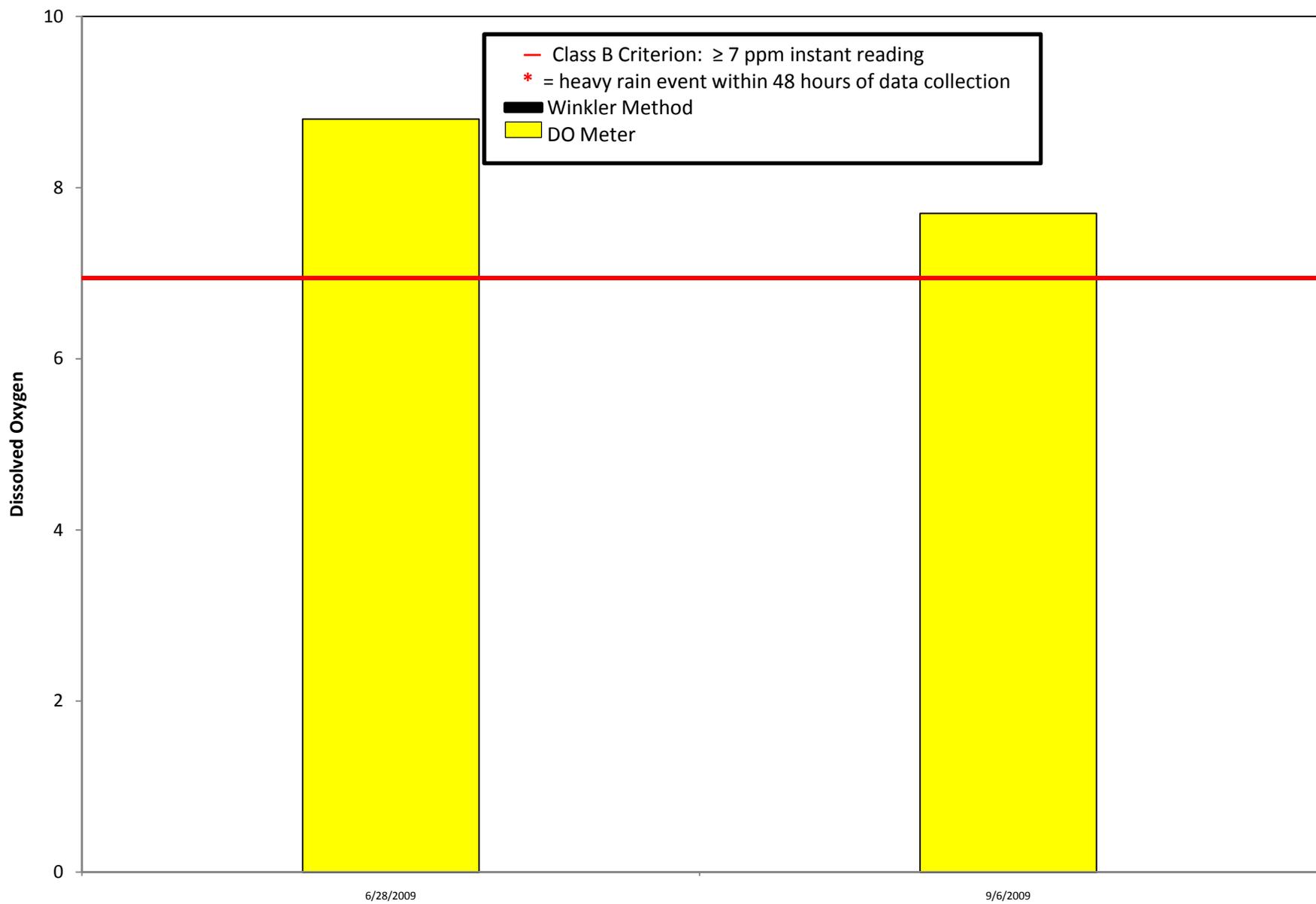
# Lower Androscoggin River 2009 DO - Fish Park Below Dam (Apr - Sep)



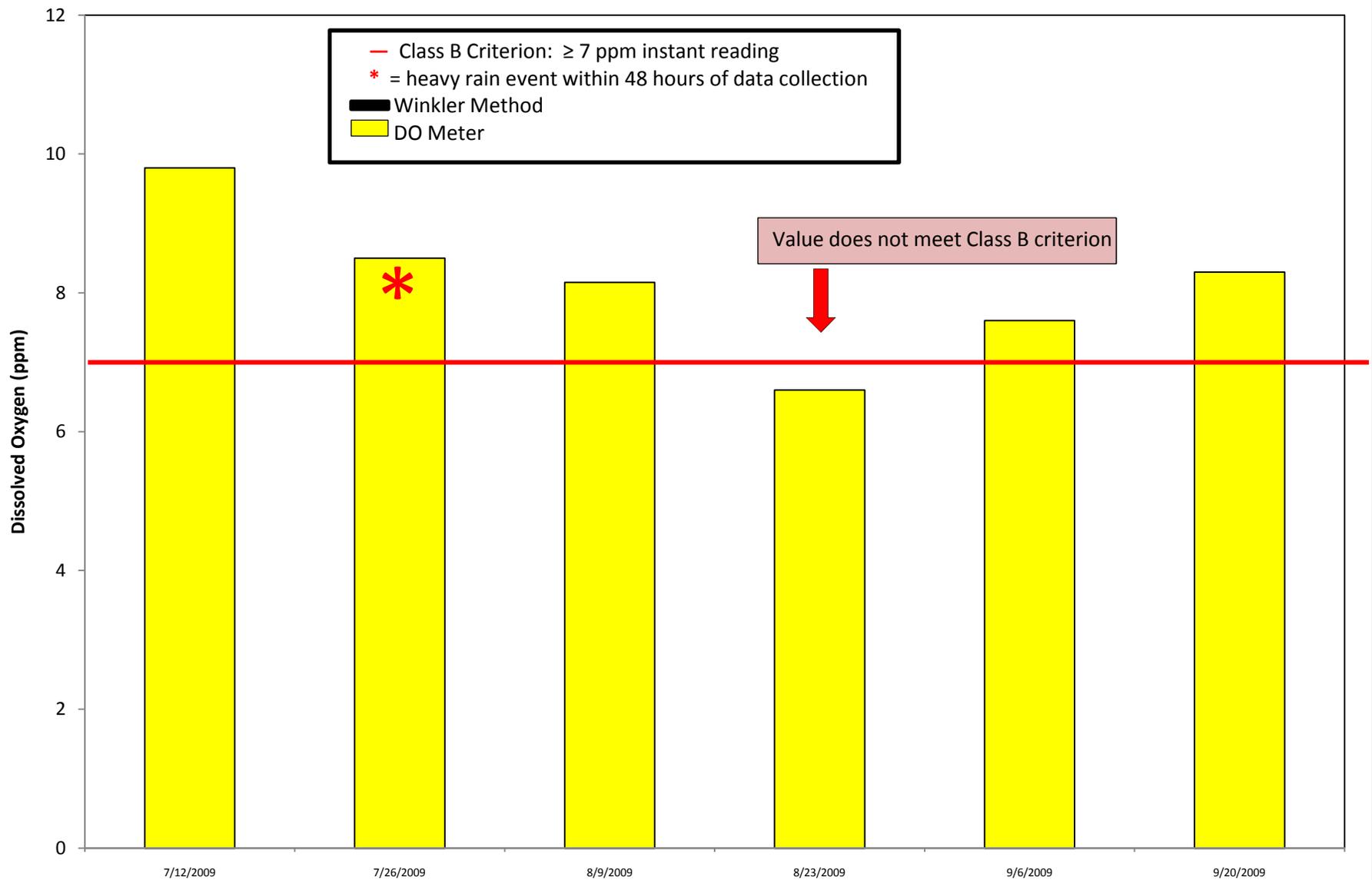
### Lower Androscoggin River 2009 DO - Brunswick Interstate Ledges (Apr - Sep)



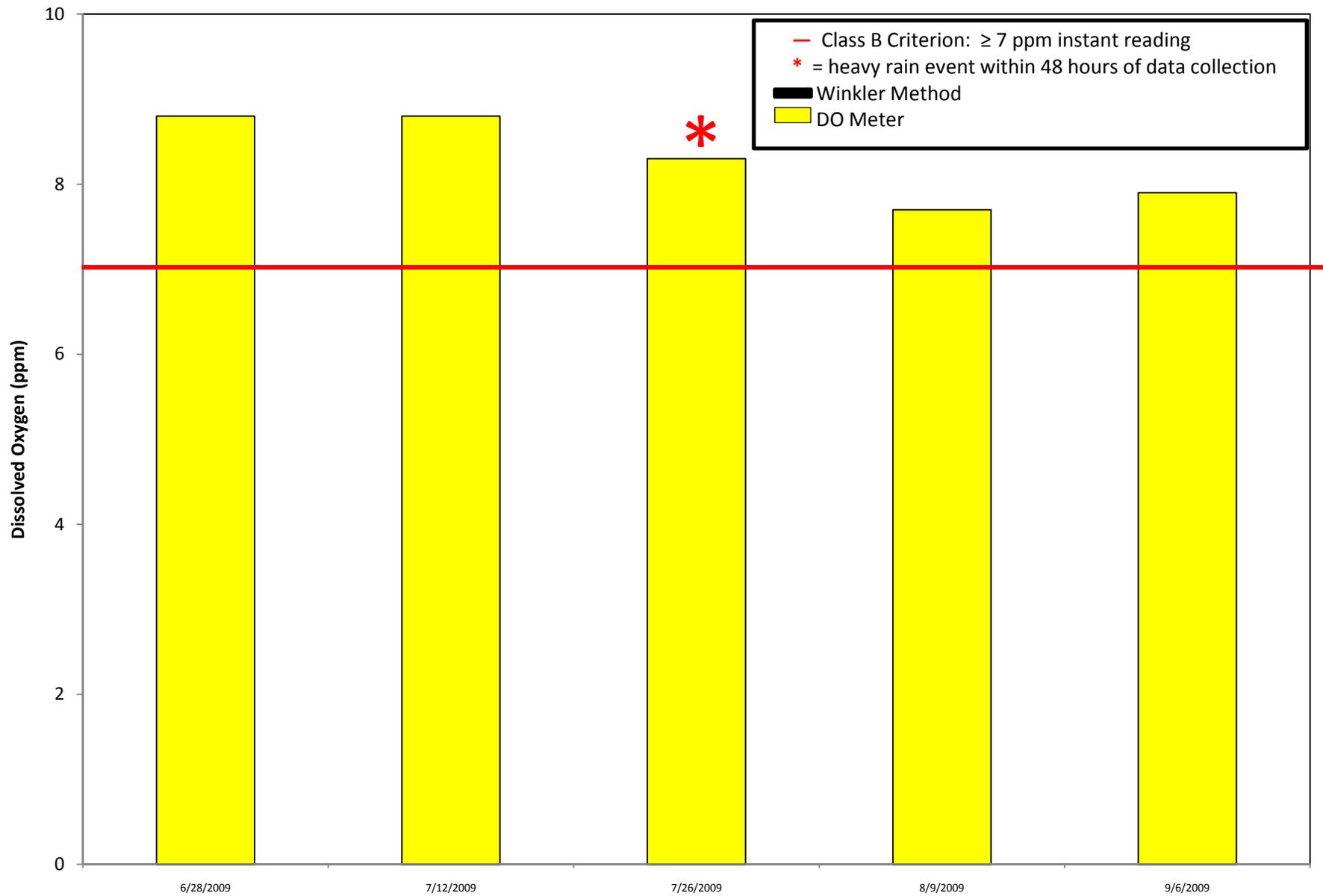
### Lower Androscoggin River 2009 DO - Brunswick Canoe Portage (Apr - Sep)



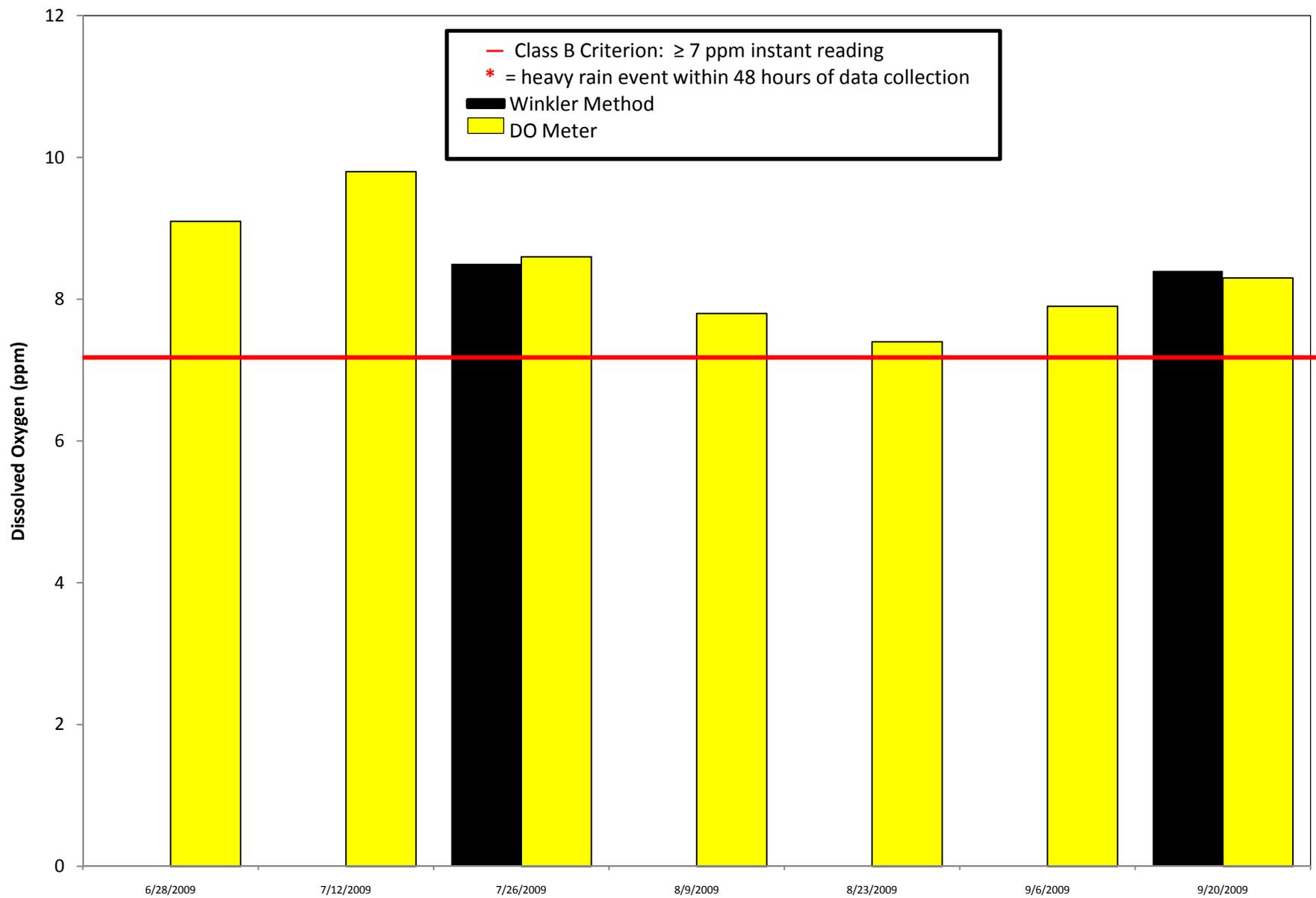
### Lower Androscoggin River 2009 DO - Brunswick Canoe Mooring (off BCP) (Apr - Sep)



