Kennebecasis Watershed Restoration Committee
2009 Water Quality Monitoring Report

Prepared by Ben Whalen
February 2010

KENNEBECASIS WATERSHED RESTORATION COMMITTEE

New Nouveau Brunswick
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ACKNOWLEDGEMENTS

The Kennebecasis Watershed wish to acknowledge the contribution of the Department Environment for their continual consultation on the Water Classification program. The Department of Environment, Analytical Services Section and the Water Quality and Quantity Unit, both provide consultation.

KWRC also wants to thank Laura Finnamore for her efforts on compiling and reporting the data, and Dean Toole for his long term leadership.

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1.0 INTRODUCTION

In 2000, the Kennebecasis Watershed Restoration Committee (KWRC) started the first phases of the Water Classification program. In 2008, the KWRC reassessed the water quality of the Kennebecasis Watershed in an effort to evaluate changes in the watershed since the original data was attained. The Department of Environment and Local Government (DELG) developed the Water Classification program as a regulatory component of the *Clean Water Act* to help communities set goals for surface water quality, and to help achieve these water quality goals through the establishment of water quality standards, action planning and watershed management. Classification of the waterways is a simple step by step process for setting water quality goals that involves: Identifying and involving stakeholders; gathering water quality information; assembling land and water use information; setting goals for water quality and preparation and implementation of action plans. It is the purpose of this report to summarize the results of follow up water quality sampling performed through 2009 where KWRC staff collected temperature and dissolved oxygen readings to compliment data collected in 2008.

2.0 BACKGROUND

KWRC

The Kennebecasis Watershed Restoration is a non-profit organization whose mission is to restore the aquatic environment of the Kennebecasis River Watershed to historical conditions for fish and other aquatic, avian and terrestrial life. The Committee's goals are met through strategic habitat restoration, educational and advisory initiatives and promoting public awareness and participation in the restoration of the Kennebecasis River Watershed. The KWRC is composed of representatives from various provincial and federal departments, municipalities of the area, Soil and Crop Improvement Associations and local interest groups (Appendix A).

The KWRC has been orchestrating and implementing restoration activities within the Kennebecasis Watershed since 1994. The initiative began with a comprehensive habitat assessment of 285.5 km of stream studied through stream survey work, water quality sampling and stock assessment identifying concerns throughout the watershed. Based on the findings from this assessment, a prioritized list of impacted sites was compiled for the watershed to provide a clear direction for restoration efforts by the Committee.

Since our beginning in 1994 we have completed various restoration projects and have placed approximately 165 digger logs and 185 rock-sills in-stream and constructed 56 stable fording sites. Over 50km of fencing has been erected and 181000 trees and seedlings planted within riparian zones with the full cooperation, participation and in-kind support of the stakeholders of the watershed, particularly the farming community.

Community and landowner involvement and awareness are essential components to our projects that will help to ensure the sustainability of the watershed for years to come.

These successes have not only had direct positive impacts on the landowners associated with the work, but also on the Village of Sussex Corner and the Town of Sussex. Both of these councils are in full support of the initiatives undertaken, particularly on Trout Creek, realizing they will be the benefactors of improved water quality and diminished flood and erosion damage due to ice generation on the system.

WATER CLASSIFICATION

The Water Classification program is the regulatory component of the Clean Water Act, and in essence gives watershed stakeholders an opportunity to set water quality standards for streams and rivers in their area. This program will not be discussed in great detail here, but it involves a number of steps towards the end product. These steps are all designed to understand the current water quality, land use, and stakeholder concerns in order to ultimately set water quality goals, and set in motion mechanisms to achieve them. The end result is a minimum baseline level of water quality throughout the watersheds, with more advanced objectives or goals reflective of the interests of the community.

In 2004 the KWRC completed it's first Provisional Water Classification Report. This report was to serve as the backbone for the proposed Water Classification Regulation for the watershed. Unfortunately the regulation met with some obstacles and had to be re-evaluated. In 2008 the KWRC re-visited 20 of the historical water sampling stations to re-evaluate the water conditions. This effort resulted in temperature and dissolved oxygen data that was compromised and thus in 2009 these two parameters were revisited. The 2008 and 2009 water quality data will serve as the basis for discussion when the NB Department of Environment (DENV) re-introduces the strengthened water classification regulation to the public in 2011.

