GREAT WORKS RIVER WATERSHED COALITION

2004 Water Quality Monitoring Data Report

Great Works River Watershed Coalition
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Contents

Report prepared by N. Freese – 10/9/04

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INTRODUCTION

In September of 2004 the Great Works River Watershed Coalition completed the third season of water quality monitoring in the Great Works River and tributaries. Twenty-seven sites were identified for water sampling and analysis during the 2004 water quality monitoring season which began on May 22, 2004 and continued every other Saturday until September 11, 2004. The volunteers of the Great Works River Watershed Coalition contributed over 275 hours and traveled over 1900 miles to support this water monitoring program. As in the past, the volunteer participation is an essential component for the continued success of this monitoring program.

WATER QUALITY CLASSIFICATION STANDARDS[1]

The State Legislature has established statutes[2] that classify Maine surface waters on the basis of water quality standards and intended uses. The Maine Department of Environmental Protection is charged with ensuring that these standards are met for all surface waters in the State. The classification scheme and standards for the parameters as measured by the GWRWC are as follows:

- **CLASS A:** suitable for drinking (after disinfecting), swimming, and fishing
- **CLASS B:** suitable for drinking (after treatment), swimming, and fishing
- **CLASS C:** suitable for drinking (after treatment), swimming, and fishing

Dissolved Oxygen Standards

- **Class A and B:** not less than 7 parts per million (ppm) or 75% of saturation, whichever is higher
- **Class C:** not less than 5 parts per million (ppm) or 60% of saturation, whichever is higher

The Great Works River has been classified by the State of Maine as a Class B river. The water quality monitoring completed from 2002 to 2004 supports this classification but indicates several areas of concern as indicated in the discussion below.

DISSOLVED OXYGEN RESULTS DISCUSSION[3]

The dissolved oxygen sampling activities completed by the Great Works River Watershed Coalition for the 2004 water quality monitoring season continued to be enormously successful in terms of the sample completion rate. Volunteers were able to collect 98% (240 out of 244) of all samples intended for collection.

During the summer of 2004 we experienced several significant rain events in the days prior to three of the collection days (6/5,8/14, and 9/11). The Great Works River provides stormwater run-off for an 84 square mile watershed including the towns of Sanford, North Berwick, Berwick, and South Berwick. These rain events caused an increased flow of water in the river (as reported by volunteers) and generally increased the dissolved oxygen levels.

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[1] Information copied from the PRESUMPSCOT RIVER WATCH 2002 Water Quality Monitoring Data Report, page 1.
[2] Title 38 Maine Revised Statutes Annotated (MRSA), Chapter 3, Subchapter 1, Article 4-A, § 465.
[3] Laboratory titrations using Winkler method

RANKED VIOLATION OF DISSOLVED OXYGEN CLASS B STANDARDS 2003-2004				
Site Number	**# of samples 2003**	**# of violations 2003**	**# of samples 2004**	**# of violations 2004**
GW90	9	0	8	3
GW85	9	7	6	2
GW80	9	3	9	5
GW75	8	5	9	5
GW66	9	0	9	1
GW55	9	0	9	0
GW50	8	5	9	2
GW49	8	0	9	0
GW40	9	0	9	0
GW38	9	0	9	0
GW35	8	1	8	0
GW30	9	0	9	0
GW20	9	6	9	0
GW15	9	3	9	2
GW12	9	4	9	2
GW08	9	8	9	2
GW02	9	1	9	0
TOTALS	149	43	148	24

As can be seen in the table above, during the 2004 monitoring season there was a significant decrease in the total number of dissolved oxygen violations in the main stem of the river. Violations indicate a dissolved oxygen reading of less than 75%. The data continued to support the identified problem areas in the main stem of the river and tributaries (See Appendix for complete results).

The average D.O. for the main stem of the Great Works River during the summer of 2004 was 79.4%. In comparison the average for the entire watershed was 76.5%. These levels are very consistent with our data from last year. When examined on a site by site basis, the dissolved oxygen data indicates a number of areas of concern. Most of the averages under the 75% level are from tributaries in the watershed. Several, specifically West Brook (WB50) and Chick's Brook (CB02), were consistently low (41.2% and 47.7% respectively) throughout the monitoring season. Volunteers from the field report that WB50 is draining a "marshy, swampy" area which explains the low levels recorded. The coalition may want to examine these sites to see if remediation is appropriate or if the levels are part of the natural ecosystem.