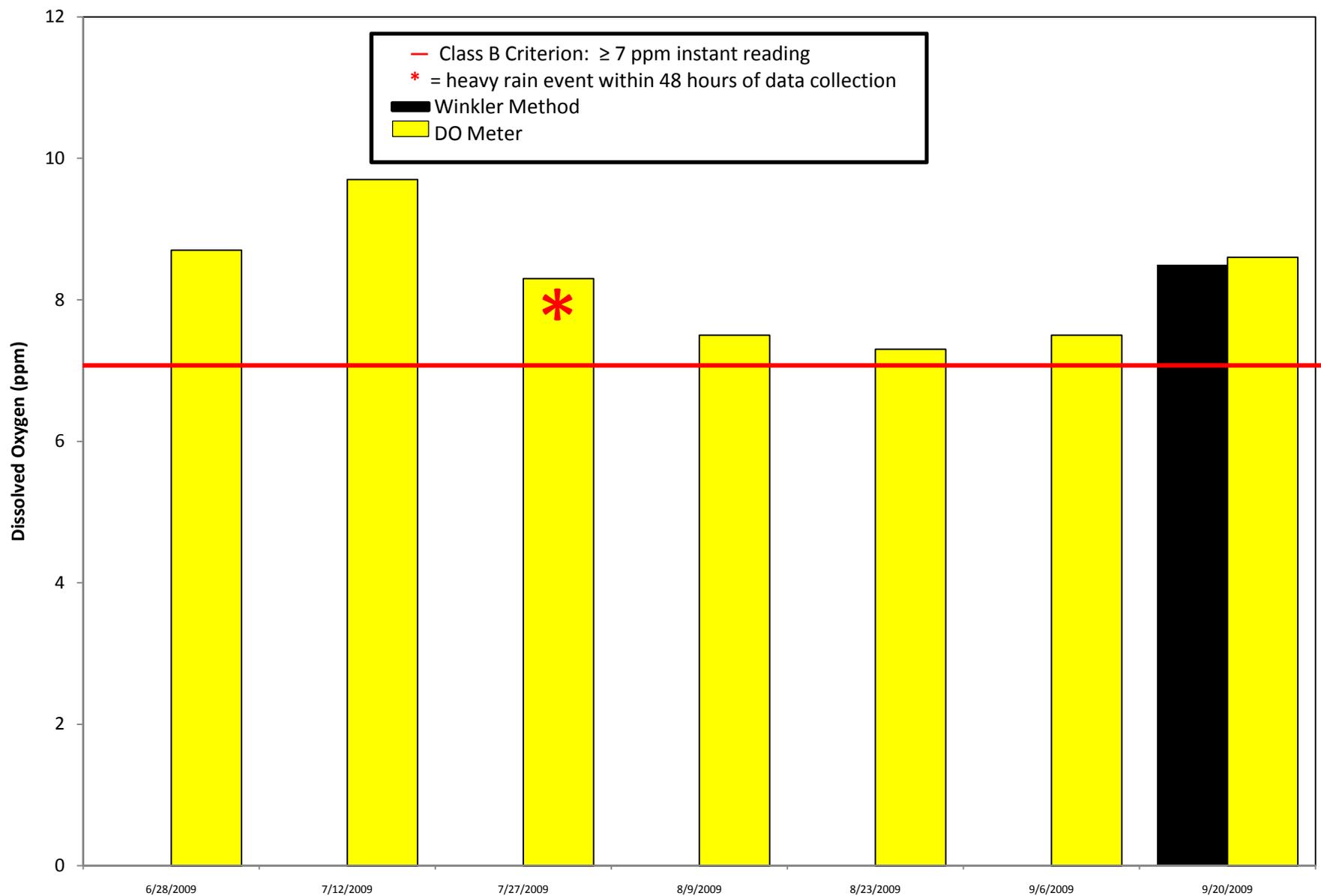
### Lower Androscoggin River 2009 DO - Brunswick Water St. Boat Launch (Apr - Sep)



### Lower Androscoggin River 2009 DO - Water St. Mooring (off BWS) (Apr - Sep)



## Lower Androscoggin River 2009 DO - Brunswick Bay Bridge (Apr - Sep)



**Lower Androscoggin River 2009 Dissolved Oxygen**  
**Class B Criterion: > 7 ppm instant reading**  
 (\* = value not used; taken during heavy rain event)

☐ = does not meet criterion; out of compliance				DO-Winkler (ppm) Criterion: > 7 ppm instant			DO-Meter (ppm) Criterion: > 7 ppm instant			Temp		Notes
Date	Sample Time	Weather	Adversities (precip last 48 hrs)	Replicate Data	Rep Data	Heavy Rain Data Excluded	(Mean of Reps)	Rep Data	Heavy Rain Data Excluded	Air (C°)	Water (C°)	
<b>Durham Boat Launch</b>												
6/28/2009	7:55 AM	overcast	P-low	8.4		8.4				16.5	18.5	
7/12/2009	8:00 AM	overcast	P-heavy	9.2	9.2, 9.2	*				16.0	17.0	heavy rain previous night
7/26/2009	7:35 AM	fog/haze	P-heavy	8.1		*				17.5	19.5	heavy rain two nights before sample
8/9/2009	8:00 AM	clear		7.8		7.8				13.5	20.5	
8/23/2009	7:55 AM	clear	P-heavy, B	6.6		*				22.5	24.0	3 boats launched before sample
9/6/2009	8:00 AM	clear	B	8.2		8.2				11.0	18.0	boats
9/20/2009	8:00 AM	clear		9		9				6.0	15.5	
<b>DBL Geometric mean</b>				<b>8.15</b>		<b>8.34</b>						
<b>Pejepscot Boat Launch</b>												
6/28/2009	8:35 AM	overcast	P-low				8.7		8.7	17.5	19.3	
7/12/2009	7:00 AM	overcast	P-low	9.8		9.8	9.1	9.1, 9.1	9.1	16.5	17.6	sampled DO in flow and eddy- same reading
7/26/2009	7:35 AM	overcast	P-moderate				8.2		8.2	18.0	19.8	DO 1 at .5m; DO 2 at 1m; H2O temp at .5m: 20.1; SC at .5m: 6
8/9/2009	6:40 AM	clear					7.6		7.6	13.0	21.3	
8/23/2009	6:35 AM	clear/overcast					7.1	7.1, 7.2	7.1	23.6	25.6	air temp from DO meter; bacteria sample by hand direct to bott
9/6/2009	6:55 AM	clear		8.3		8.3	7.9	7.9, 7.9	7.9	8.0	20.0	lowest water of season, 1m depth
9/20/2009	7:00 AM	clear					9.3		9.3	4.0	17.0	
<b>PBL Geometric mean</b>				<b>9.02</b>		<b>9.02</b>	<b>8.24</b>		<b>8.24</b>			
<b>Fish Park Up [above dam]</b>												
5/17/2009	10:55 AM	overcast	P	10.2		10.2						
6/28/2009	8:00 AM	overcast	P-low				8.6		8.6	16.5	19.6	high water; 3'
7/12/2009	7:40 AM	overcast	P-low				9.2		9.2	16.5	17.8	sampling depth - 1m
7/26/2009	8:05 AM	overcast	P-moderate	10		10	8	8, 8	8	18.0	20.7	WT at surface: 10
8/9/2009	7:10 AM	clear					7.6		7.6	13.0	21.8	sample at 1m
8/23/2009	7:15 AM	partly cloudy					7		7	22.2	25.4	N. wind
9/6/2009	7:35 AM	clear					8		8	11.0	20.3	1m sample
9/20/2009	7:30 AM	clear		8.8		8.8	8.6	8.6, 8.6	8.6	5.0	17.6	WT- 8.8
<b>FPU Geometric mean</b>				<b>9.38</b>		<b>9.38</b>	<b>8.11</b>		<b>8.11</b>			

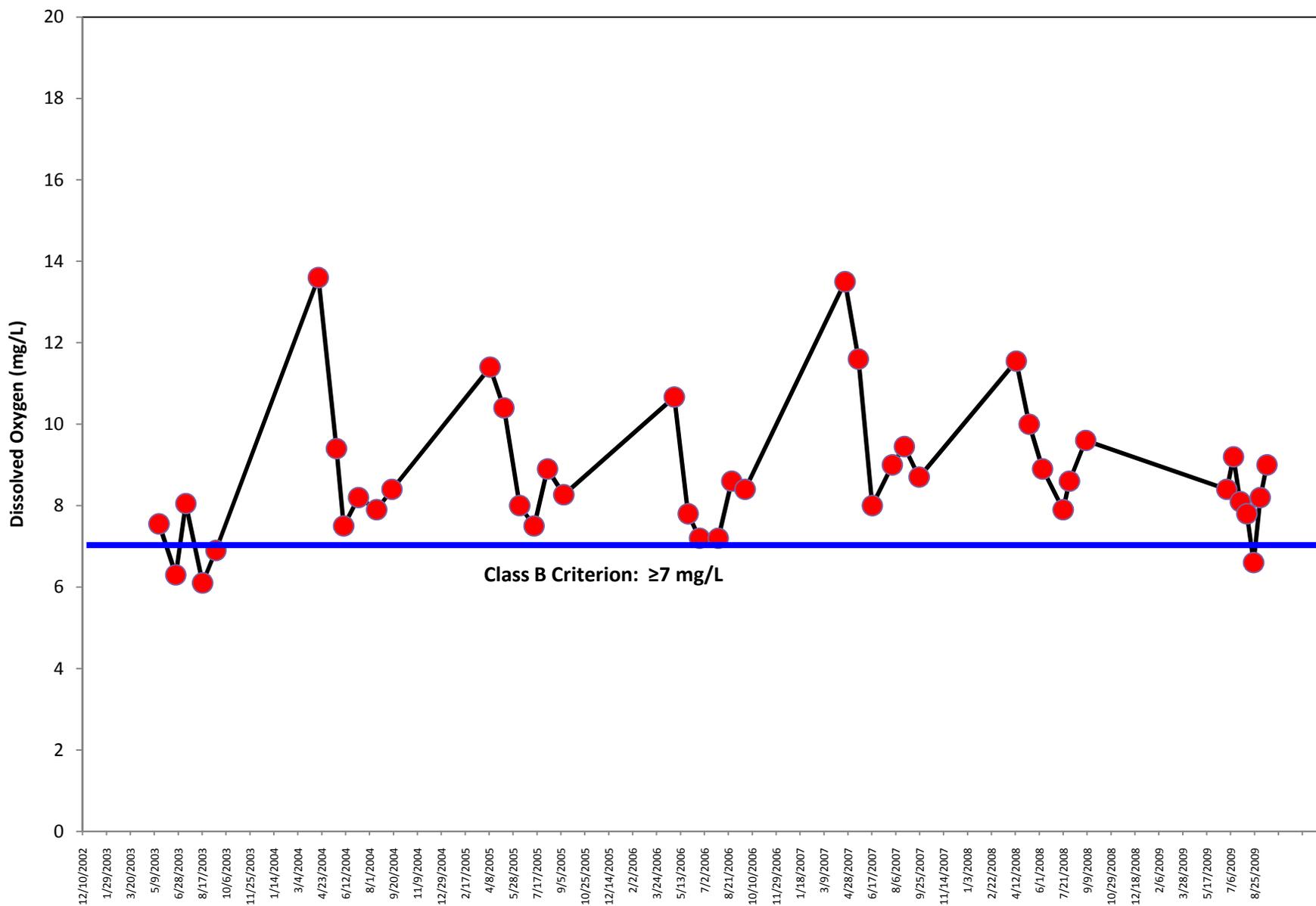
**Lower Androscoggin River 2009 Dissolved Oxygen**  
**Class B Criterion: > 7 ppm instant reading**  
 (\* = value not used; taken during heavy rain event)

☐ = does not meet criterion; out of compliance				DO-Winkler (ppm) Criterion: > 7 ppm instant			DO-Meter (ppm) Criterion: > 7 ppm instant			Temp		Notes
Date	Sample Time	Weather	Adversities (precip last 48 hrs)	Replicate Data	Rep Data	Heavy Rain Data Excluded	(Mean of Reps)	Rep Data	Heavy Rain Data Excluded	Air (C°)	Water (C°)	
<b>Fish Park Down [below dam]</b>												
6/28/2009	7:45 AM	overcast	P-low				8.9		8.9	16.2	19.5	high water
7/12/2009	7:50 AM	overcast	P-low				9.4		9.4	16.4	17.8	sampling depth- .5m
7/26/2009	8:25 AM	fog/haze	P-moderate				8.5		8.5	18.5	20.6	sample at .5m
8/9/2009	7:25 AM	clear		8.5		8.5	7.7	7.7, 7.7	7.7	12.5	21.7	WT Surface: 8.2, 8.6, 8.8
8/23/2009	7:25 AM	overcast					7.1		7.1	23.3	25.4	no waves
9/6/2009	7:50 AM	clear					7.9		7.9	11.5	20.7	.5m sample depth
9/20/2009	7:45 AM						8.7		8.7	5.0	17.5	
<b>FPD Geometric mean</b>				<b>8.50</b>		<b>8.50</b>	<b>8.28</b>		<b>8.28</b>			
<b>Bruns. Interstate Ledges</b>												
6/28/2009	7:20 AM	overcast	P-low				8.9	8.9, 8.9	8.9	16.5	19.6	
7/12/2009	8:10 AM	overcast	P-low				9.3		9.3	18.5	17.9	
7/26/2009	8:40 AM	fog/haze	P-moderate				8.4		8.4	18.5	20.6	small amount of foam across river; readings taken at .5m and 1m
8/9/2009	7:55 AM	clear					7.8		7.8	14.5	21.7	light foam; low water
8/23/2009	7:50 AM	partly cloudy		7.1		7.1	7	7, 7	7	23.1	25.4	low water
9/6/2009	8:10 AM	clear					7.8		7.8	13.0	20.3	1m sample depth
9/20/2009	8:30 AM	clear					8.7		8.7	9.0	17.5	
<b>BIL Geometric mean</b>				<b>7.10</b>		<b>7.10</b>	<b>8.24</b>		<b>8.24</b>			
<b>Bruns. Canoe Portage</b>												
6/28/2009	6:50 AM	overcast	P-low				8.8		8.8	16.5	19.6	high water
9/6/2009	8:40 AM	clear					7.7		7.7	13.0	20.1	.5m depth
<b>BCP Geometric mean</b>							<b>8.23</b>		<b>8.23</b>			
<b>Bruns. Canoe Mooring [off BCP]</b>												
7/12/2009	7:30 AM	overcast	P-low				9.8	9.8, 9.8	9.8		18.0	bacteria-surface sample 9"; bacteria- mid depth sample
7/26/2009	7:30 AM	overcast	P-heavy				8.5	8.5, 8.5	*	21.0	20.8	1 boat and several ducks
8/9/2009	7:30 AM	clear	M, W				8.15	8.1, 8.2	8.1	18.0	21.8	a lot of effluent-very foamy
8/23/2009	8:00 AM	overcast	W				6.6		6.6	24.0	25.0	W-ducks
9/6/2009	9:05 AM	clear					7.6		7.6		20.3	2.5m sample depth
9/20/2009	6:55 AM	clear					8.3	8.3, 8.3		11.4	17.1	
<b>BCM Geometric mean</b>							<b>8.10</b>		<b>7.94</b>			

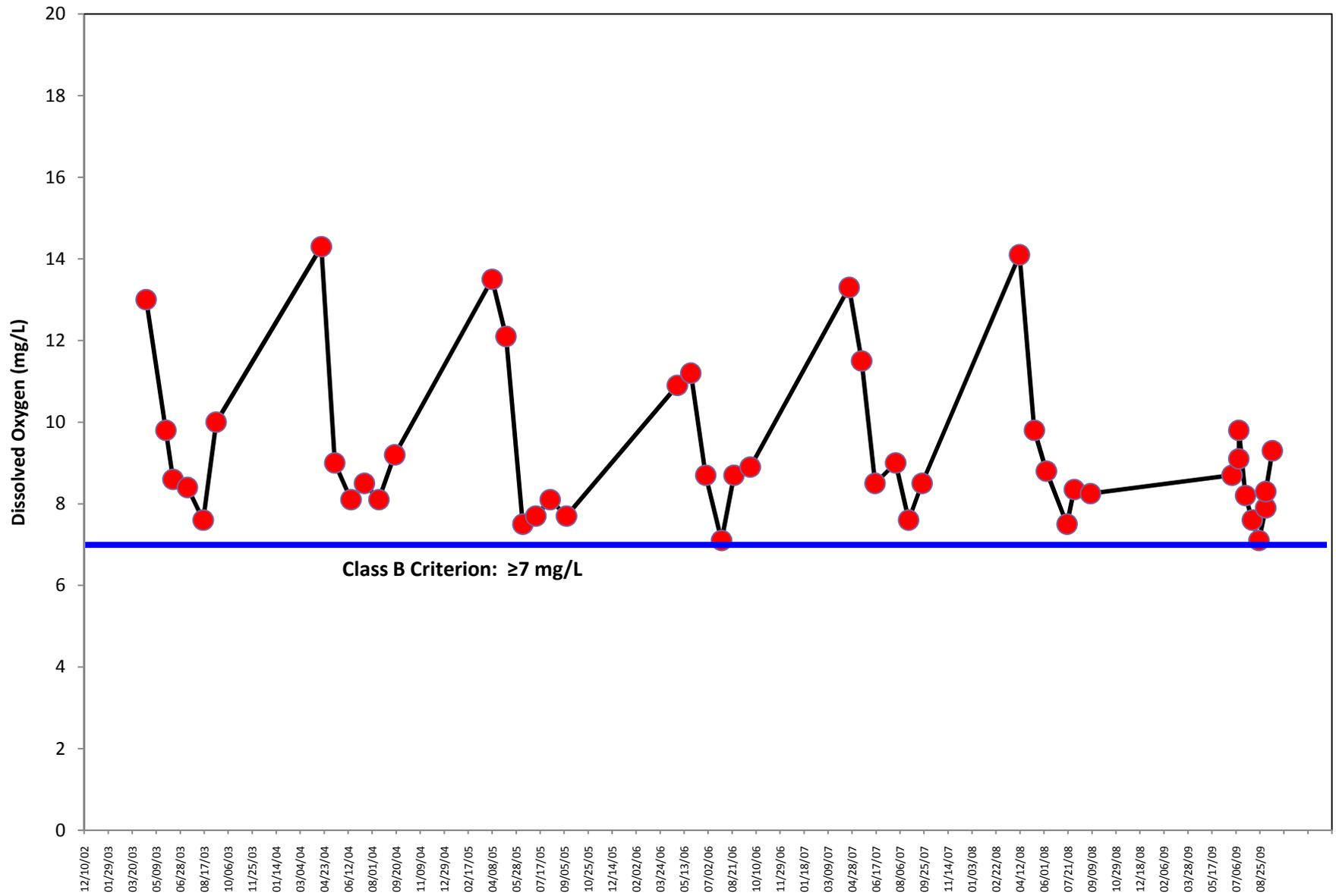
**Lower Androscoggin River 2009 Dissolved Oxygen**  
**Class B Criterion: > 7 ppm instant reading**  
 (\* = value not used; taken during heavy rain event)