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3.0 DESCRIPTION OF THE STUDY AREA

The Kennebecasis River system has been and continues to be an important resource to the people of the southeastern area of New Brunswick. Kennebecasis is a Maliseet term that means "little snake", a good description for the river whose watershed covers 134,660 hectares as it twists and turns from its head waters in Goshen to the head of tide at Bloomfield.

The mainstem of the Kennebecasis River is spread out over two counties, Kings and Albert, extending 103.35 km from its origin in Hamilton Lake to its confluence with the head of tide at Bloomfield. The Kennebecasis Watershed is made up of a number of significant tributaries including South Branch (17.89 km), Smith's Creek (35.39 km), Trout Creek (26.75 km), Millstream River (45.52 km), and Moosehorn Creek (15.83 km) distributed throughout eight parishes from Elgin parish to Springfield parish.

To more easily manage the large watershed the KWRC has broken it down into five sub-watersheds (Figure 1.) An effort was made to garner a good representation of

the current conditions of each of these sub-watersheds when selecting sampling site locations. A table and map in Appendix B provides the location of the sampling stations used in the 2009 water quality sampling efforts.

The Kennebecasis River system plays a significant role in providing habitat for many species of birds, mammals and amphibians that use its banks, oxbows and backwaters for nesting and rearing of their offspring. This watershed is also the home to several different varieties of freshwater species of fish (Appendix C). Due to the physical and hydrological characteristics of the watershed, the Kennebecasis River and its tributaries have played a significant role in settlement, tourism, and commercial endeavors for the immediate and surrounding areas.