Of much more concern are the dissolved oxygen levels at the Channel Lane (GW75) site. This monitoring site is at the northern end of Bauneg Beg Pond where the northern flowage of the main stem of the Great Works River widens out and slows down to become Bauneg Beg Pond. This data from this site fluctuated throughout the season and had a significantly lower average (64.8%) than any of the other main stem sites. The data from 8/14/04 indicated a significantly low level of 29.1% dissolved oxygen. The field volunteer monitor from this site also reported the growth of "large green balls of algae/vegetation" as the season progressed. It is important to note that 4 of the 5 sites north of Bauneg Beg that stayed the same or increased in the number of dissolved oxygen violations in the 2003-4 seasons. All sites below Bauneg Beg stayed the same or decreased in the number of D.O. violations in the 2004 monitoring season. It is recommended that the northern end of the Great Works River watershed be examined for remediation possibilities to address these observed problems.

According to Hach Chemical[4] the maximum temperature for the survivability of Brook Trout is 24°C and they will not grow if the temperature rises above 19°C. The temperature must be below 9°C for spawning and below 13°C for the embryos to survive. In the Great Works River the average water temperature was 18.2°C for the 2002 water monitoring season, 17.6°C in 2003, and 17.7°C for the 2004 season. These indicate that the main stem of the river should support Brook Trout as a species. However, since water temperature is highly dependent on the depth, volume and amount of shade, any fish species could be at risk due to the variable flow of the Great Works River. Since the depth and volume of the river rely primarily on weather events (spring run-off and rainfall) which cannot be controlled, it becomes even more important to maintain the shade cover on the river. It is strongly recommended that the efforts of the GWRWC to maintain buffer zones on the banks of the river and tributaries be maintained and/or improved to help in the stability of the water temperature and the resulting survivability of the aquatic species.

E.coli RESULTS[5] and DISCUSSION

In 2003 we added two new parameters of bacteria and low-level phosphorus testing to the monitoring program. We continued collecting for this data in 2004. Volunteers in the field collected water samples in whirlpack bags at ten sites along the main stem of the Great Works River. The bags were kept in coolers until they were transported to Demers Lab in Sanford, Maine for testing. The sample completion rate by the volunteers for the *E. coli* tests was 98% (88 out of 90 samples).

E. coli bacteria is an indication of the presence of fecal contamination in the watershed. The sources of this contamination could be from point sources such as wastewater treatment plants discharges and/or stormwater overflows. The bacteria could also originate from polluted runoff sources such as pet waste, livestock contamination and/or failing septic systems. Finally, the *E.coli* may originate in nonhuman-associated sources such as native wildlife. By itself *E. coli* is generally not a threat to human health but can, however, be associated with disease-causing organisms.

The significant rainfall events and subsequent runoff that caused higher levels of dissolved oxygen also had a profound effect on the levels of *E. coli* in the river. During the 2004 monitoring season we had 23 instantaneous violations (Confluent or >400). When the data is examined in light of the rain events (6/5/04, 8/14/04, 9/11/04) it is clear that the increased rainfall can be associated with higher levels of *E.coli*. It is likely that the increased rainfall washed polluted runoff with potential sources of *E.coli* into the river.

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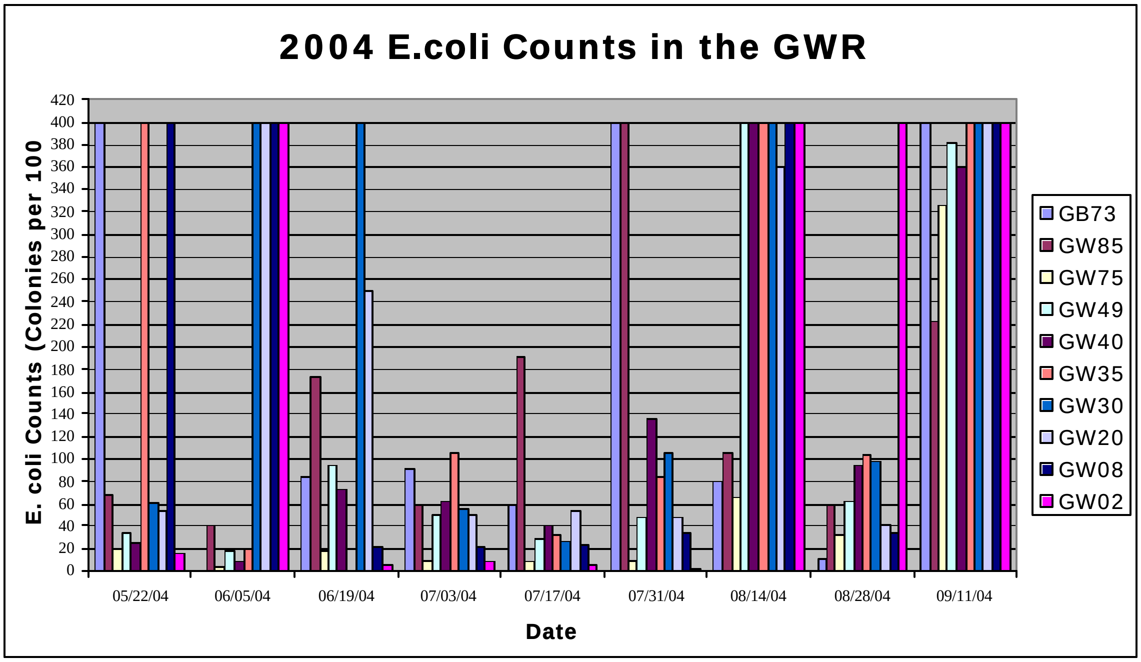
[4] http://www.hach.com/h2ou/