☐ = does not meet criterion; out of compliance				DO-Winkler (ppm) Criterion: > 7 ppm instant			DO-Meter (ppm) Criterion: > 7 ppm instant			Temp		Notes
Date	Sample Time	Weather	Adversities (precip last 48 hrs)	Replicate Data	Rep Data	Heavy Rain Data Excluded	(Mean of Reps)	Rep Data	Heavy Rain Data Excluded	Air (C°)	Water (C°)	
<b>Bruns. Water St. Boat Launch</b>												
6/28/2009	9:35 AM		P-moderate				8.8		8.8	16.7	10.0	2+ boats
7/12/2009	9:20 AM	overcast	P-moderate				8.8		8.8	14.4	18.0	2+ boats
7/26/2009	7:55 AM	overcast/fog	P-heavy				8.3		*	18.3	15.6	boat
8/9/2009	7:40 AM	clear	P-moderate				7.7		7.7	14.4	21.0	DO- Ed; monthly = throw bottle
9/6/2009	7:45 AM	clear					7.9		7.9	8.9	19.9	DO-KMC
<b>BWS Geometric mean</b>							<b>8.29</b>		<b>8.28</b>			
<b>Water St. Mooring [off BWS]</b>												
6/28/2009	7:50 AM	overcast	P-low				9.1		9.1		19.4	DO taken at 7' (8.8 DO recorded at shore)
7/12/2009	7:45 AM	overcast	P-low				9.8		9.8		17.9	sample at 7'
7/26/2009	8:40 AM	fog/haze	P-moderate	8.5		8.5	8.6		8.6		20.5	WT at surface: 8.4, 8.4, 8.6; DO meter at surface: 8.5
8/9/2009	7:50 AM	clear					7.8		7.8		21.8	
8/23/2009	7:55 AM						7.4		7.4		25.3	
9/6/2009	8:00 AM	clear					7.9		7.9		20.4	2.5m sample depth
9/20/2009	7:59 AM	clear		8.4		8.4	8.3		8.3	11.4	17.6	
<b>WSM Geometric mean</b>				<b>8.45</b>		<b>8.45</b>	<b>8.38</b>		<b>8.38</b>			
<b>Brunswick Bay Bridge</b>												
6/28/2009	8:50 AM	overcast	P-moderate				8.7		8.7		18.6	
7/12/2009	8:40 AM	overcast	P-moderate				9.7		9.7		17.7	
7/27/2009	8:20 AM	overcast	P-high				8.3		*			
8/9/2009	7:00 AM						7.5		7.5		20.9	bacteria sample taken at 1:50pm
8/23/2009	7:20 AM						7.3	7.3, 7.3	7.3		25.0	
9/6/2009	7:10 AM	clear					7.5	7.5, 7.5	7.5		19.7	.5 m sample
9/20/2009	7:25 AM	clear		8.5		8.5	8.6		8.6	12.2	17.5	
<b>BBB Geometric mean</b>				<b>8.50</b>		<b>8.50</b>	<b>8.19</b>		<b>8.17</b>			

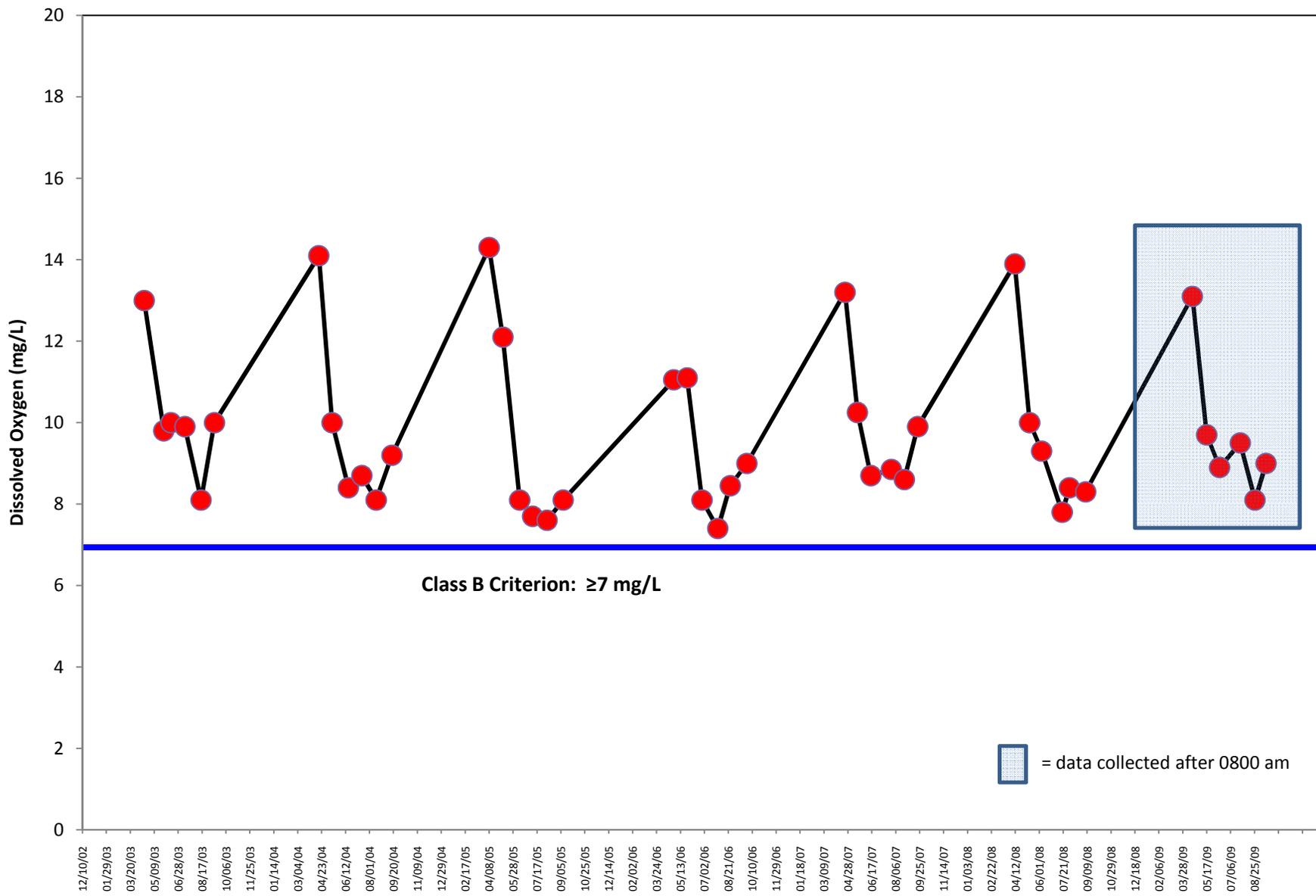
## Durham Boat Launch Dissolved Oxygen: 2003 - 2009 (Apr - Sep)



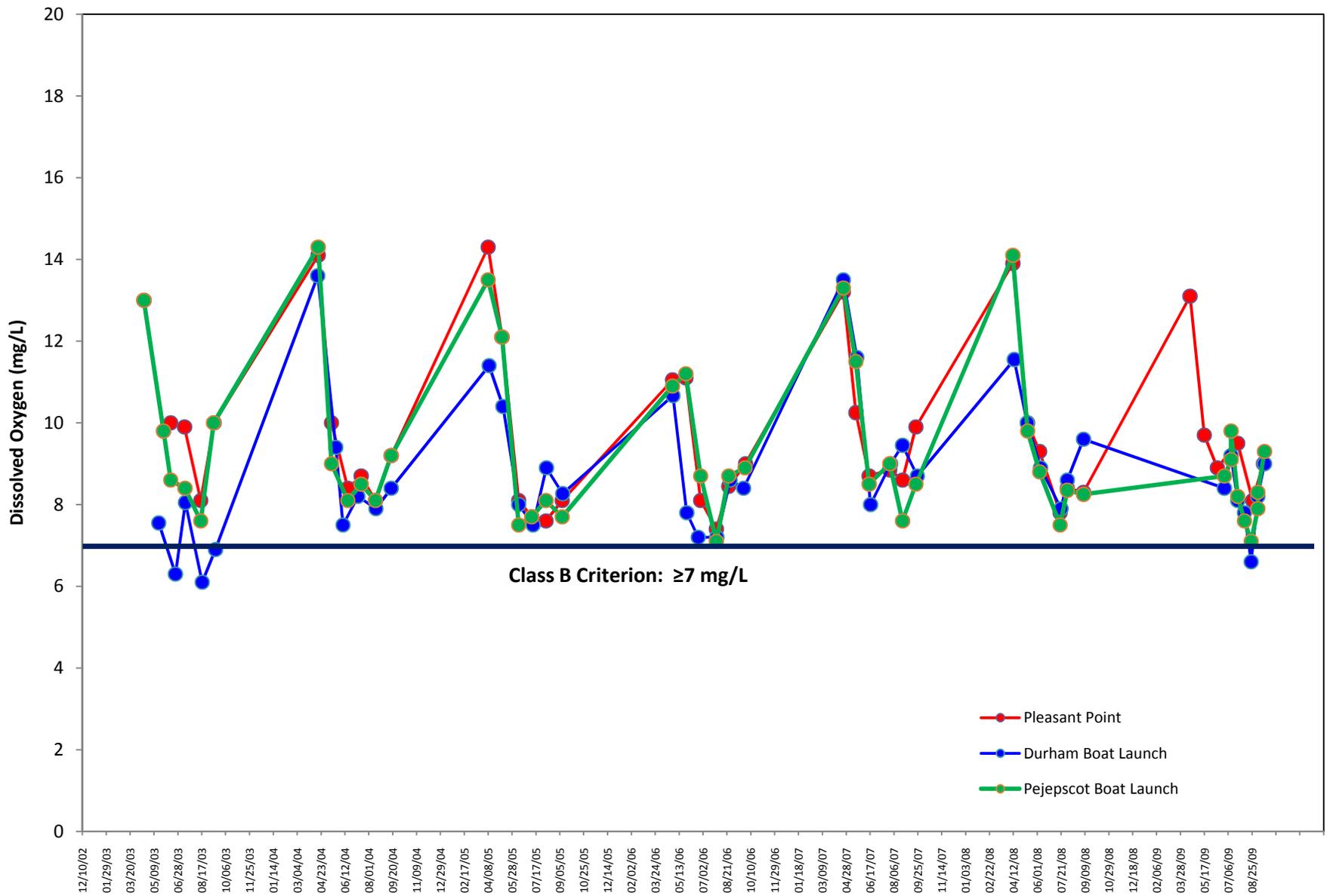
# Pejepscot Boat Launch Dissolved Oxygen: 2003 - 2009 (Apr - Sep)



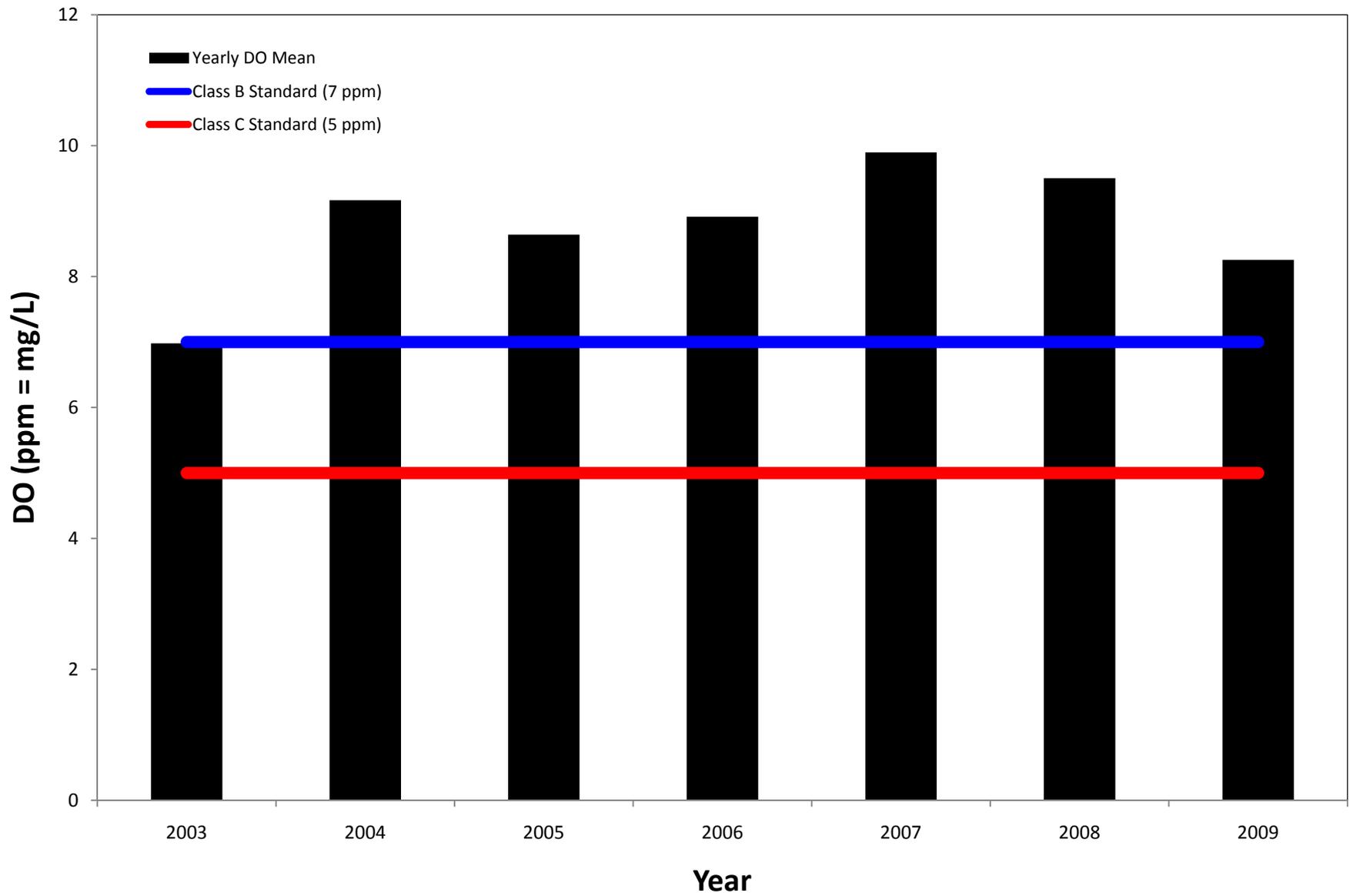
## Pleasant Point Dissolved Oxygen: 2003 - 2009 (Apr - Sep)