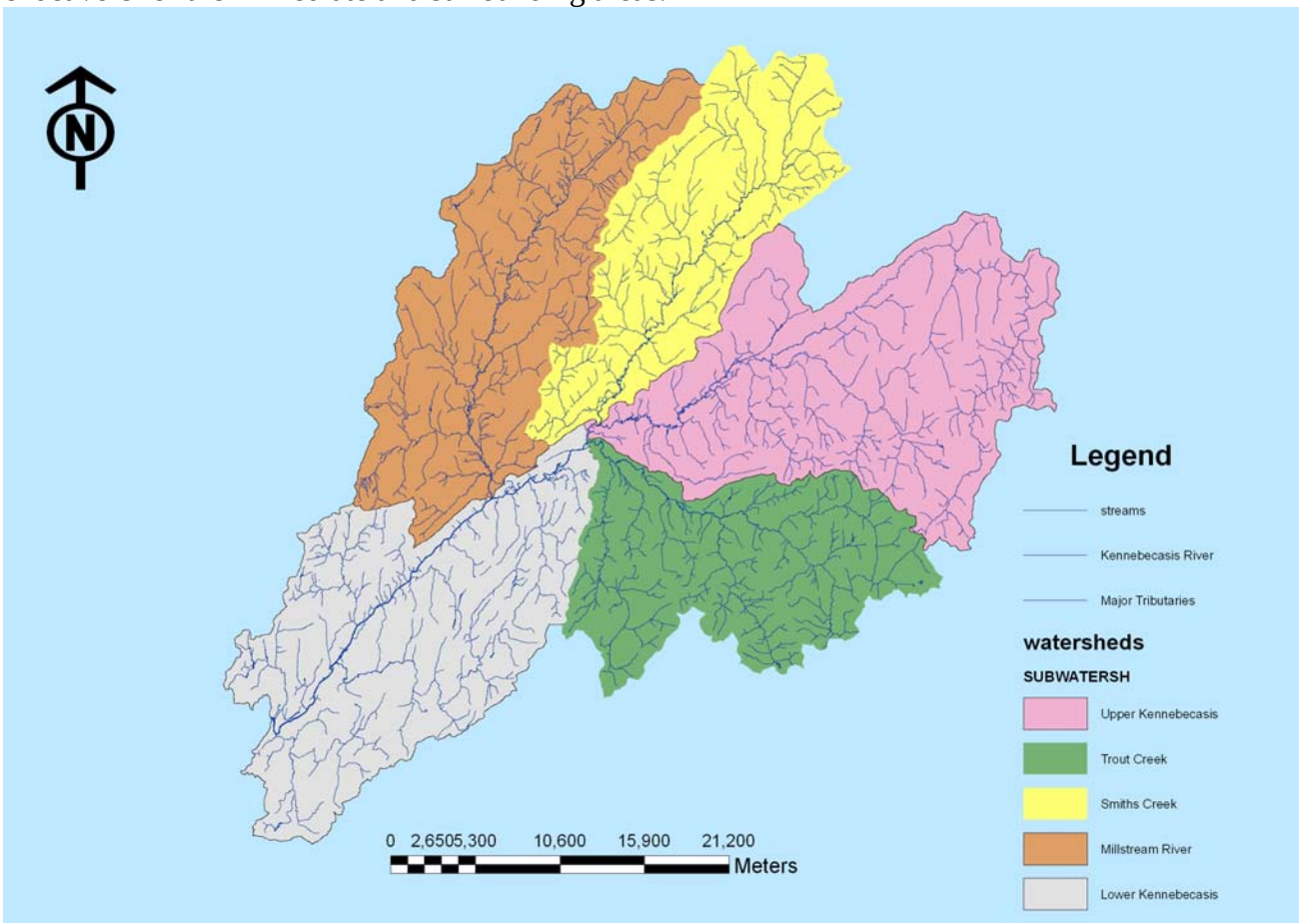

Figure 1: A sub-watershed map of the Kennebecasis Watershed

The Kennebecasis River and its tributaries meander through a collage of geological land types and anthropogenic land-uses including vast agricultural lands, industries, recreational areas and municipalities (i.e. Village of Sussex Corner, Apohaqui, Norton, Bloomfield and the town of Sussex). Approximately seventy-eight percent of the watershed consists of forested lands with seventeen percent consisting of agricultural and occupied lands (Figure 2). The Kennebecasis Watershed is the home to a variety of different activities that directly and indirectly affect water quality. Agricultural residential and other occupied lands directly influence the water quality of the watershed

through cattle grazing, riparian vegetation removal and agricultural and municipal run-off. Residential areas such as Penobsquis, Sussex, Apohaqui, Norton and Bloomfield as well as rural residence dot the entire length of the Kennebecasis River and its tributaries. Industries such as a potash mine, saw mills, and fish hatcheries are littered throughout its reaches. Recreational industries including two golf courses are also found on the Kennebecasis tributaries.