[5] *E. coli* testing completed at Demers Laboratory



The *E.coli* counts of 400 colonies per 100 mL indicate confluent growth in the lab. The actual accounts were most likely higher than 400 colonies. In contrast, the 2003 data contained considerably fewer instances of confluent results. Specifically during the entire 2003 season there were only a total of 5 instances of more than 200 colonies per 100, as compared to 29 readings above 200 in the 2004 season. During the 2003 monitoring season the levels of bacteria were found to be consistently low in the known swimming areas of Bauneg Beg and Leigh's Mill Pond. This was not true in the 2004 season. Interestingly, the only site not showing confluent growth at some point during the season was GW75 (Channel Lane) mentioned as a concern in the dissolved oxygen section. All other sites measured confluent levels that in turn correlated with the rain events.

These levels are cause for concern but it should be noted that Demers Laboratory had numerous cases of confluent levels of *E. coli* this summer due to the weather conditions.

PHOSPHORUS[6]

The Great Works River watershed is an 84 square mile watershed under considerable developmental pressure in the southern Maine area. The land uses in the area include forest, residential, agricultural, and wetlands. The phosphorus parameter was added to collect data on low-level phosphorus and nonpoint source pollution. Phosphorus may wash into watersheds and be an indication of erosion and nutrient overload problems. The implementation of best management practices (BMPs) for nonpoint source pollution may help to reduce low-level phosphorus amounts. Such BMPs may include maintaining a buffer of shade-producing vegetation along the banks of the river, reducing the use of fertilizers, installing fencing for livestock, mulching erosion-prone areas, and establishing stormwater management practices to reduce urban and agricultural runoff.

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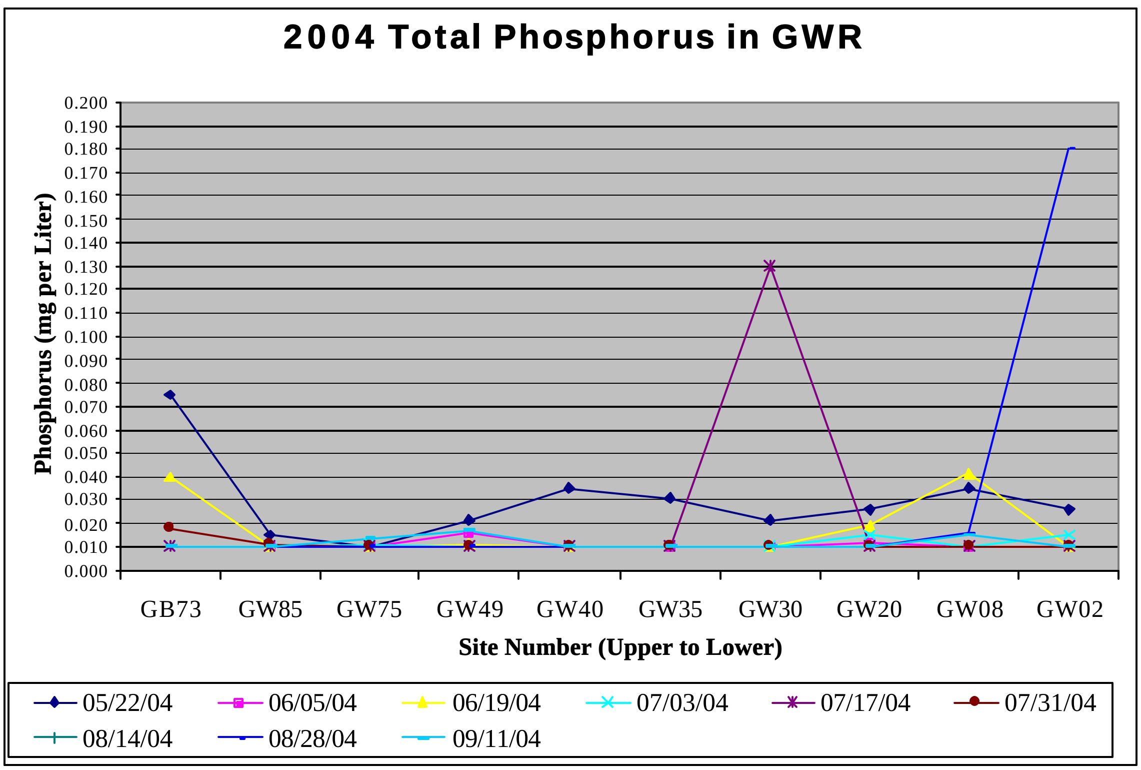
[6] Low level phosphorus testing completed at Demers Laboratory