## Lower Androscoggin River - All Sites - Dissolved Oxygen 2003 to 2009 (Apr - Sep)

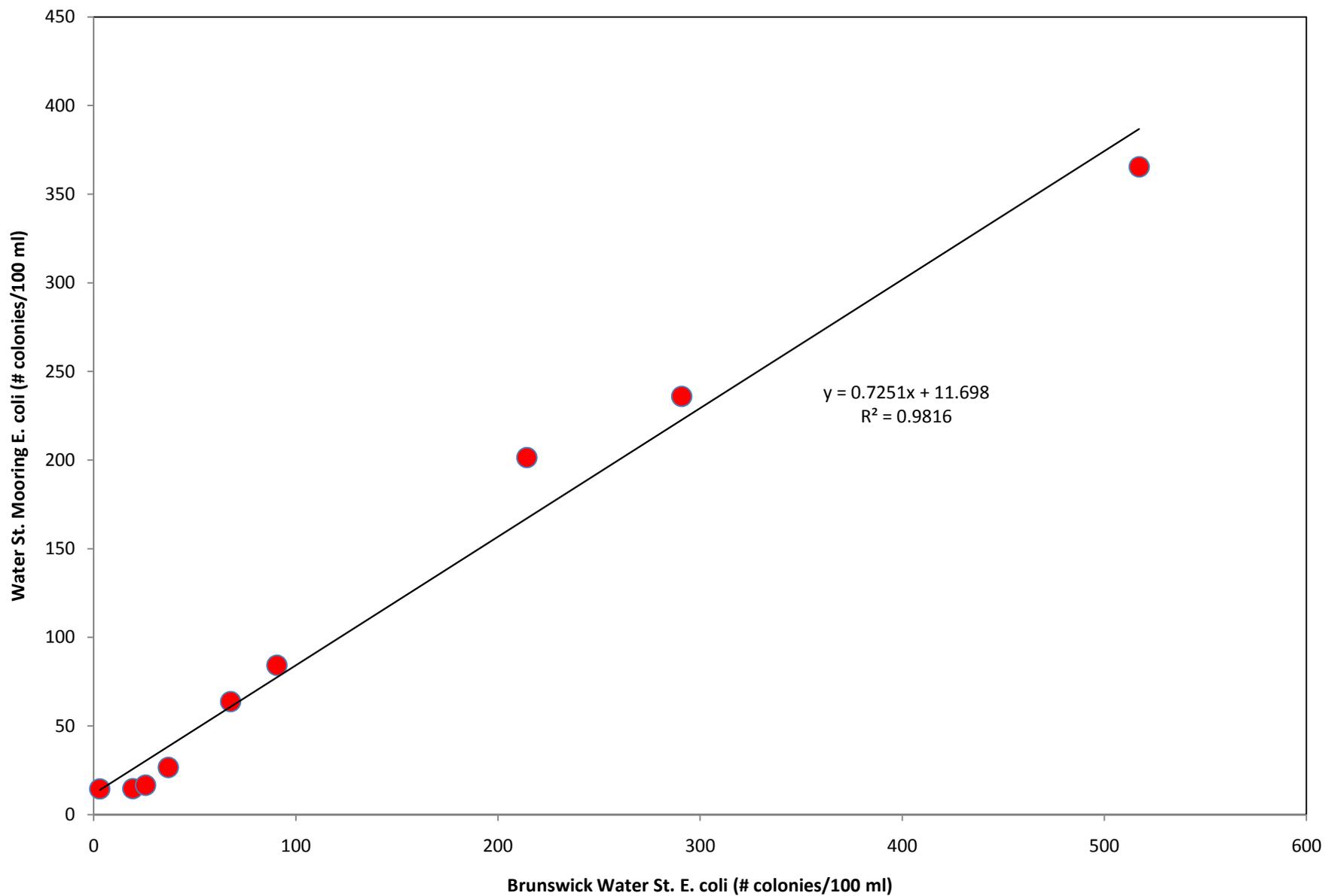


### Yearly DO Means for Lower Androscoggin River vs Class B & C Standards

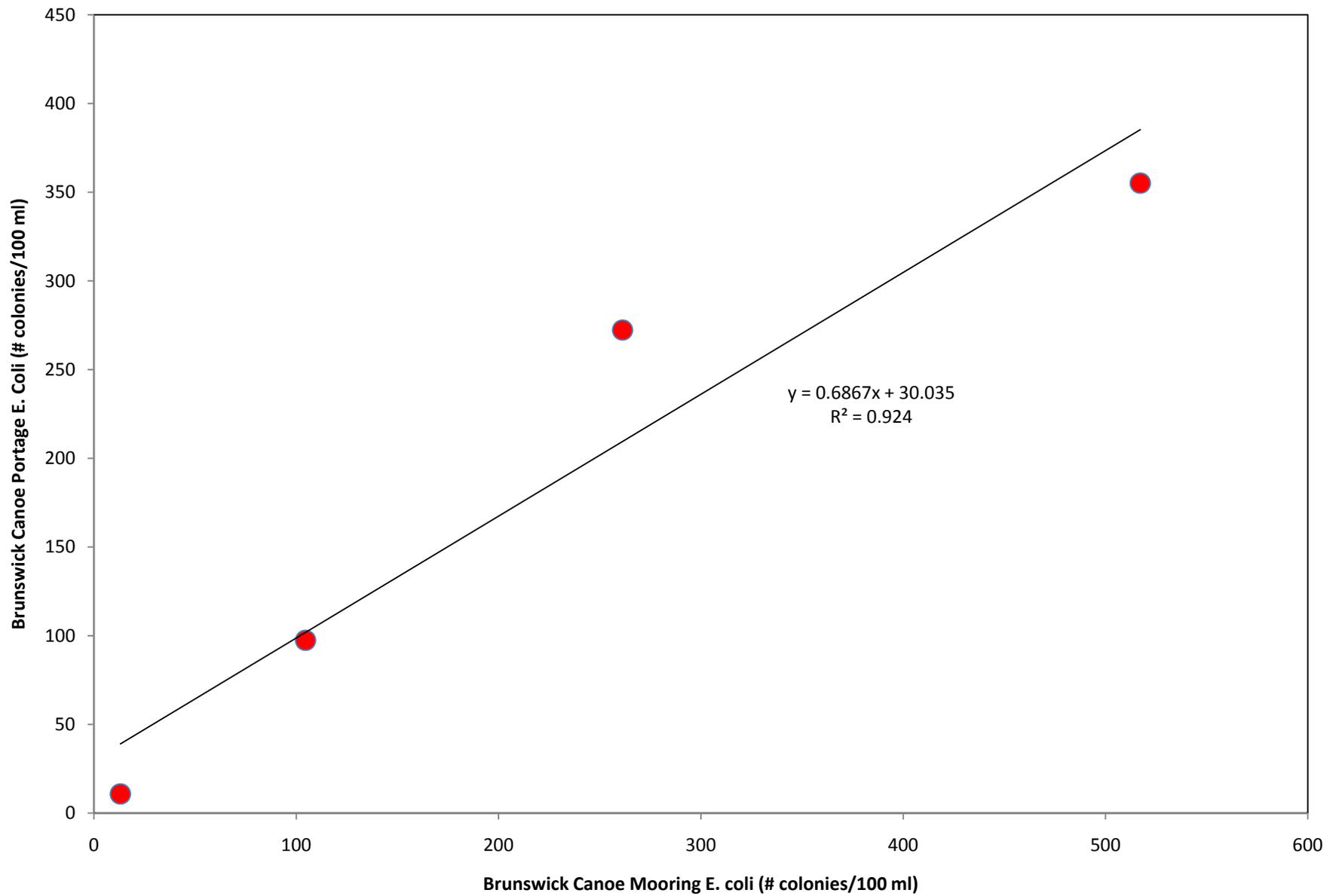


(for 2003 to 2008 Sites = Pleasant Pt., Pejepscot Boat Launch & Durham Boat Launch; for 2009 = all 10 sites monitored)

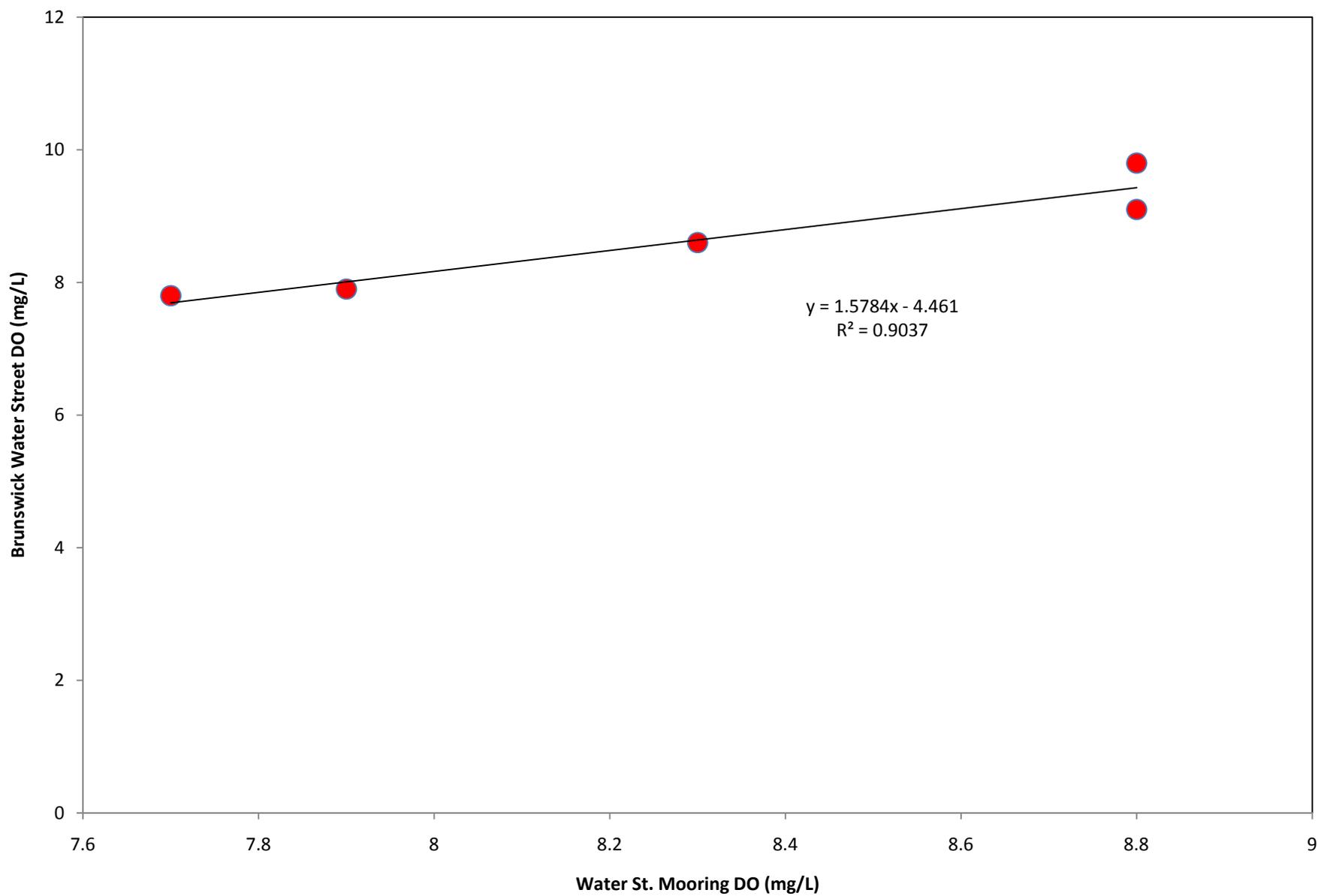
### Brunswick Water St. vs Water St. Mooring - E. coli



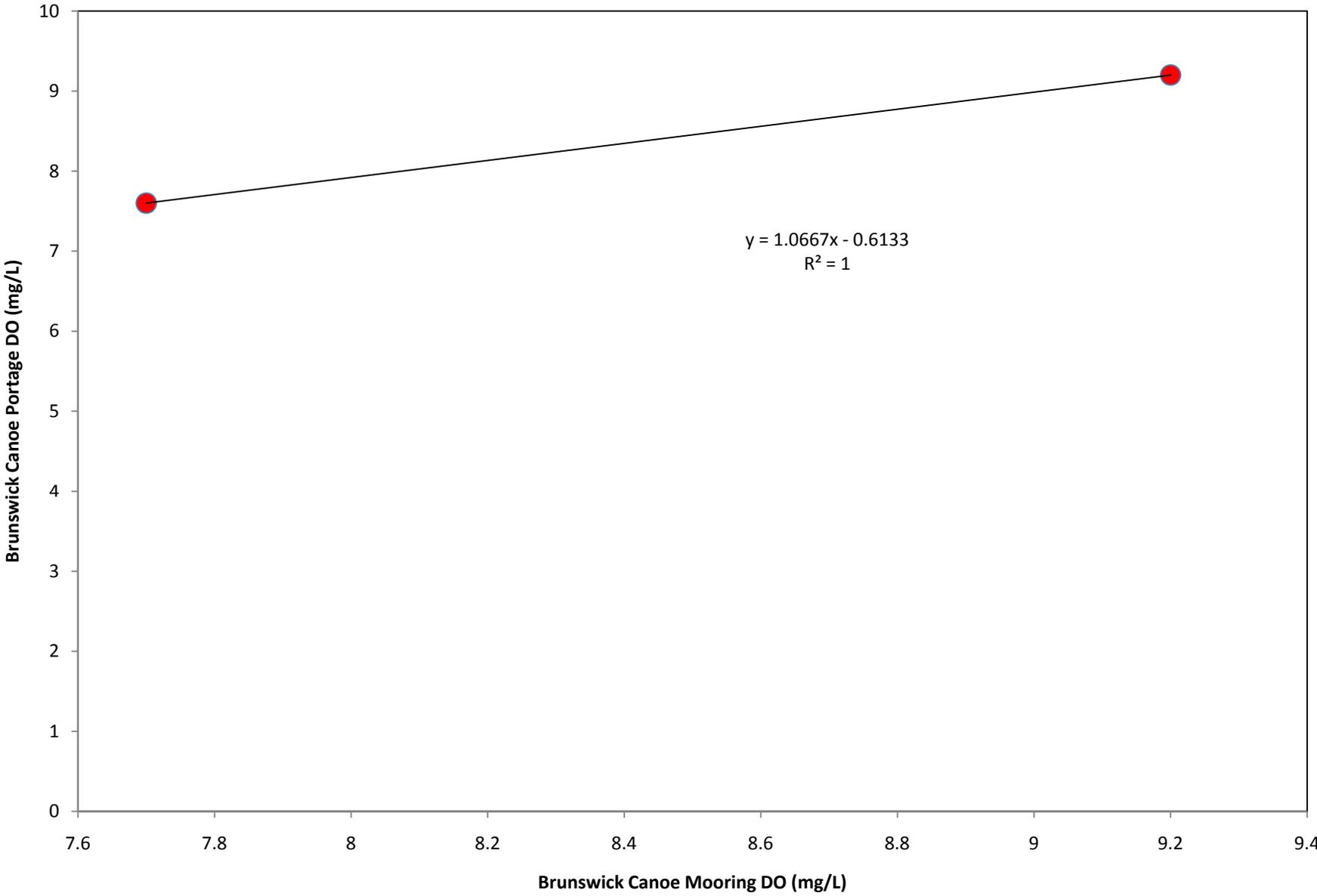
## Brunswick Canoe Portage vs Brunswick Canoe Mooring - E. coli



### Brunswick Water St. vs Water St. Mooring - Dissolved Oxygen



# Brunswick Canoe Portage vs Brunswick Canoe Mooring- Dissolved Oxygen



Appendix I  
Public 163 LD 330 Section 24

PLEASE NOTE: Legislative Information **cannot** perform research, provide legal advice, or interpret Maine law. For legal assistance, please contact a qualified attorney.

## **An Act To Change the Classification of Certain Waters of the State**

**Be it enacted by the People of the State of Maine as follows:**

**Sec. 1. 38 MRSA §467, sub-§1, ¶C**, as amended by PL 2003, c. 317, §2, is further amended to read:

C. Androscoggin River, Upper Drainage; that portion within the State lying above the river's most upstream crossing of the Maine-New Hampshire boundary - Class A unless otherwise specified.

(1) Cupsuptic River and its tributaries - Class AA.

(2) Kennebago River and its tributaries except for the impoundment of the dam at Kennebago Falls - Class AA.

(3) Rapid River, from a point located 1,000 feet downstream of Middle Dam to its confluence with Umbagog Lake - Class AA.

(4) Magalloway River and tributaries above Aziscohos Lake in Lynchton Township, Parmachenee Township and Bowmantown Township - Class AA.

(4-A) Abbott Brook and its tributaries in Lincoln Plantation - Class AA.

(5) Little Magalloway River and tributaries in Parmachenee Township and Bowmantown Township - Class AA.

(6) Long Pond Stream in Rangeley - Class AA.

(7) Dodge Pond Stream in Rangeley - Class AA.

**Sec. 2. 38 MRSA §467, sub-§1, ¶D**, as amended by PL 2003, c. 317, §3, is further amended to read:

D. Androscoggin River, minor tributaries - Class B unless otherwise specified.

(1) All tributaries of the Androscoggin River that enter between the Maine-New Hampshire boundary in Gilead and its confluence with, and including, the Ellis River and that are not otherwise classified - Class A.

(2) Bear River - Class AA.

(3) Sabattus River from Sabattus Lake to limits of the Lisbon urban area - Class C.

- (4) Webb River - Class A.
- (5) Swift River, and its tributaries, above the Mexico-Rumford boundary - Class A.
- (6) Nezinscot River, east and west branches above their confluence in Buckfield - Class A.
- (7) Wild River in Gilead, Batchelders Grant - Class AA.
- (8) Aunt Hannah Brook and its tributaries in Dixfield - Class A.

**Sec. 3. 38 MRSA §467, sub-§4, ¶A**, as amended by PL 2003, c. 317, §6 and affected by §25, is further amended to read:

A. Kennebec River, main stem.

- (1) From the east outlet of Moosehead Lake to a point 1,000 feet below the lake - Class A.
- (2) From the west outlet of Moosehead Lake to a point 1,000 feet below the lake - Class A.
- (3) From a point 1,000 feet below Moosehead Lake to its confluence with Indian Pond - Class AA.
- (4) From Harris Dam to a point located 1,000 feet downstream from Harris Dam - Class A.
- (5) From a point located 1,000 feet downstream from Harris Dam to its confluence with the Dead River - Class AA.
- (6) From its confluence with the Dead River to the confluence with Wyman Lake, including all impoundments - Class A.
- (7) From the Wyman Dam to its confluence with the impoundment formed by the Williams Dam - Class A.
- (8) From the confluence with the Williams impoundment to the Route 201A bridge in Anson-Madison, including all impoundments - Class A.
- (9) From the Route 201A bridge in Anson-Madison to the Fairfield-Skowhegan boundary, including all impoundments - Class B.
- (10) From the Fairfield-Skowhegan boundary to ~~its confluence with Messalonskee Stream, including all impoundments~~ the Shawmut Dam - Class C.
- (10-A) From the Shawmut Dam to its confluence with Messalonskee Stream, excluding all impoundments - Class B.

(a) Waters impounded by the Hydro-Kennebec Dam and the Lockwood Dam in Waterville-Winslow - Class C.

(11) From its confluence with Messalonskee Stream to the Sidney-Augusta boundary, including all impoundments - Class B.

(12) From the Sidney-Augusta boundary to the Father John J. Curran Bridge in Augusta, including all impoundments - Class B.