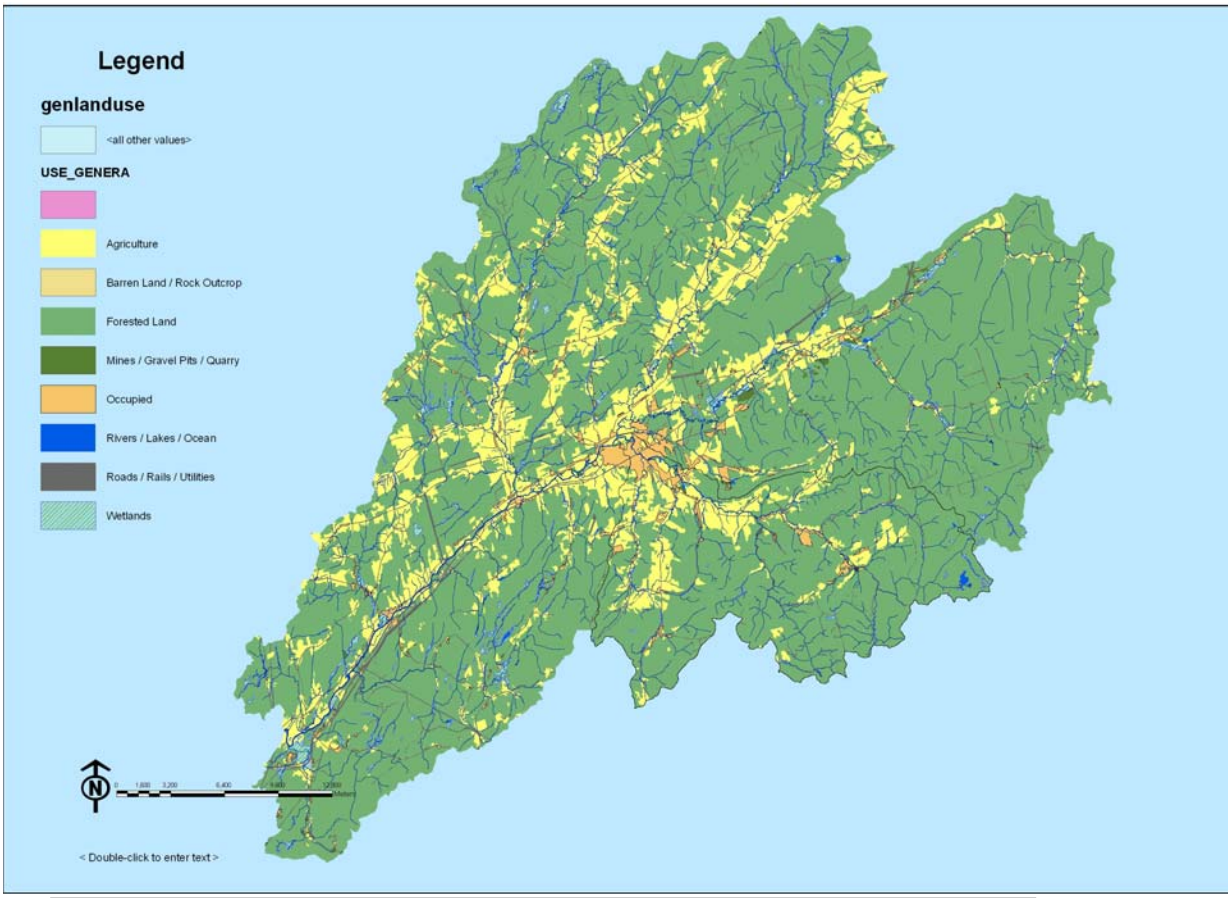

Figure 2: General land use map of the Kennebecasis Watershed

WATER QUALITY CONCERNS IN THE WATERSHED

Before the water classification program began, water quality concerns in the watershed were typical of those in other agriculturally dominated watersheds. Concerns regarding water temperature, dissolved oxygen, phosphorus, nitrogen, and E. coli were issues that have been historically of high priority to the committee. Limited water quality sampling for other studies and numerous water temperature investigations had raised awareness to these water quality problems, with restoration work focused at addressing them. We also monitor water quality impairments originating from rural development and industry, as they were identified in the water sampling exercises in 2000 and 2001.

4.0 Results of 2009 DO and Temperature Monitoring

Objective

The objective of performing dissolved oxygen (DO) and temperature (temp) monitoring in 2009 was to further compliment the full water quality analysis done in 2008. While full chemistry and biological testing was performed on samples in 2008, the data collected for DO had a low confidence value. The questionable results prompted DENV to request further monitoring to solidify the Water Classification documentation. The effort in 2009 will provide that confidence.

Monitoring Methods

Monitoring sites from the 2008 sampling exercise were again utilized for the 2009 exercise, as shown in Appendix B. An effort was made to also mimic the date and weather conditions of the previous years sampling where samples were taken once monthly through the warmer months. An YSI DO probe was used to take the DO and temperature at each site. This data was recorded onto a daily monitoring sheet and then the data was compiled through a desktop exercise.

Discussion on Results of DO and Temperature Monitoring

No unexpected issues arose through the monitoring of DO and temperature through 2009. Data tables and charts in Appendix D illustrate the correlation between DO and temperature and this relationship exists nicely at all sites. A number of the sites have elevated stream temperatures in the summer months and this is cause for concern for fish health and water quality. A brief discussion on the results from each sub-watershed is below.

Millstream River: The Millstream River was consistently over 20ºC at Berwick (KV-24) and Apohaqui (KV-14) for the months of July and August. The headwater site near the mouth of Sheck Brook (MR-01) also had one month with a temperature greater than 19ºC, however, this result maybe due to a large amount of beaver activity further upstream. This indicates that a great deal of work still needs to be done to improve the riparian vegetation of this system so that more shade is provided to the river to keep water temperatures cooler.

Smith Creek: The mouth of Smith Creek (KV-07) and the headwater site near at the Oldfield Bridge (KV-47) also had elevated stream temperatures for the summer months, and even McGregor Brook (KV-49) had temperatures over 18ºC for July and August. The result at McGregor Brook was unexpected and future monitoring of this site maybe required since the Provisional Classification of this tributary is “A”. Like Millstream River this system is very much impacted by the poor historical agricultural practices of harvesting and grazing along stream banks and much more work is still needed to improve riparian vegetation status

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Trout Creek: Trout Creek is likely the coldest system in the Kennebecasis watershed. This is likely due primarily to natural features, but also secondarily to the fact that the upper sub-watershed has a very healthy riparian zone. The headwater site on this system, above the confluence with Cedar Camp Brook (KV-26), never reached a temperature over 14ºC. Unfortunately the lower portion of this sub-watershed is not so healthy as it is impacted by agriculture and urbanization. At the lower site (KV-11) the temperatures in August reached 19.2ºC. This is likely due to the inflow of the Ward's Creek which historically has been identified with having stream temperature issues. In 2009 both sites on this tributary (KV-10, KV-40) had August temperatures over 20ºC and the July temperatures were above 18ºC. Work is scheduled to be completed on Ward's Creek in 2010 that should have a positive impact on the Trout Creek system in the future.