Although the heavy rainfall events influenced the dissolved oxygen and *E.coli* levels, the data from the 2004 season indicates the low level phosphorus levels are considerably improved over last year. In 2003 the average phosphorus level was 49 ppb (parts per billion). The recommended limit for low-level phosphorus is 30 ppb. In 2004 the average level was 18 ppb on the main stem of the river for the season. It should be noted that many of the readings at graphed at 0.010 mg/L (10 ppb) were actually at levels below the low-level detection limits of the test performed at Demers Lab. The actual reading in many cases is <0.010mg/L but was plotted at 0.010mg/L. Therefore the actual levels on phosphorus are most likely below the average level of 18 ppb.

There were several instances of violations in the 2004 data. On a seasonal note the first monitoring date (5/22/04) showed consistently elevated levels of phosphorus along the length of the river. In addition there were two significant spikes in the data. The first occurred at GW30 (130 ppb) on 7/17/04 and the second occurred on 8/28/04 at GW02 (180 ppb). The field volunteer responsible for collecting at GW02 reported that shortly before 8/28/04 the dam above Leigh's Mill Pond had been opened up to allow for a sewer pipe installation and all of the water and sediment behind the dam had been allowed to run into Leigh's Mill Pond resulting in the phosphorus spike.



On a site by site basis it is clear that GB73 has elevated levels of low-level phosphorus during much of the 2004 monitoring season. It is the only site tested that has two incidences of levels of 40 ppb or higher. This data is significant because GB73 was added in the 2004 monitoring season due to concern about the affect of Goodall Brook on the main stem of the Great Works River. The preliminary data indicates that the concern is justified and on-going identification and remediation work being done through the GWR Stream Survey should be continued.

CONCLUSIONS

The data collected in the 2004 monitoring season provides impetus for several areas of focus for future work by the Great Works River Watershed Coalition and other interested parties. As indicated by the observations completed in the GWR Stream Survey (May, 2004) there is considerable cause for concern in the northern Great Works River watershed. The data collected during this summer supports those concerns and highlights several specific areas such as Channel Lane, Sand Pond Road, and Goodall Brook. It is hoped that these data can be used to support future work in the watershed to address some of the issues brought to light through the work of the Great Works River Watershed Coalition.

The volunteers should be congratulated on their hard work in the field throughout the monitoring season. The stunningly high sample completion rate provides baseline data on the river that may be used by any interested parties such as state, county, or local governments. Copies of this report will be sent to all the municipal offices of the watershed and members of the Great Works River Watershed Coalition. Other organizations such as Trout Unlimited and Great Works Regional Land Trust will receive our data to assist in furthering their conservation and restoration efforts.

We are also using this opportunity as an educational outreach tool. Noble High School Academy 3 students analyzed the data and assisted in completing this report. The opportunity to work with real data will continue to be explored in the years ahead. Coalition members will also be making presentations for local municipal and civic groups to increase the awareness, knowledge, and understanding of our efforts. It is hoped that this report will help to gain more community support, both in the form of financial contributions and, more importantly, in the form of increased volunteer participation. In the end, none of this would be possible without the commitment and dedicated work of the volunteers.

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