(13) From the Father John J. Curran Bridge in Augusta to a line drawn across the tidal estuary of the Kennebec River due east of Abagadasset Point - Class B. Further, the Legislature finds that the free-flowing habitat of this river segment provides irreplaceable social and economic benefits and that this use must be maintained. Further, the license limits for total residual chlorine and bacteria for existing direct discharges of wastewater to this segment as of January 1, 2003 must remain the same as the limits in effect on that date and must remain in effect until June 30, 2009 or upon renewal of the license, whichever comes later. Thereafter, license limits for total residual chlorine and bacteria must be those established by the department in the license and may include a compliance schedule pursuant to section 414-A, subsection 2.

(14) From a line drawn across the tidal estuary of the Kennebec River due east of Abagadasset Point, to a line across the southwesterly area of Merrymeeting Bay formed by an extension of the Brunswick-Bath boundary across the bay in a northwesterly direction to the westerly shore of Merrymeeting Bay and to a line drawn from Chop Point in Woolwich to West Chop Point in Bath - Class B. Further, the Legislature finds that the free-flowing habitat of this river segment provides irreplaceable social and economic benefits and that this use must be maintained.

**Sec. 4. 38 MRSA §467, sub-§4, ¶I**, as repealed and replaced by PL 1989, c. 228, §2, is amended to read:

I. Kennebec River, minor tributaries - Class B unless otherwise specified.

(1) All minor tributaries entering above Wyman Dam that are not otherwise classified - Class A.

(2) All tidal portions of tributaries entering between ~~Edwards Dam~~ the Sidney-Vassalboro-Augusta town line and a line drawn across the tidal estuary of the Kennebec River due east of Abagadasset Point - Class ~~C~~ B, unless otherwise specified.

(a) Eastern River from head of tide to its confluence with the Kennebec River - Class C.

(3) Cold Stream, West Forks Plantation - Class AA.

(4) Moxie Stream, Moxie Gore, below a point located 1,000 feet downstream of the Moxie

Pond dam - Class AA.

(5) Austin Stream and its tributaries above the highway bridge of Route 201 in the Town of Bingham - Class A.

**Sec. 5. 38 MRSA §467, sub-§7, ¶E**, as amended by PL 1999, c. 277, §11, is further amended to read:

E. Piscataquis River Drainage.

(1) Piscataquis River, main stem.

(a) From the confluence of the East Branch and the West Branch to the Route 15 bridge in Guilford - Class A.

(b) From the Route 15 bridge in Guilford to the Maine Central Railroad bridge in Dover-Foxcroft - Class B.

(c) From the Maine Central Railroad bridge in Dover-Foxcroft to its confluence with the Penobscot River - Class B.

(2) Piscataquis River, tributaries - Class B unless otherwise specified.

(a) Except as otherwise provided, East and West Branches of the Piscataquis River and their tributaries above their confluence near Blanchard - Class A.

(b) East Branch of the Piscataquis River from 1,000 feet below Shirley Pond to its confluence with the West Branch - Class AA.

(c) Pleasant River, East Branch and its tributaries - Class A.

(d) Pleasant River, West Branch, from the outlet of Fourth West Branch Pond to its confluence with the East Branch - Class AA.

(e) Pleasant River, West Branch tributaries - Class A.

(f) Sebec River and its tributaries above Route 6 in Milo - Class A.

(g) West Branch of the Piscataquis River from 1,000 feet below West Shirley Bog to its confluence with the East Branch - Class AA.

(h) Black Stream - Class A.

(i) Cold Stream - Class A.

(j) Kingsbury Stream - Class A.

(k) Schoodic Stream - Class A.

(l) Scutaze Stream - Class A.

(m) ~~Sebois~~Seboeis Stream, including East and West Branches, and tributaries - Class A.

(n) Alder Stream and its tributaries - Class A.

**Sec. 6. 38 MRSA §467, sub-§7, ¶F**, as amended by PL 2003, c. 317, §13, is further amended to read:

F. Penobscot River, minor tributaries - Class B unless otherwise specified.

(1) Cambolasse Stream (Lincoln) below the Route 2 bridge - Class C.

(2) Great Works Stream (Bradley) and its tributaries above the Route 178 bridge - Class A.

(3) Kenduskeag Stream (Bangor) below the Bullseye Bridge - Class C.

(4) Mattanawcook Stream (Lincoln) below the outlet of Mattanawcook Pond - Class C.

(5) Olamon Stream and its tributaries above the bridge on Horseback Road - Class A.

(6) Passadumkeag River and its tributaries - Class A, unless otherwise specified.

(a) Passadumkeag River from the Pumpkinhill Dam to its confluence with the Penobscot River - Class AA.

(b) Ayers Brook - Class AA.

(7) Souadabscook Stream above head of tide - Class AA.

(7-A) Souadabscook Stream, tributaries of - Class B, unless otherwise specified.

(a) West Branch Souadabscook Stream (Hampden, Newburgh) - Class A.

(b) Brown Brook (Hampden) - Class A.

(8) Sunkhaze Stream and its tributaries - Class AA.

(9) Birch Stream - Class A.

(10) Hemlock Stream - Class A.

(11) Mattamiscontis Stream and its tributaries - Class A.

(12) Medunkeunk Stream - Class A.

(13) Rockabema Stream - Class A.

(14) Salmon Stream - Class A.

(15) Salmon Stream in Winn - Class A.

(16) Little Salmon Stream in Medway - Class A.

(17) Narrimissic River in Bucksport and Orland, including all impoundments - Class B.

**Sec. 7. 38 MRSA §467, sub-§9, ¶B**, as amended by PL 1991, c. 499, §16, is further amended to read:

B. Presumpscot River, tributaries - Class A unless otherwise specified.

(1) All tributaries entering below the outlet of Sebago Lake - Class B.

(2) Crooked River and its tributaries, except as otherwise provided, excluding existing impoundments ~~and excluding that area of the river previously impounded at Scribners Mill~~ - Class AA.

(3) Stevens Brook (Bridgton) - Class B.

(4) Mile Brook (Casco) - Class B.

**Sec. 8. 38 MRSA §467, sub-§12, ¶B**, as amended by PL 2003, c. 317, §15, is further amended to read:

B. Saco River, tributaries, those waters lying within the State - Class B unless otherwise specified.

(1) All tributaries entering above the confluence of the Ossipee River lying within the State

and not otherwise classified - Class A.

(2) Wards Brook (Fryeburg) - Class C.

(3) Buff Brook (Waterboro) - Class A.

(4) Ossipee River Drainage, those waters lying within the State - Class B unless otherwise specified.

(a) Emerson Brook in Parsonsfield - Class A.

(b) South River and its tributaries (Parsonsfield), those waters lying within the State - Class A.

**Sec. 9. 38 MRSA §467, sub-§13, ¶A**, as repealed and replaced by PL 1989, c. 764, §14, is amended to read:

A. St. Croix River, main stem.

(1) Except as otherwise provided, from the outlet of Chiputneticook Lakes to its confluence with the Woodland Lake impoundment, those waters lying within the State - Class A.

(2) Those waters ~~of~~ impounded in the Grand Falls Flowage including those waters between Route 1 (Princeton and Indian Township) and ~~Black-Cat Island~~ Grand Falls Dam - Class BGPA.

(3) Woodland Lake impoundment - Class C.

(4) From the Woodland Dam to tidewater, those waters lying within the State, including all impoundments - Class C.

**Sec. 10. 38 MRSA §467, sub-§15, ¶C**, as amended by PL 2003, c. 317, §17, is further amended to read:

C. Aroostook River Drainage.

(1) Aroostook River, main stem.

(a) From the confluence of Millinocket Stream and Munsungan Stream to the Route 11 bridge - Class AA.

(b) From the Route 11 bridge to the Sheridan Dam - Class B.

- (c) From the Sheridan Dam to its confluence with Presque Isle Stream, including all impoundments - Class B.
  - (d) From its confluence with Presque Isle Stream to a point located 3.0 miles upstream of the intake of the Caribou water supply, including all impoundments - Class C.
  - (e) From a point located 3.0 miles upstream of the intake of the Caribou water supply to a point located 100 yards downstream of the intake of the Caribou water supply, including all impoundments - Class B.
  - (f) From a point located 100 yards downstream of the intake of the Caribou water supply to the international boundary, including all impoundments - Class C.
- (2) Aroostook River, tributaries, those waters lying within the State - Class A unless otherwise specified.
- (a) All tributaries of the Aroostook River entering below the confluence of the Machias River that are not otherwise classified - Class B.
  - (b) Little Machias River and its tributaries - Class A.
  - (c) Little Madawaska River and its tributaries, including Madawaska Lake tributaries above the Caribou-Connor Township line - Class A.
  - (d) Machias River, from the outlet of Big Machias Lake to the Aroostook River - Class AA.
  - (e) Millinocket Stream, from the outlet of Millinocket Lake to its confluence with Munsungan Stream - Class AA.
  - (f) Munsungan Stream, from the outlet of Little Munsungan Lake to its confluence with Millinocket Stream - Class AA.
  - (g) Presque Isle Stream and its tributaries above the Mapleton-Presque Isle town line - Class A.
  - (h) St. Croix Stream from its confluence with Hall Brook in T.9, R.5, W.E.L.S. to its confluence with the Aroostook River - Class AA.

(j) Squa Pan Stream from the outlet of Squa Pan Lake to its confluence with the Aroostook River - Class C.

(k) Limestone Stream from the Long Road bridge to the Canadian border - Class C.

(l) Beaver Brook and its tributaries (T.14 R.6 W.E.L.S., T.14 R.5 W.E.L.S., T.13 R.5 W.E.L.S., Portage Lake, Ashland, Castle Hill) - Class A.

(m) Gardner Brook and its tributaries (T.14 R.5 W.E.L.S., T.13 R.5 W.E.L.S., Wade) - Class A.

**Sec. 11. 38 MRSA §467, sub-§15, ¶F**, as amended by PL 2003, c. 317, §18, is further amended to read:

F. St. John River, minor tributaries, those waters lying within the State - Class A unless otherwise specified.

(1) Except as otherwise classified, all minor tributaries of the St. John River entering below the international bridge in Fort Kent, those waters lying within the State - Class B.

(2) Baker Branch, from the headwaters at the St. John Ponds to its confluence with the Southwest Branch - Class AA.

(3) Big Black River, from the international boundary to its confluence with the St. John River - Class AA.

(4) Northwest Branch, from the outlet of Beaver Pond in T.12, R.17, W.E.L.S. to its confluence with the St. John River - Class AA.

(5) Prestile Stream from its source to Route 1A in Mars Hill - Class A.

(6) Southwest Branch, from a point located 5 miles downstream of the international boundary to its confluence with the Baker Branch - Class AA.

(7) Violette Stream and its tributaries, from its source to the confluence with Caniba Brook - Class A.

**Sec. 12. 38 MRSA §467, sub-§16, ¶B**, as amended by PL 1999, c. 277, §22, is further amended to read:

B. Salmon Falls River, tributaries, those waters lying within the State - Class B unless otherwise specified.

(1) Chicks Brook (South Berwick, York) - Class A.

(2) Little River and its tributaries (Berwick, North Berwick, Lebanon) - Class A.

**Sec. 13. 38 MRSA §468, sub-§1, ¶A-1** is enacted to read:

A-1. Cape Elizabeth.

(1) Trout Brook, those waters that form the town boundary with South Portland - Class C.

**Sec. 14. 38 MRSA §468, sub-§1, ¶B**, as repealed and replaced by PL 1989, c. 764, §21, is amended to read:

B. Portland.

(1) All minor drainages unless otherwise specified - Class C.

(2) Stroudwater River from its origin to tidewater, including all tributaries - Class B.

**Sec. 15. 38 MRSA §468, sub-§1, ¶C**, as repealed and replaced by PL 1989, c. 764, §21, is amended to read:

C. Scarborough.

(1) All minor drainages - Class C unless otherwise specified.

(2) Finnard Brook - Class B.

(3) Stuart Brook - Class B.

(4) Nonesuch River from the headwaters to a point 1/2 mile downstream of Mitchell Hill Road crossing - Class B.

(5) Stroudwater River from its origin to tidewater, including all tributaries - Class B.

**Sec. 16. 38 MRSA §468, sub-§1, ¶D**, as repealed and replaced by PL 1989, c. 764, §21, is amended to read:

D. South Portland.

(1) All minor drainages - Class C.

(2) Trout Brook downstream of the first point where the brook becomes the town boundary between South Portland and Cape Elizabeth - Class C.

**Sec. 17. 38 MRSA §468, sub-§1, ¶J** is enacted to read:

J. Westbrook.

(1) Long Creek, main stem - Class C.

**Sec. 18. 38 MRSA §468, sub-§4, ¶D** is enacted to read:

D. Bristol.

(1) Pemaquid River and its tributaries, all freshwater sections below Pemaquid Pond - Class A.

**Sec. 19. 38 MRSA §468, sub-§7, ¶D** is enacted to read:

D. Black Brook in Lincolnville - Class A.

**Sec. 20. 38 MRSA §468, sub-§7, ¶E** is enacted to read:

E. Kendall Brook in Lincolnville - Class A.

**Sec. 21. 38 MRSA §468, sub-§7, ¶F** is enacted to read:

F. Tucker Brook in Lincolnville - Class A.

**Sec. 22. 38 MRSA §469, sub-§5, ¶B**, as enacted by PL 1989, c. 764, §27, is amended to read:

B. Phippsburg.

(1) Tidal waters east of longitude 69°-50'-05" W. and west of longitude 69°-47'-00" W. - Class SA.

(2) Tidal waters of The Basin, including The Narrows east of a line drawn between 69°-51'-57" W. and 43°-48'-14" N. - Class SA.

**Sec. 23. Report concerning procedures for reclassification.** The Department of Environmental Protection shall review the current procedures for reclassification contained in the Maine Revised Statutes, Title 38, section 464, subsection 2 and suggest any changes or clarifications needed to make the procedures more consistent and efficient while maintaining a full public review process. The recommendations may include draft legislation. The report must be submitted to the Joint Standing Committee on Natural Resources by January 15, 2010 and the committee may submit legislation related to this report to the Second Regular Session of the 124th Legislature.

**Sec. 24. Lower Androscoggin River water quality sampling; report; legislation.** The Department of Environmental Protection, with the assistance of and in consultation with volunteer river monitors, shall establish and implement a water quality sampling program for the lower Androscoggin River from Gulf Island Dam to the line formed by the extension of the Bath-Brunswick boundary across Merrymeeting Bay in a northwesterly direction.

**1. Timing.** The water quality sampling program must occur during the 2009 sampling season.

**2. Purpose.** The purpose of the water quality sampling program implemented under this section is to allow additional water quality data to be collected to determine if the section of the Androscoggin River from Worumbo Dam in Lisbon Falls to the line formed by the extension of the Bath-Brunswick boundary across Merrymeeting Bay in a northwesterly direction meets, or can reasonably be expected

to meet, the criteria for reclassification from Class C to Class B.

**3. Reclassification procedures.** Unless the Department of Environmental Protection is unable to obtain the required monitoring data due to excessive rainfall or other unforeseen events, or unless the monitoring data indicate an upgrade is unwarranted, the department shall initiate the procedures for reclassification in accordance with the Maine Revised Statutes, Title 38, section 464, subsection 2 to upgrade the lower Androscoggin River from Worumbo Dam in Lisbon Falls to the line formed by the extension of the Bath-Brunswick boundary across Merrymeeting Bay in a northwesterly direction from Class C to Class B.