Upper Kennebecasis: The Upper Kennebecasis sub-watershed has numerous high gradient streams that help maintain lower stream temperatures and deterred the human degradation of the riparian zone. It was therefore no surprise that no issues with temperature were noticed on the upper sites (KV-02, KV-30, and KV-43) of this system. The lowest monitoring site (KV-06) near the Salmon River covered bridge is below a large expanse of agriculture ground and this resulted in summer temperatures reaching over 19ºC. In 2008 and 2009 an effort was made to plant trees along a good percentage of the riparian area above this lower site and this will have a positive impact in the near future as the trees grow and mature.

Lower Kennebecasis: Since the last site on the Upper sub-watershed has elevated temperatures it is not surprising that the Lower sub-watershed also has elevated stream temperatures. The temperature on the Kennebecasis at Norton (KV-16) was over 20ºC in August and just under that in July. A quick look at an aerial photo of the Lower Kennebecasis River easily shows that the riparian area along this stretch of river is ribbon like at best. Some effort was made in 2009 to stabilize eroding stream banks along the mainstem by planting trees but much more planting has to be done before a noticeable difference will be realized.

5.0 Closing Comments

The Kennebecasis Watershed Restoration Committee is committed to restoring the degraded riparian zones of the Kennebecasis watershed. Over time the number of trees the KWRC has planted in the past will start to make a bigger difference as they mature and begin to more fully function as a complete riparian ecosystem. Where certain streams are not currently meeting their Provisional Classification the KWRC will work with stakeholders and restore the riparian and aquatic habitats as needed. This will require public/private support as well as the ongoing support from the NB Department of Environment and the Canadian Department of Fisheries and Oceans.