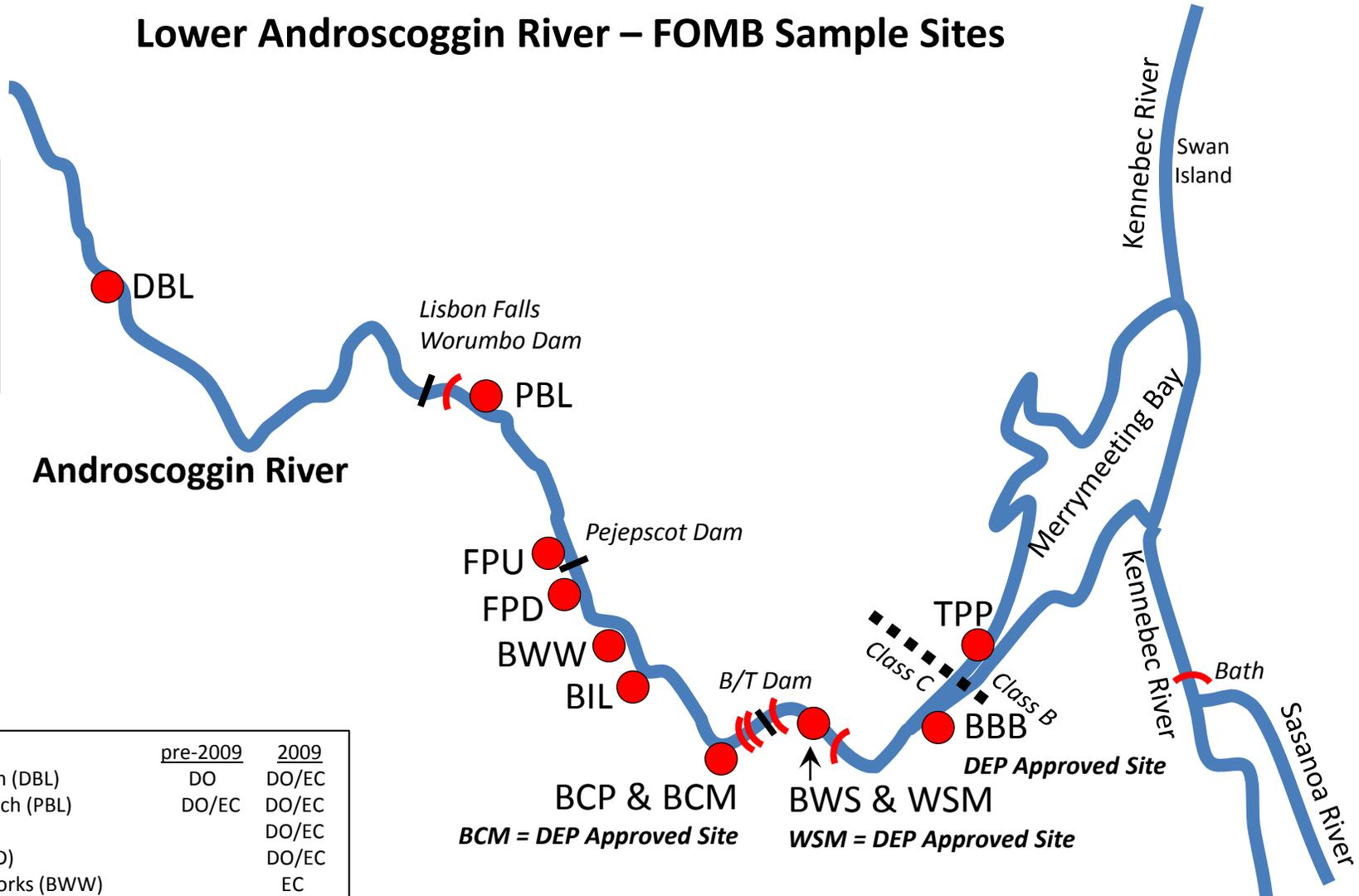
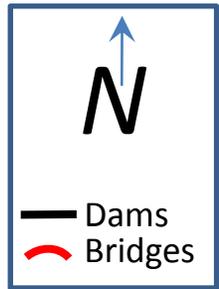
**4. Report.** By February 15, 2010, the Department of Environmental Protection shall submit a report, including recommendations and any necessary implementing legislation, in connection with the water quality sampling program required under this section to the Joint Standing Committee on Natural Resources.

**5. Legislation authorized.** The Joint Standing Committee on Natural Resources may report out legislation relating to the subject matter of this section to the Second Regular Session of the 124th Legislature.

Effective September 12, 2009

Appendix 2  
Map Lower Androscoggin River

# Lower Androskoggin River – FOMB Sample Sites



	<u>pre-2009</u>	<u>2009</u>
Durham Boat Launch (DBL)	DO	DO/EC
Pejepscot Boat Launch (PBL)	DO/EC	DO/EC
Fish Park Up (FPU)		DO/EC
Fish Park Down (FPD)		DO/EC
Brunswick Water Works (BWW)		EC
Brunswick Interstate Ledges (BIL)		DO/EC
Brunswick Canoe Portage (BCP)		DO/EC
Brunswick Canoe Mooring (BCM)		DO/EC
Brunswick Water St. Boat Launch (BWS)	EC	DO/EC
Water Street Mooring (WSM)		DO/EC
Brunswick Bay Bridge (BBB)	EC	DO/EC
Topsham Pleasant Pt. (TPP)	DO	DO

BCP & BCM  
**BCM = DEP Approved Site**

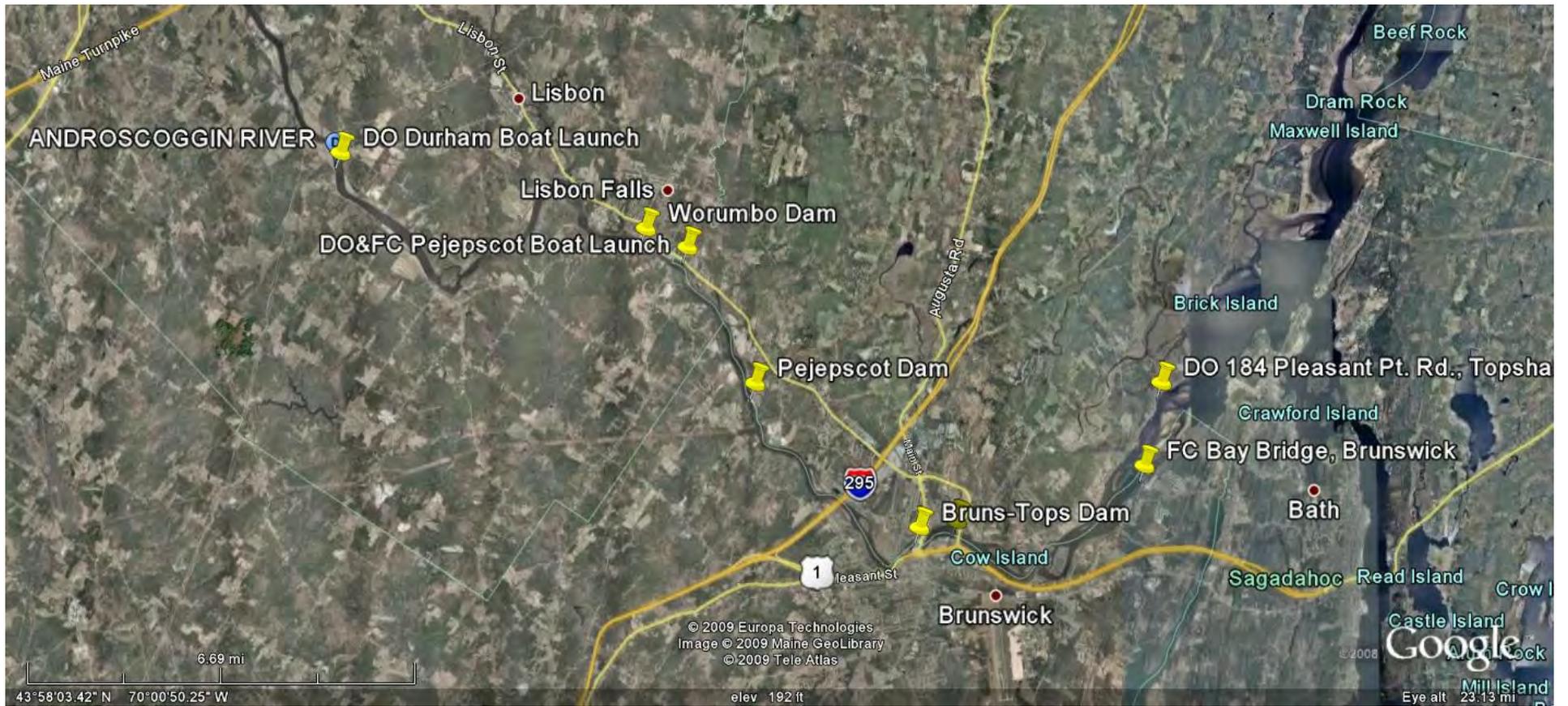
BWS & WSM  
**WSM = DEP Approved Site**

TPP  
**DEP Approved Site**

BBB  
**DEP Approved Site**

<b>Upstream Monitoring</b>	<u>pre-2009</u>	<u>2009</u>
Gulf Island Pond Above	DO	
Gulf Island Pond Below (Bates Boathouse)	DO	
Auburn Boat Launch		DO

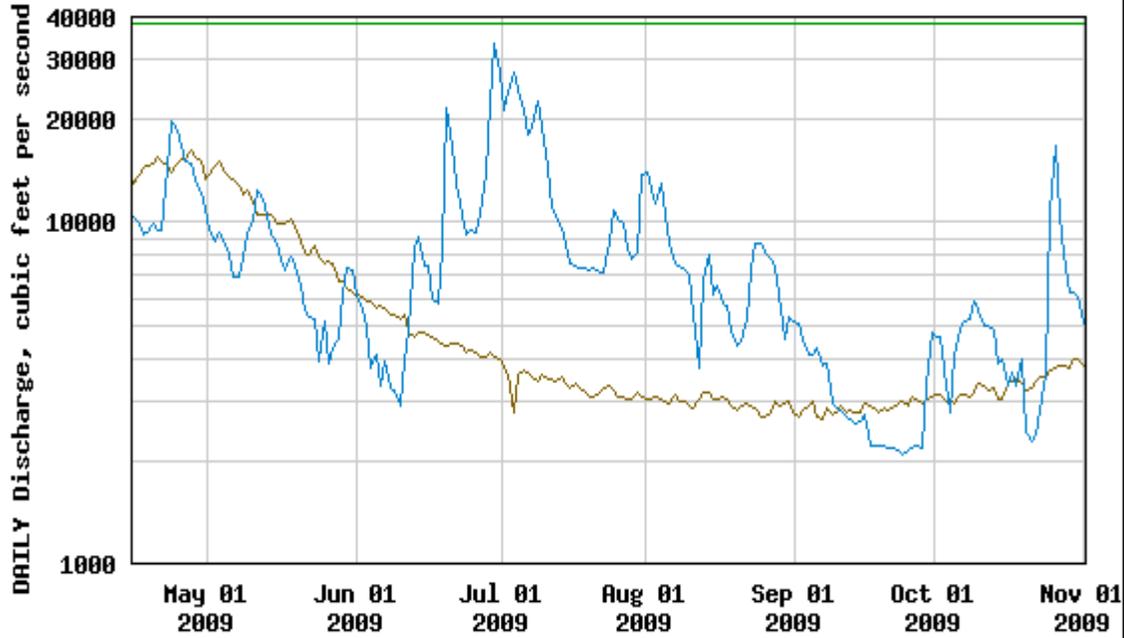
Appendix 3  
Lower Androscoggin River  
Aerial View Map



Appendix 4  
USGS Monthly Flows  
Lower Androscoggin River - Auburn



### USGS 01059000 Androscoggin River near Auburn, Maine



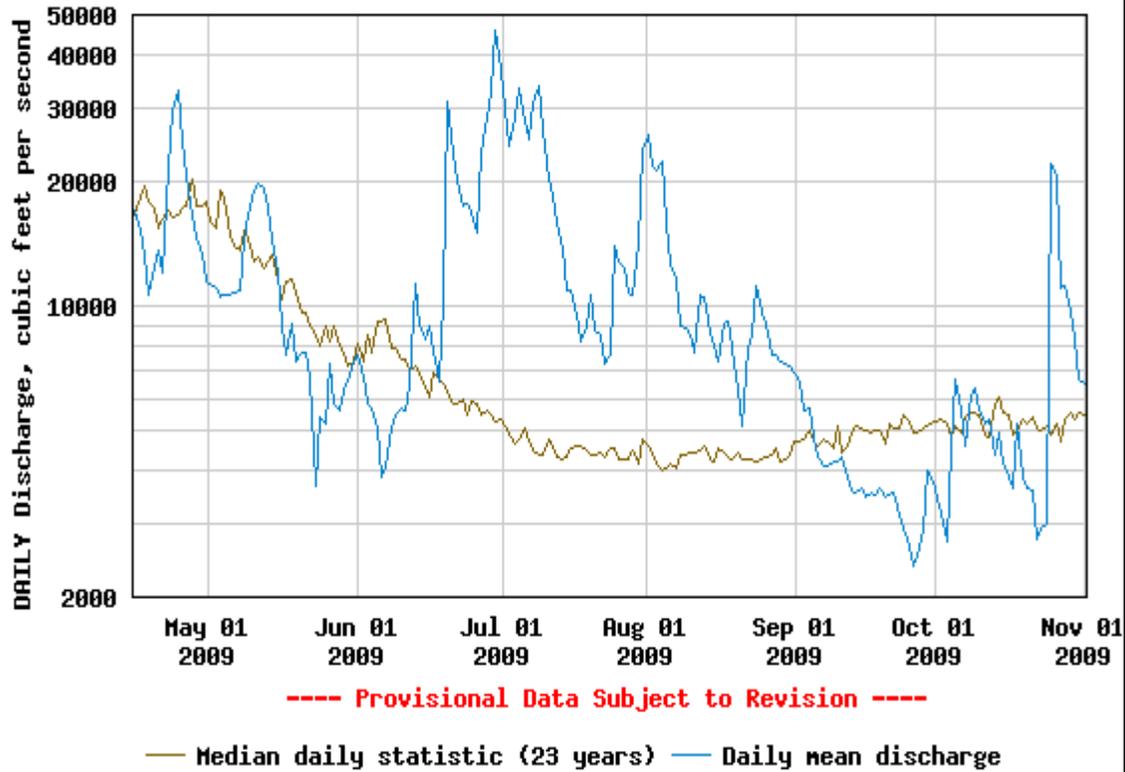
----- Provisional Data Subject to Revision -----

- Median daily statistic (79 years)
- 2 Year Peak Flow \*
- Daily mean discharge

Appendix 5  
USGS Monthly Flows  
Lower Androscoggin River - Sidney



### USGS 01049265 Kennebec River at North Sidney, Maine



Appendix 6  
National Weather  
Portland Summary  
2009

000  
 CXUS51 KGYX 061615  
 CLAPWM

PORTLAND CLIMATE DATA FOR THE YEAR 2009  
 NATIONAL WEATHER SERVICE GRAY ME  
 1115 AM EST WED JAN 6 2010

THE YEAR 2009 IN PORTLAND MAINE WILL GO INTO THE RECORD BOOKS AS ONE OF THE WETTEST YEARS EVER RECORDED IN THE PAST 139 YEARS. HERE ARE SOME OF THE CLIMATOLOGICAL STATISTICS AND A DISCUSSION OF THE WEATHER HIGHLIGHTS FOR THE PAST YEAR.

TEMPERATURE DATA	YEAR 2009	NORMAL	DEPARTURE
AVG. MONTHLY	46.1	45.7	PLUS 0.4
AVG. MAXIMUM	55.1	55.2	MINUS 0.1
AVG. MINIMUM	37.1	36.3	PLUS 0.8

NUMBER OF DAYS:	YEAR 2009	NORMAL	
MAXIMUM 90 OR ABOVE	4	4.5	MINUS 0.5
MAXIMUM 32 OR BELOW	48	47.7	PLUS 0.3
MINIMUM 32 OR BELOW	139	154.7	MINUS 15.7
MINIMUM 0 OR BELOW	10	13.3	MINUS 3.3

HIGHEST TEMPERATURE... 92 ON APRIL 28TH  
 LOWEST TEMPERATURE... -16 ON JANUARY 16TH  
 COLDEST HIGH... 14 ON JANUARY 15TH & 16TH  
 WARMEST LOW.... 71 ON AUGUST 23RD

WARMEST DAY... AUGUST 19TH WITH AN AVERAGE OF 80 DEGREES  
 COLDEST DAY... JANUARY 16TH WITH AN AVERAGE OF -1 DEGREE

	YEAR 2009	NORMAL	DEPARTURE
HEATING DEGREE DAYS	7076	7318	MINUS 242
COOLING DEGREE DAYS	304	347	MINUS 43

HEATING AND COOLING DEGREE DAYS LISTED ARE FOR THE CALENDAR YEAR. THE HEATING DEGREE DAY SEASON NORMALLY RUNS FROM JULY 1ST THROUGH JUNE 30TH...WHILE THE COOLING DEGREE SEASON NORMALLY RUNS FROM JANUARY 1ST THROUGH DECEMBER 31ST.

PRECIPITATION	58.61	45.83	PLUS 12.78
SNOWFALL	67.7	66.4	PLUS 1.3

GREATEST PRECIPITATION IN 24 HOURS... 5.25 INCHES ON NOVEMBER 14-15TH  
 GREATEST SNOWFALL IN 24 HOURS... 11.6 INCHES ON JANUARY 18-19TH  
 GREATEST SNOW DEPTH ON GROUND... 16 INCHES ON JANUARY 29TH

THE FOLLOWING DATA IS FOR A CALENDAR DAY /MIDNIGHT TO MIDNIGHT/...