APPENDIX A

KWRC Committee Members Listing

Kennebecasis Watershed Restoration Committee

Canadian Forest Service

Department of Fisheries and Oceans

Kings County Soil and Crop Improvement Association

MLA Kings East

N.B. Department of Agriculture and Aquaculture

N.B. Department of Natural Resources

N.B. Department of the Environment

N.B. Department of Transportation

N.B. Soil and Crop Improvement Association

Potash Corporation of Saskatchewan

Royal District Planning Commission

Sussex Fish and Game Association

Town of Hampton

Town of Sussex

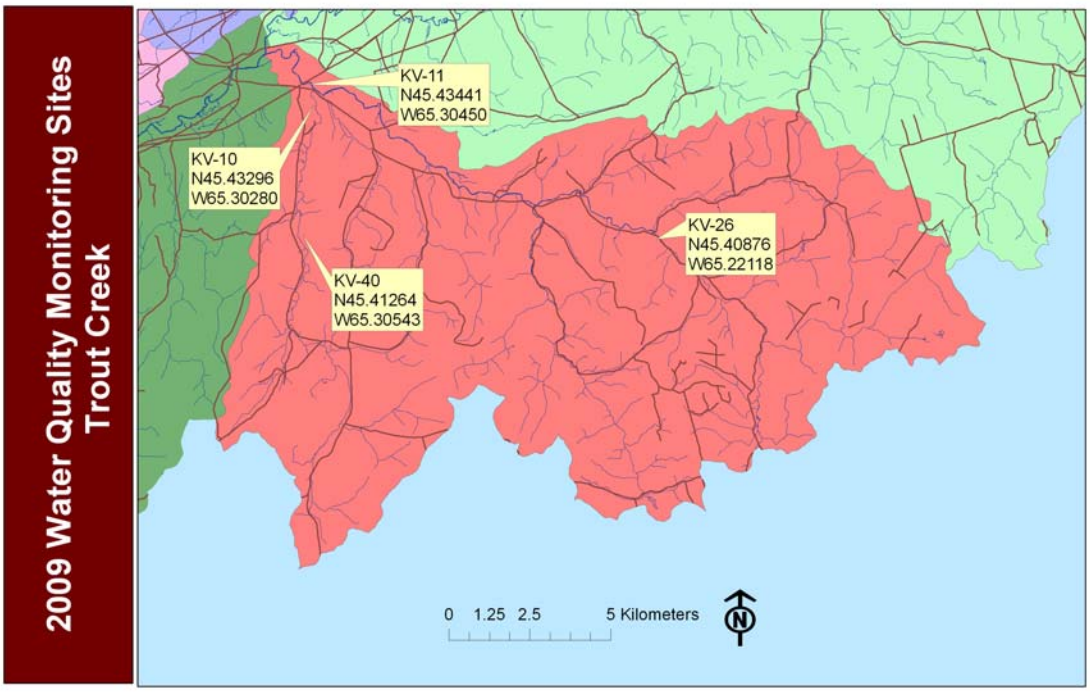
Village of Sussex Corner

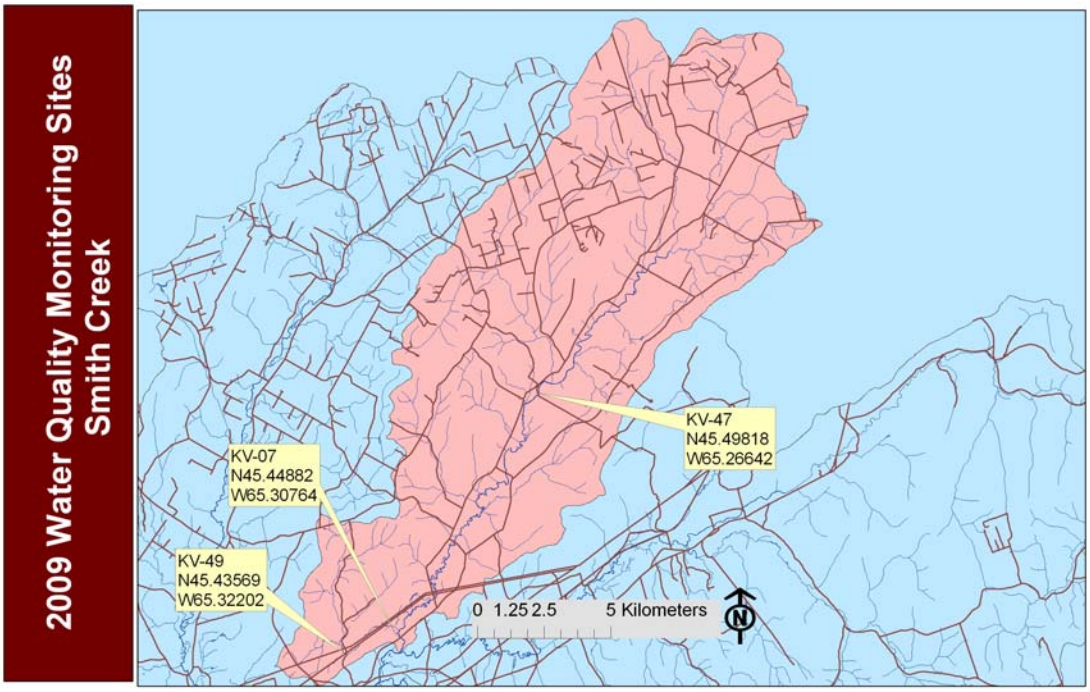
APPENDIX B

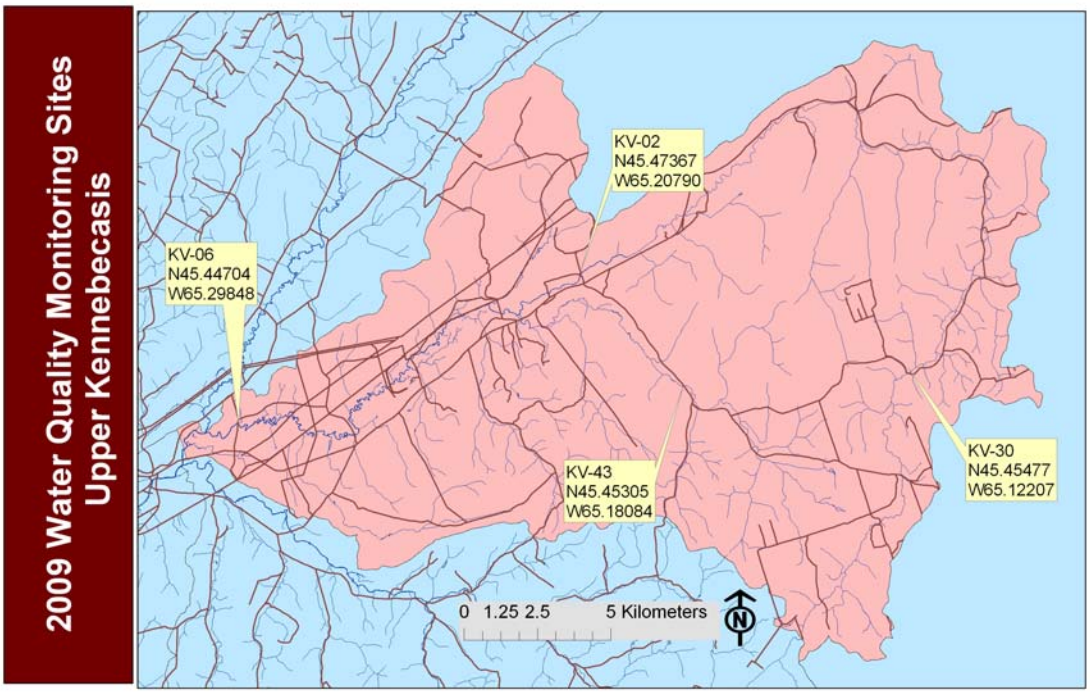
2009 Monitoring Stations Location and Descriptions