NUMBER OF DAYS WITH PRECIPITATION OF		NORMAL	DEPARTURE
.01 INCH OR MORE	136	128.1	PLUS 7.9
.10 INCH OR MORE	81	77.3	PLUS 3.7
.50 INCH OR MORE	33	28.9	PLUS 4.1
1.00 INCH OR MORE	19	10.7	PLUS 8.3

NUMBER OF DAYS WITH SNOWFALL OF		NORMAL	DEPARTURE
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1 WHOLE INCH OR MORE	16	17.2	MINUS 1.2
3 WHOLE INCHES OR MORE	8	9.0	MINUS 1.0
6 WHOLE INCHES OR MORE	3	3.6	MINUS 0.6
NUMBER OF DAYS WITH THUNDERSTORMS...	10	17.6	MINUS 7.6
NUMBER OF DAYS WITH HEAVY FOG...	52	48.6	PLUS 3.4
(VISIBILITY 1/4 MILE OR LESS)			

...PORTLAND MAINE 2009 MONTHLY TEMPERATURE DATA...  
(RANK: 1ST = WARMEST, 69TH = COLDEST)

MONTH	AVG HIGH	AVG LOW	MEAN TEMP	DEPARTURE FROM NORMAL	RANK
JAN	27.9	7.1	17.5	MINUS 4.2	17TH
FEB	35.8	16.0	25.9	PLUS 1.1	20TH (TIED)
MAR	41.5	24.4	33.0	MINUS 0.7	32ND
APR	57.0	36.4	46.7	PLUS 3.0	2ND
MAY	64.5	45.7	55.1	PLUS 1.3	12TH
JUN	67.9	54.1	61.0	MINUS 1.9	54TH (TIED)
JUL	74.0	58.3	66.2	MINUS 2.5	62ND
AUG	79.0	60.4	69.7	PLUS 2.5	10TH
SEP	69.5	48.6	59.1	PLUS 0.4	37TH
OCT	55.5	38.2	46.9	MINUS 0.8	56TH
NOV	52.0	34.0	43.0	PLUS 4.7	2ND (TIED)
DEC	36.9	21.6	29.3	PLUS 1.7	26TH
YEAR	55.1	37.1	46.1	PLUS 0.4	20TH (TIED)

...PORTLAND MAINE 2009 MONTHLY PRECIPITATION DATA...  
(RANK: 1ST = WETTEST, 139TH = DRIEST)

MONTH	PRECIPITATION	DEPARTURE FROM NORMAL	RANK
JAN	2.35	MINUS 1.74	116TH
FEB	2.79	MINUS 0.35	91ST
MAR	2.66	MINUS 1.48	98TH
APR	4.63	PLUS 0.37	37TH
MAY	4.52	PLUS 0.70	37TH
JUN	8.56	PLUS 5.28	5TH
JUL	8.60	PLUS 5.28	2ND
AUG	5.15	PLUS 2.10	16TH
SEP	1.38	MINUS 1.99	121ST
OCT	4.99	PLUS 0.59	28TH
NOV	7.74	PLUS 3.02	9TH (TIED)
DEC	5.24	PLUS 1.00	32ND
YEAR	58.61	PLUS 12.78	8TH

...PORTLAND MAINE 2009 MONTHLY SNOWFALL DATA...  
(RANK: 1 = SNOWIEST, 128TH = LEAST SNOWIEST)

MONTH	SNOWFALL	DEPARTURE FROM NORMAL	RANK
JAN	28.0	PLUS 7.5	23RD
FEB	15.3	PLUS 2.5	68TH (TIED)
MAR	10.6	MINUS 2.4	68TH (TIED)
APR	0.0	MINUS 3.2	119TH (TIED)
MAY	0.0	MINUS TRACE	23RD (TIED)
JUN	0.0	NORMAL	-----
JUL	0.0	NORMAL	-----

AUG	0.0	NORMAL	-----
SEP	0.0	NORMAL	-----
OCT	TRACE	MINUS 0.1	12TH (TIED)
NOV	TRACE	MINUS 3.2	92ND (TIED)
DEC	13.8	PLUS 0.2	49TH
YEAR	67.7	PLUS 1.3	-----

NOTE...SNOWFALL FOR THE YEAR IS GIVEN FOR THE CALENDAR YEAR.  
 NORMALLY SNOWFALL TOTALS AND RANKINGS ARE GIVEN FOR THE SEASON  
 ...FROM JULY 1ST THROUGH JUNE 30TH.

...DISCUSSION...

THE YEAR 2009 WAS MUCH WETTER AND SLIGHTLY WARMER THAN NORMAL.

PRECIPITATION (RAINFALL PLUS MELTED SNOWFALL) FOR THE YEAR WAS 58.61 INCHES. THIS WAS NEARLY 13 INCHES (12.78 INCHES) ABOVE NORMAL AND RANKS AS THE 8TH WETTEST YEAR IN THE PAST 139 YEARS OF PRECIPITATION RECORDS. THE WETTEST YEAR WAS IN 2005 WITH 66.45 INCHES AND THE DRIEST YEAR WAS IN 1941 WITH JUST 25.27 INCHES OF PRECIPITATION.

HERE IS A LIST OF THE TEN WETTEST YEARS ON RECORD...

RANK	PRECIPITATION	YEAR	
1	66.45 INCHES	2005	
2	66.33 INCHES	1983	
3	61.24 INCHES	2008	
4	61.15 INCHES	1979	
5	60.86 INCHES	2006	
6	59.69 INCHES	1920	
7	59.24 INCHES	1888	
8	58.61 INCHES	2009	<===
9	58.39 INCHES	1996	
10	58.07 INCHES	1933	

DRIEST	25.27 INCHES	1941
NORMAL	45.83 INCHES	

THE WET YEAR WAS HIGHLIGHTED BY THE WETTEST SUMMER ON RECORD. ALL THREE SUMMER MONTHS HAD ABOVE NORMAL RAINFALL WITH BOTH JUNE AND JULY RECORDING OVER EIGHT INCHES OF RAIN WITH AUGUST TOPPING FIVE INCHES. THIS WAS THE 5TH WETTEST JUNE WITH 8.56 INCHES OF RAIN FOLLOWED BY THE 2ND WETTEST JULY WITH 8.60 INCHES OF RAIN. AUGUST WAS THE 16TH WETTEST ON RECORD WITH 5.15 INCHES OF RAIN. JULY ALSO SET A RECORD WITH THE MOST DAYS IN THE MONTH OF JULY WITH RAIN. THERE WERE 22 DAYS WITH A TRACE OR MORE RAINFALL...BREAKING THE OLD RECORD FOR JULY OF 21 DAYS WHICH OCCURRED IN 1938 AND 1974.

HERE IS A LIST OF THE WETTEST SUMMERS ON RECORD...

RANK	RAINFALL	YEAR	
1	22.31 INCHES	2009	<===
2	19.04 INCHES	1991	
3	18.43 INCHES	1915	
4	17.56 INCHES	1917	
5	17.21 INCHES	2006	
6	15.96 INCHES	1998	

7	15.89	INCHES	1872
8	15.72	INCHES	1922
9	15.60	INCHES	1885
10	15.42	INCHES	1892
11	15.33	INCHES	1887
12	14.87	INCHES	2008
13	14.14	INCHES	1877
	14.14	INCHES	1879
DRIEST	4.10	INCHES	1999
NORMAL	9.65	INCHES	

THIS WAS ALSO ONE OF THE WETTEST SEASONS EVER IN PORTLAND MAINE. THE 22.31 INCHES THIS SUMMER WAS THE 4TH WETTEST SEASON EVER AND ONLY THE 7TH TIME PORTLAND RECORDED MORE THAN 20 INCHES OF PRECIPITATION IN A SEASON. THE WETTEST SEASON WAS AUTUMN OF 2005 WITH 24.18 INCHES OF PRECIPITATION.

HERE IS A LIST OF THE WETTEST SEASONS ON RECORD IN PORTLAND...

RANK	PRECIPITATION	SEASON	
1	24.18 INCHES	AUTUMN 2005	
2	23.15 INCHES	AUTUMN 1888	
3	22.55 INCHES	SPRING 1983	
4	22.31 INCHES	SUMMER 2009	<===
5	22.20 INCHES	AUTUMN 1996	
6	21.07 INCHES	SPRING 1901	
7	20.49 INCHES	WINTER 1934-35	
8	19.93 INCHES	SPRING 2005	
9	19.57 INCHES	SPRING 1984	
10	19.51 INCHES	SPRING 1973	

NORMAL WINTER	11.47	INCHES
NORMAL SPRING	12.22	INCHES
NORMAL SUMMER	9.65	INCHES
NORMAL AUTUMN	12.49	INCHES

NOTE...METEOROLOGICAL SEASONS ARE AS FOLLOWS...

WINTER IS DECEMBER, JANUARY AND FEBRUARY. SPRING IS MARCH, APRIL AND MAY. SUMMER IS JUNE, JULY AND AUGUST. AUTUMN IS SEPTEMBER, OCTOBER AND NOVEMBER.

IT SHOULD ALSO BE NOTED THAT THE COMBINED RAINFALL FOR JUNE AND JULY WAS A RECORD FOR THE TWO MONTH PERIOD. THE 17.16 INCHES OF RAIN IN JUNE AND JULY EASILY SURPASSED THE OLD RECORD FOR THE TWO MONTH PERIOD OF 14.83 INCHES IN 2006. NORMALLY THESE TWO MONTHS COMBINE FOR 6.60 INCHES OF RAIN.

THE RECORD SETTING WET SUMMER WAS A SHARP TURN AROUND FROM THE BEGINNING OF THE YEAR WHEN EACH OF THE FIRST THREE MONTHS HAD BELOW NORMAL PRECIPITATION. SEPTEMBER WAS THE ONLY OTHER MONTH IN 2009 WITH BELOW NORMAL PRECIPITATION.

NOVEMBER 2009 TIED AS THE NINTH WETTEST WITH 7.74 INCHES OF PRECIPITATION. THIS WAS HIGHLIGHTED BY A DAILY RECORD RAINFALL OF 5.03 INCHES FOR THE MONTH OF NOVEMBER. THE 5.03 INCHES ON NOVEMBER 14TH TOPPED THE OLD RECORD FOR MOST RAIN IN A NOVEMBER DAY IN PORTLAND OF 4.70 INCHES WHICH WAS SET ON NOVEMBER 10, 1990.

THIS WAS ONLY THE EIGHTH TIME PORTLAND HAD OVER FIVE INCHES OF PRECIPITATION FOR ANY DAY IN THE YEAR. THE WETTEST DAY EVER IN PORTLAND WAS ON OCTOBER 21, 1996 WHEN 11.74 INCHES OF RAIN FELL.

THE 5.03 INCHES ON NOVEMBER 14TH COMBINED WITH 0.22 INCHES ON THE 15TH TO GIVE THE GREATEST 24 HOUR (NOT NECESSARILY A CALENDAR DAY) TOTAL RAINFALL OF 5.25 INCHES FOR THE YEAR.

SNOWFALL FOR THE YEAR TOTALED 67.7 INCHES WHICH WAS 1.3 INCHES ABOVE NORMAL. RANKINGS FOR CALENDAR YEAR SNOWFALL ARE NOT KEPT, RATHER RANKINGS ARE FOR SEASONAL SNOWFALL.

JANUARY WAS THE SNOWIEST MONTH OF THE YEAR WITH 28.0 INCHES. THIS WAS FOLLOWED BY 15.3 INCHES IN FEBRUARY, 13.8 INCHES IN DECEMBER AND 10.6 INCHES IN MARCH. THE REST OF THE YEAR ACCOUNTED FOR JUST A TRACE OF SNOWFALL.

THE BIGGEST 24 HOUR SNOWFALL WAS JUST UNDER A FOOT OF SNOW (11.6 INCHES) ON JANUARY 18-19TH. TEN DAYS LATER, ON THE 29TH, PORTLAND HAD ITS GREATEST SNOW DEPTH FOR THE YEAR WITH 16 INCHES OF SNOW ON THE GROUND.

TEMPERATURES FOR THE YEAR WERE SLIGHTLY ABOVE NORMAL. THE AVERAGE TEMPERATURE OF 46.1 DEGREES WAS 0.4 DEGREES ABOVE NORMAL. THE WARMEST YEAR WAS IN 2006 WITH AN AVERAGE TEMPERATURE OF 48.5 DEGREES WHILE THE COLDEST YEAR WAS IN 1962 WITH AN AVERAGE TEMPERATURE OF 43.3 DEGREES. THE YEAR OF 2009 TIED AS THE 20TH WARMEST IN THE 69 YEARS OF TEMPERATURE RECORDS AT THE PORTLAND JETPORT.

THE AVERAGE HIGH FOR THE YEAR WAS 55.1 DEGREES...JUST 0.1 DEGREE BELOW NORMAL. THE AVERAGE LOW FOR THE YEAR WAS 37.1 DEGREES OR 0.8 DEGREES ABOVE NORMAL.

THE HOTTEST TEMPERATURE FOR THE YEAR SURPRISINGLY OCCURRED IN APRIL. THE HIGH OF 92 DEGREES ON APRIL 28TH WAS NOT ONLY A RECORD FOR THE WARMEST TEMPERATURE IN APRIL BUT WAS THE FIRST TIME PORTLAND EVER REACHED 90 DEGREES IN APRIL.

THIS WAS FOLLOWED BY A 91 DEGREE HIGH TEMPERATURE ON MAY 21ST...ONLY THE 14TH TIME PORTLAND HIT 90 IN MAY AND TIED TWO OTHER DAYS IN MAY AS THE 6TH WARMEST TEMPERATURE EVER RECORDED IN THAT MONTH.

THERE WERE TWO MORE 90 DEGREE DAYS IN 2009 AND THOSE HAPPENED IN AUGUST. AUGUST ALSO HAD THE WARMEST DAY OF THE YEAR WITH AN AVERAGE TEMPERATURE OF 80 DEGREES ON AUGUST 19TH AND THE WARMEST LOW TEMPERATURE FOR THE YEAR OF 71 DEGREES ON THE MORNING OF THE 23RD.

JUNE AND JULY, AS WET AS THEY WERE, WERE ALSO QUITE COOL WITH WELL BELOW NORMAL TEMPERATURES AND NO 90 DEGREE READINGS. IN FACT, JUNE NEVER REACHED 80 DEGREES WITH A MONTHLY HIGH OF ONLY 78. THERE WERE JUST TWO OTHER YEARS AT THE PORTLAND JETPORT WHEN JUNE TEMPERATURES NEVER REACHED 80.

OVERALL, JUNE WAS 1.9 DEGREES COLDER THAN NORMAL. THAT WAS TOPPED BY JULY WHICH WAS 2.5 DEGREES BELOW NORMAL.

JULY HAD SOME VERY REMARKABLY COLD HIGH TEMPERATURES EARLY IN THE MONTH. THE HIGH OF 58 DEGREES ON JULY 8TH TIED AS THE SECOND COLDEST HIGH EVER RECORDED IN THE MONTH OF JULY. THE RECORD STILL STANDS AT 57 DEGREES ON JULY 4TH, 1992.

THERE WERE TWO OTHER DAYS IN JULY THAT NEVER REACHED 60 AND ONE DAY THAT REACHED 60 DEGREES. THESE COLD HIGHS ALSO RANKED AS SOME OF THE COLDEST HIGH TEMPERATURES EVER RECORDED IN JULY.

HERE IS A LIST OF THE COLDEST JULY HIGH TEMPERATURES AT THE PORTLAND JETPORT...

RANK	TEMPERATURE	DATE
1	57 DEGREES	JULY 4, 1992
2	58 DEGREES	JULY 6, 1956
	58 DEGREES	JULY 8, 2009 <===
4	59 DEGREES	JULY 8, 1961
	59 DEGREES	JULY 16, 1961
	59 DEGREES	JULY 30, 1976
	59 DEGREES	JULY 3, 1987
	59 DEGREES	JULY 1, 2009 <===
	59 DEGREES	JULY 2, 2009 <===
10	60 DEGREES	JULY 7, 2009 <===
11	61 DEGREES	SEVERAL DATES

THESE TEMPERATURES ARE AN ASTOUNDING 20 DEGREES OR SO BELOW THE NORMAL JULY HIGH TEMPERATURE OF 78 DEGREES.

OVERALL, JULY 2009 WAS THE EIGHTH COLDEST ON RECORD WITH AN AVERAGE TEMPERATURE OF 66.2 DEGREES. THE COLDEST JULY WAS IN 1962 WITH AN AVERAGE TEMPERATURE OF 64.0 DEGREES. NORMALLY JULY HAS AN AVERAGE TEMPERATURE OF 68.7 DEGREES.

THE AVERAGE HIGH TEMPERATURE IN JULY WAS A RECORD FOR BEING SO COLD. THE AVERAGE HIGH WAS JUST 74.0 DEGREES, TOPPING THE OLD MARK OF 74.6 DEGREES IN 2004. NORMALLY JULY HAS AN AVERAGE HIGH OF 78.8 DEGREES.

IT IS INTERESTING TO NOTE THAT THE COLD WEATHER IN JUNE AND JULY FOLLOWED A VERY WARM SPRING WHEN PORTLANDS AVERAGE TEMPERATURE FOR THE SPRING MONTHS OF MARCH, APRIL AND MAY TIED AS THE 7TH WARMEST ON RECORD.

THE MONTH WITH THE GREATEST DEPARTURE FROM NORMAL WAS NOVEMBER WITH AN AVERAGE TEMPERATURE THAT WAS 4.7 DEGREES ABOVE NORMAL. THE AVERAGE OF 43.0 DEGREES TIED AS THE SECOND WARMEST ON RECORD.

FOR THE YEAR THERE WERE SEVEN MONTHS WITH ABOVE NORMAL TEMPERATURES AND FIVE WITH BELOW NORMAL TEMPERATURES. JANUARY WAS THE MOST EXTREME ON THE COLD SIDE WITH AN AVERAGE THAT WAS 4.2 DEGREES BELOW NORMAL AND THE 17TH COLDEST JANUARY ON RECORD.

JANUARY ALSO HAD THE COLDEST DAY OF THE YEAR. THE AVERAGE TEMPERATURE ON JANUARY 16TH WAS MINUS ONE...THE ONLY DAY TO AVERAGE BELOW ZERO DURING THE YEAR. THE HIGH TEMPERATURE ON JANUARY 16TH WAS 14 DEGREES WHICH TIED JANUARY 15TH AS

THE COLDEST HIGH FOR THE YEAR. THE LOW ON JANUARY 16TH WAS  
16 DEGREES BELOW ZERO...THE COLDEST TEMPERATURE FOR THE  
YEAR.

HERE IS A LIST OF DAILY TEMPERATURE AND PRECIPITATION RECORDS...  
FROM MIDNIGHT TO MIDNIGHT...SET OR TIED DURING THE YEAR 2009...