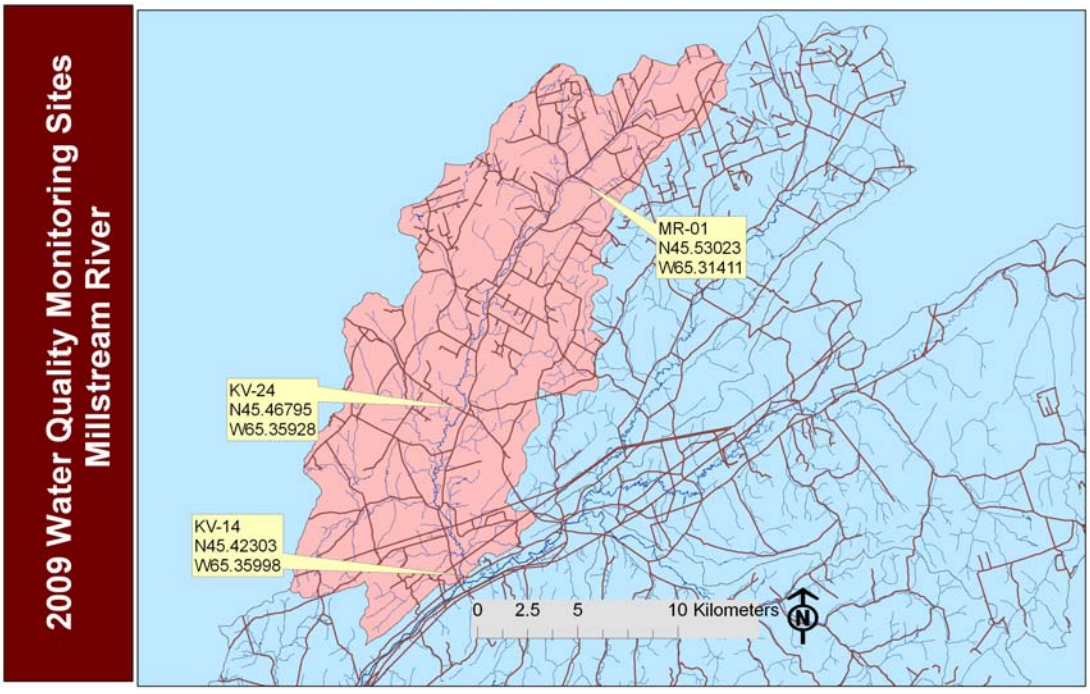
List of 2008 and 2009 Water Sampling Sites