DATE	RECORD	PREVIOUS RECORD AND YEAR
JAN 18	11.5 - GREATEST DAILY SNOWFALL	11.2 INCHES IN 1979
JAN 25	35 - GREATEST DAILY TEMP. RANGE	32 DEGREES IN 1986
FEB 8	51 - RECORD HIGH TEMPERATURE	46 DEGREES IN 1991
MAR 2	7.9 - GREATEST DAILY SNOWFALL	6.0 INCHES IN 1908
MAR 7	37 - WARMEST LOW TEMPERATURE	37 DEGREES IN 1974 & 1979 (TIED)
MAR 30	4 - SMALLEST DAILY TEMP. RANGE	4 DEGREES IN 1944, 1956 & 1972 (TIED)
APR 18	46 - WARMEST LOW TEMPERATURE	45 DEGREES IN 1945, 1973, 1987 & 2006
APR 26	80 - RECORD HIGH TEMPERATURE	76 DEGREES IN 1985
APR 26	49 - WARMEST LOW TEMPERATURE	49 DEGREES IN 1986 (TIED)
APR 26	65 - WARMEST DAILY AVERAGE TEMP.	60 DEGREES IN 1985
APR 28	92 - RECORD HIGH TEMPERATURE	81 DEGREES IN 1990
APR 28	69 - WARMEST DAILY AVERAGE TEMP.	63 DEGREES IN 1990
APR 28	47 - GREATEST DAILY TEMP. RANGE	37 DEGREES IN 1990
MAY 21	91 - RECORD HIGH TEMPERATURE	87 DEGREES IN 1992
MAY 21	70 - WARMEST AVERAGE TEMPERATURE	70 DEGREES IN 1996 (TIED)
MAY 21	43 - GREATEST DAILY TEMP. RANGE	43 DEGREES IN 1992 (TIED)
MAY 22	63 - WARMEST LOW TEMPERATURE	60 DEGREES IN 1987
MAY 22	75 - WARMEST AVERAGE TEMPERATURE	72 DEGREES IN 1987 & 1992
MAY 28	49 - COLDEST HIGH TEMPERATURE	53 DEGREES IN 1941 & 2004
MAY 28	47 - COLDEST AVERAGE TEMPERATURE	49 DEGREES IN 1950 & 1977
MAY 28	5 - SMALLEST DAILY TEMP. RANGE	5 DEGREES IN 1941 & 1966 (TIED)
JUN 12	1.67 - GREATEST PRECIPITATION	1.18 INCHES IN 1936
JUN 14	3 - SMALLEST DAILY TEMP. RANGE	6 DEGREES IN 1954
JUN 19	3.21 - GREATEST PRECIPITATION	2.43 INCHES IN 1922
JUN 19	5 - SMALLEST DAILY TEMP. RANGE	5 DEGREES IN 1959 & 1962 (TIED)
JUN 30	4 - SMALLEST DAILY TEMP. RANGE	7 DEGREES IN 1967, 1972, 1980 & 1996
JUL 1	59 - COLDEST HIGH TEMPERATURE	62 DEGREES IN 1976
JUL 1	3 - SMALLEST DAILY TEMP. RANGE	4 DEGREES IN 1979
JUL 2	59 - COLDEST HIGH TEMPERATURE	63 DEGREES IN 1986
JUL 2	3 - SMALLEST DAILY TEMP. RANGE	5 DEGREES IN 1970
JUL 2	1.41 - GREATEST PRECIPITATION	1.32 INCHES IN 1983
JUL 7	60 - COLDEST HIGH TEMPERATURE	64 DEGREES IN 1956
JUL 7	5 - SMALLEST DAILY TEMP. RANGE	6 DEGREES IN 2005
JUL 7	1.57 - GREATEST PRECIPITATION	1.34 INCHES IN 1935
JUL 8	58 - COLDEST HIGH TEMPERATURE	59 DEGREES IN 1961
JUL 8	57 - COLDEST DAILY AVERAGE TEMP.	57 DEGREES IN 1963 & 1995 (TIED)
JUL 8	3 - SMALLEST DAILY TEMP. RANGE	4 DEGREES IN 1979
JUL 24	65 - COLDEST HIGH TEMPERATURE	66 DEGREES IN 1964
JUL 24	5 - SMALLEST DAILY TEMP. RANGE	7 DEGREES IN 1988
JUL 24	2.10 - GREATEST PRECIPITATION	1.77 INCHES IN 2008
JUL 30	67 - WARMEST LOW TEMPERATURE	67 DEGREES IN 1970, 1979 & 1983 (TIED)
AUG 19	90 - RECORD HIGH TEMPERATURE	90 DEGREES IN 1947 (TIED)
AUG 19	70 - WARMEST LOW TEMPERATURE	67 DEGREES IN 1955
AUG 19	80 - WARMEST DAILY AVERAGE TEMP.	76 DEGREES IN 1947 & 2002

AUG 21	68 - WARMEST LOW TEMPERATURE	66 DEGREES IN 2003
AUG 22	69 - WARMEST LOW TEMPERATURE	66 DEGREES IN 1976 & 2003
AUG 23	71 - WARMEST LOW TEMPERATURE	66 DEGREES IN 1942
AUG 23	79 - WARMEST DAILY AVERAGE TEMP.	76 DEGREES IN 1942
AUG 23	2.97 - GREATEST PRECIPITATION	1.91 INCHES IN 1966
AUG 24	66 - WARMEST LOW TEMPERATURE	65 DEGREES IN 1947 & 1974
SEP 23	67 - WARMEST DAILY AVERAGE TEMP.	67 DEGREES IN 1959 (TIED)
OCT 3	1.90 - GREATEST PRECIPITATION	1.68 INCHES IN 1979
OCT 13	48 - COLDEST HIGH TEMPERATURE	48 DEGREES IN 1988 (TIED)
OCT 15	43 - COLDEST HIGH TEMPERATURE	47 DEGREES IN 1961
OCT 15	37 - COLDEST DAILY AVERAGE TEMP.	37 DEGREES IN 1980 (TIED)
OCT 18	TRACE - GREATEST SNOWFALL	TRACE - MOST RECENT IN 1959 (TIED)
OCT 28	4 - SMALLEST DAILY TEMP. RANGE	4 DEGREES IN 1953 (TIED)
NOV 9	37 - GREATEST DAILY TEMP. RANGE	30 DEGREES IN 1964
NOV 10	64 - RECORD HIGH TEMPERATURE	63 DEGREES IN 1999
NOV 14	5.03 - GREATEST PRECIPITATION	1.75 INCHES IN 1887
NOV 26	5 - SMALLEST DAILY TEMP. RANGE	5 DEGREES IN 1942, 1996 & 1999 (TIED)
DEC 3	68 - RECORD HIGH TEMPERATURE	55 DEGREES IN 1970 & 1986
DEC 3	56 - WARMEST AVERAGE TEMPERATURE	47 DEGREES IN 1982 & 1986

## MONTHLY RECORDS FOR PORTLAND SET OR TIED IN 2009...

DATE	RECORD	PREVIOUS RECORD AND DATE
APRIL 28	92 - WARMEST TEMPERATURE	85 DEGREES ON APRIL 21, 1957 & APRIL 20, 2005
APRIL 28	69 - WARMEST DAILY AVG TEMP.	68 DEGREES ON APRIL 21, 1957
JULY 1	3 - SMALLEST DAILY TEMP. RANGE	
JULY 2	3 - SMALLEST DAILY TEMP. RANGE	
JULY 8	3 - SMALLEST DAILY TEMP. RANGE	3 DEGREES SET 6 OTHER TIMES IN PREVIOUS YEARS IN JULY
JULY 1-31	22 DAYS WITH PRECIPITATION	21 DAYS IN 1938 & 1974
NOV 14	5.03 - GREATEST CALENDAR DAY PRECIPITATION	4.70 INCHES ON NOV 10, 1990
NOV 14-15	5.25 - GREATEST ANY 24 HOUR PRECIPITATION	4.70 INCHES ON NOV 10, 1990

OF NOTE...

APRIL WAS THE 2ND WARMEST ON RECORD  
 NOVEMBER TIED AS THE 2ND WARMEST ON RECORD  
 JULY WAS THE 2ND WETTEST ON RECORD

## SEASONAL RECORDS FOR PORTLAND SET OR TIED IN 2009...

WETTEST SUMMER - 22.31 INCHES	OLD RECORD 19.04 INCHES IN 1991
WETTEST JUNE & JULY - 17.16 INCHES	OLD RECORD 14.83 INCHES IN 2006

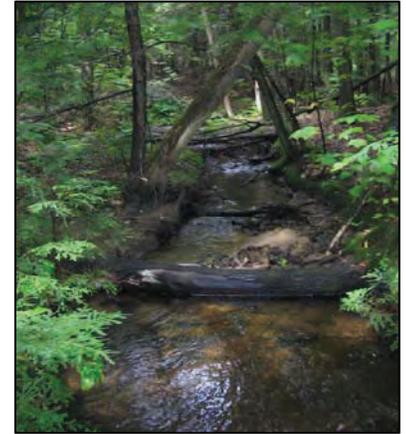
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SJC

Appendix 7  
FOMB DEP SAP  
2009 Final



# Maine Volunteer River Monitoring Program (VRMP) Quality Assurance Program Plan



## SAMPLING and ANALYSIS PLAN (SAP)

Maine Department of Environmental Protection  
Bureau of Land and Water Quality  
Division of Watershed Management &  
Division of Environmental Assessment

**Title of SAP:** Androscoggin River

**Volunteer Group Name:** Friends of Merrymeeting Bay (FOMB)

**Date of Latest Modification to SAP:** July 29, 2009

**Date of VRMP QAPP Being Referenced in this SAP:** June 10, 2009

**Project Duration (if known):**

### Review & Approval Signatures:

FOMB Board Chair- Research & Advocacy	_____	_____
	Ed Friedman	Date
Maine DEP QA Manager:	_____	_____
	Malcolm Burson	Date
Maine DEP-DEA Representative:	_____	_____
	Barry Mower	Date
Maine DEP-VRMP Biologist:	_____	_____
	Mary Ellen Dennis	Date
Maine DEP-VRMP Coordinator:	_____	_____
	Jeff Varricchione	Date



**Applied Biomonitoring**  
**11648 - 72<sup>nd</sup> PL NE**  
**Kirkland, WA 98034**  
**425-823-3905**

Applied Biomonitoring is an environmental consulting firm specializing in innovative, state-of-the-art environmental monitoring and assessment services coupled with timely client communication and scientific credibility. We have conducted numerous field studies to support projects for federal regulatory agencies, state and local authorities (including Maine DEP) and private industry.

Michael H. Salazar, Principal of Applied Biomonitoring, has been a leader in state-of-the-art environmental monitoring methodology with over 30 years of experience. Michael Salazar, in collaboration with his associate Sandra Salazar, have the ability to provide clients a wide range of environmental services, including monitoring and assessment, work plan development, experimental planning and design, data analysis and interpretation, peer review, and meeting facilitation. Our primary area of expertise is analysis and interpretation of tissue, water and sediment chemistry data with respect to chemical bioavailability and associated effects on aquatic organisms.

Applied Biomonitoring is recognized as a national and international expert in characterizing and understanding the processes of bioaccumulation and associated biological effects. We are also leaders in conducting field bioassays with caged bivalves. This unique experience and expertise to design, plan, and conduct in-situ field assessments has been developed over the past 30 years by conducting more than 40 transplant studies.

In addition to services directly associated with monitoring and assessment, Applied Biomonitoring has conducted numerous peer reviews, prepared countless technical reports and guidance manuals, and provided oversight and management on many high-profile projects. Applied Biomonitoring has the unparalleled capability of conducting on-the-spot literature searches for many environmental issues. An electronic database of over 15,000 citations with an emphasis on exposure and effects measurements and assessment techniques is maintained at the Applied Biomonitoring offices.

Our primary fields of experience and expertise include:

- Work plan & criteria development
- Environmental monitoring & assessment
- Bioaccumulation & bioeffects interpretation
- In-situ field studies with caged bivalves
- Ecological risk and damage assessment
- Sediment evaluation
- Teaching & technology transfer
- Meeting facilitation
- Electronic database & literature summaries
- In-situ temperature monitoring

### ***Environmental Monitoring & Assessment***

Applied Biomonitoring has provided an extensive review of the EPA Region 10 Interim Sediment Quality Guidelines for tributyltin (TBT) and participated in a number of discussion groups to evaluate that document and is frequently contacted by the Seattle districts of EPA and the COE for technical guidance. We have been contracted by EPA to evaluate updates of Ambient Water Quality Criteria for TBT, cadmium, and copper, and contracted by Environment Canada to review two TBT assessment documents. As part of a project to evaluate the potential effects of ammonia for the City of Winnipeg using caged bivalves, Applied Biomonitoring conducted an intensive review of the EPA Ambient Water Quality Criteria for ammonia. Most recently, Applied Biomonitoring has focused on bivalve bioaccumulation, bioeffects, and pathways of exposure for metals. We have developed extensive working expertise on the relative differences in metal accumulation among various marine and freshwater mussel species.

### ***Field Bioassays, Field Monitoring and Toxicity Testing***

Applied Biomonitoring is a recognized leader in the development of *in-situ* monitoring techniques that permit synoptic collection of chemical exposure and biological effects data. Since the first pilot study conducted in 1973, Mr. Salazar has conducted 60 transplant studies using 18 marine, estuarine, and freshwater bivalve species. Results of these studies have been used by the US Navy in their risk assessment for TBT, NOAA and the US EPA in their evaluations of Superfund sites in Puget Sound, Washington; Tampa, Florida, Sault Ste. Marie, Michigan, and the Sudbury River in Massachusetts, and most recently by the Washington State Department of Natural Resources for a programmatic evaluation of herring stocks in Puget Sound.

The *in-situ* transplant approach has become a well-established monitoring tool accepted by both industry and regulatory agencies. Both Mr. and Mrs. Salazar have developed the standard protocols for conducting field studies with caged bivalves. This extensively peer reviewed document appeared for the first time in American Society for Testing and Materials (ASTM) 2001 Annual Book of Standards. The methods have also been accepted by the American Public Health Association in their Standard Methods for the Examination of Water and Wastewater, and Environment Canada for monitoring pulp and paper and mining effluents. Applied Biomonitoring has worked with scientists at Environment Canada's St. Lawrence Center for the past 6 years to develop environmental monitoring and assessment systems for endocrine disrupting chemicals. Biomarkers have been developed to quantify estrogenic effects and a benthic cage was developed to assess long-term effects under environmentally realistic conditions.

### ***Relevant Project List:***

- Lynn Lake Peer Review (2009)
- Duwamish River Mussel Study (2009)
- Motiva Oil Spill Assessment & Review (2006, 2007)
- Blanchard Seafood Study (2006)
- Puget Sound Naval Shipyard Caged Mussel Study (2005)
- Devil's Lake Canal Diversion (2005)
- Lynn Lake, Manitoba, Canada Caged Mussel Study (2004, 2005, 2009)

- Review of TBT Documents for Environment Canada (2004)
- Review of EPA Ambient Water Quality Criteria for Copper (2003)
- Kennebec River, ME Caged Mussel Study (2003)
- Androscoggin River, ME Caged Mussel Study (2003)
- Santa Barbara Shell Mound Study (2003)
- Bear Creek, WA Mussel Study (2003)
- Capitol Regional District Tissue Residue Effects Database (2002)
- San Diego Bay Dietary Copper Study (2002)
- Montreal Dietary Copper Study (2002)
- Developing a Benthic Cage for Long-term, In-situ Tests with Freshwater and Marine Bivalves (2002)
- Bonney Lake Fluoride (2002)
- Assessing Acute WET Test Variability (2001)
- Assist in Sampling Plan Development and Interpret Tissue Residues of PAHs (2001)
- PCB Site Monitoring (2001, 2002, 2003)
- Port Valdez Monitoring (2001)
- Review of Interlaboratory Variability Study, EPA Short-term Chronic & Acute Whole Effluent Toxicity Test Methods (2001)
- Environmental Monitoring for Sewage Treatment Plant (2001)
- Review of EPA Ambient Water Quality Criteria for Cadmium (2000)
- Caged Mussel Study in Augusta, ME (2000)
- Caged Clam Study at Sault Ste. Marie, MI (2000)
- Potential Toxicity and Risk to Aquatic Organisms and Human Health from Exposure to Fiberglass (2000)
- Caged Mussel Study at Cherry Point, WA (1998, 1999, 2000)
- City of Winnipeg Ammonia Study, Winnipeg, MB, Canada (1999)
- Environment Canada Effluent Monitoring Studies, Montreal, Canada (1999, 2000, 2001, 2002, 2003, 2004)
- Technical Review of Biomonitoring Study Work Plan for MCCDC Quantico, VA (1999)
- Critique of San Francisco Estuary Institute Mussel Watch (1999)
- Review of EPA Tissue Residue Effects Database (1998)
- Caged Bivalve Pilot Study at Port Alice, Vancouver Is, BC (1997)
- Caged Bivalve Pilot Study at Port Valdez, AK (1997)
- Critical Evaluation of Bivalve Mollusc Biomonitoring (1997)
- Review of EPA Ambient Water Quality Criteria for TBT (1997)