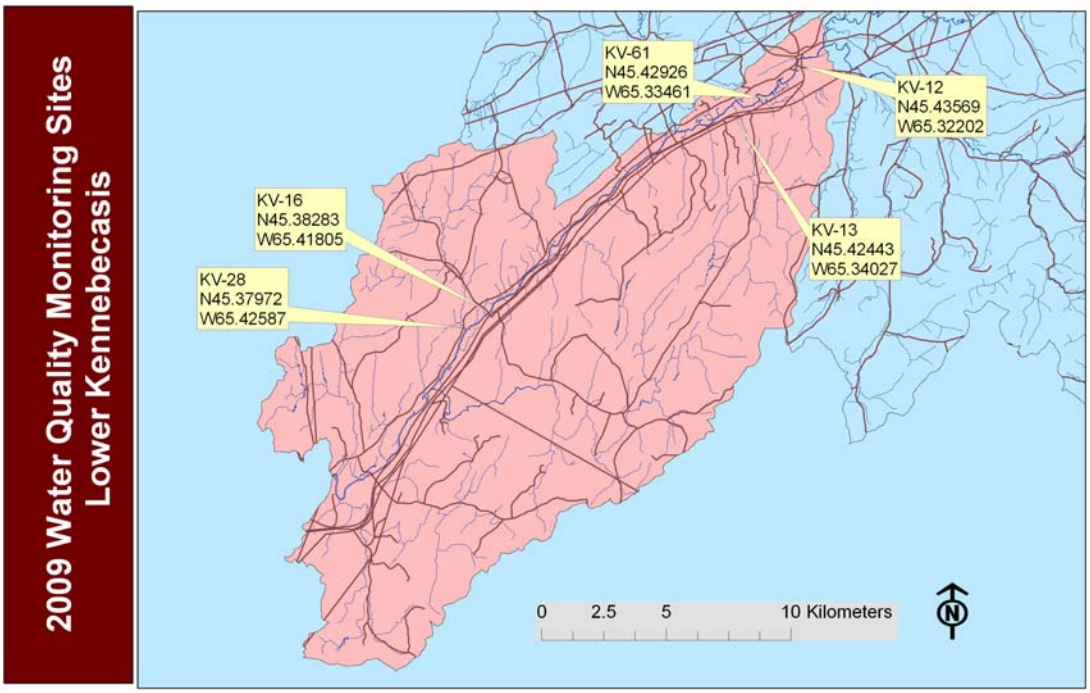
Site Number	***Description***	***Naquadat***
KV-02	Kennebecasis River @ Crockets Corner	AP0242
KV-06	Kennebecasis R. at Salmon River Covered Bridge	AP0244
KV-07	Smith's Creek, near mouth above Covered Bridge	AP0254
KV-10	Ward's Creek just above Castle Bridge	AP0258
KV-11	Trout Creek near mouth	AP0257
KV-12	Kennebecasis R. at old walking bridge	AP0238
KV-13	Musquash Bk. At old highway 1 crossing	AP0250
KV-14	Millstream R. in Apohaqui above Jones Park	AP0248
KV-16	Kennebecasis R. at bridge in Norton	AP0240
KV-24	Millstream R. at Berwick Corner bridge	AP0247
KV-26	Trout Creek above confluence with Cedar Camp Bk	AP0256
KV-28	Almshouse Bk. near Route 121 bridge	AP0289
KV-30	Kennebecasis R. at Malone Bridge, Goshen	AP0291
KV-40	Ward's Creek near cemetery on Ward's Creek Rd	AP0272
KV-43	South Branch Kennebecasis R. at headwaters bridge on Route 114 below Negro Bk	AP0275
KV-47	Smith's Creek at Oldfield Covered Bridge	AP0279
KV-49	McGregor Bk at McGregor Bk Rd bridge	AP0281
KV-61	Kennebecasis R. at Fox Hill	AP0282
MR-01	Millstream R. Headwaters above Sheck Bk, at bridge on Hayes Rd	AP0309


2009 Water Quality Monitoring Sites
Trout Creek
KV-11
N45.43441
W65.30450
KV-10
N45.43296
W65.30280
KV-26
N45.40876
W65.22118
KV-40
N45.41264
W65.30543
0 1.25 2.5 5 Kilometers
N


2009 Water Quality Monitoring Sites
Smith Creek
KV-47
N45.49818
W65.26642
KV-07
N45.44882
W65.30764
KV-49
N45.43569
W65.32202
0 1.25 2.5 5 Kilometers
N


2009 Water Quality Monitoring Sites
Upper Kennebecasis
KV-02
N45.47367
W65.20790
KV-06
N45.44704
W65.29848
KV-43
N45.45305
W65.18084
KV-30
N45.45477
W65.12207
0 1.25 2.5 5 Kilometers
N


2009 Water Quality Monitoring Sites
Millstream River
MR-01
N45.53023
W65.31411
KV-24
N45.46795
W65.35928
KV-14
N45.42303
W65.35998
0 2.5 5 10 Kilometers
N


2009 Water Quality Monitoring Sites
Lower Kennebecasis
KV-61
N45.42926
W65.33461
KV-12
N45.43569
W65.32202
KV-16
N45.38283
W65.41805
KV-13
N45.42443
W65.34027
KV-28
N45.37972
W65.42587
0
2.5
5
10 Kilometers
N

APPENDIX C

Fresh Water Fish Species
Of the
Kennebecasis River

FISH SPECIES WITHIN THE KENNEBECASIS RIVER WATERSHED

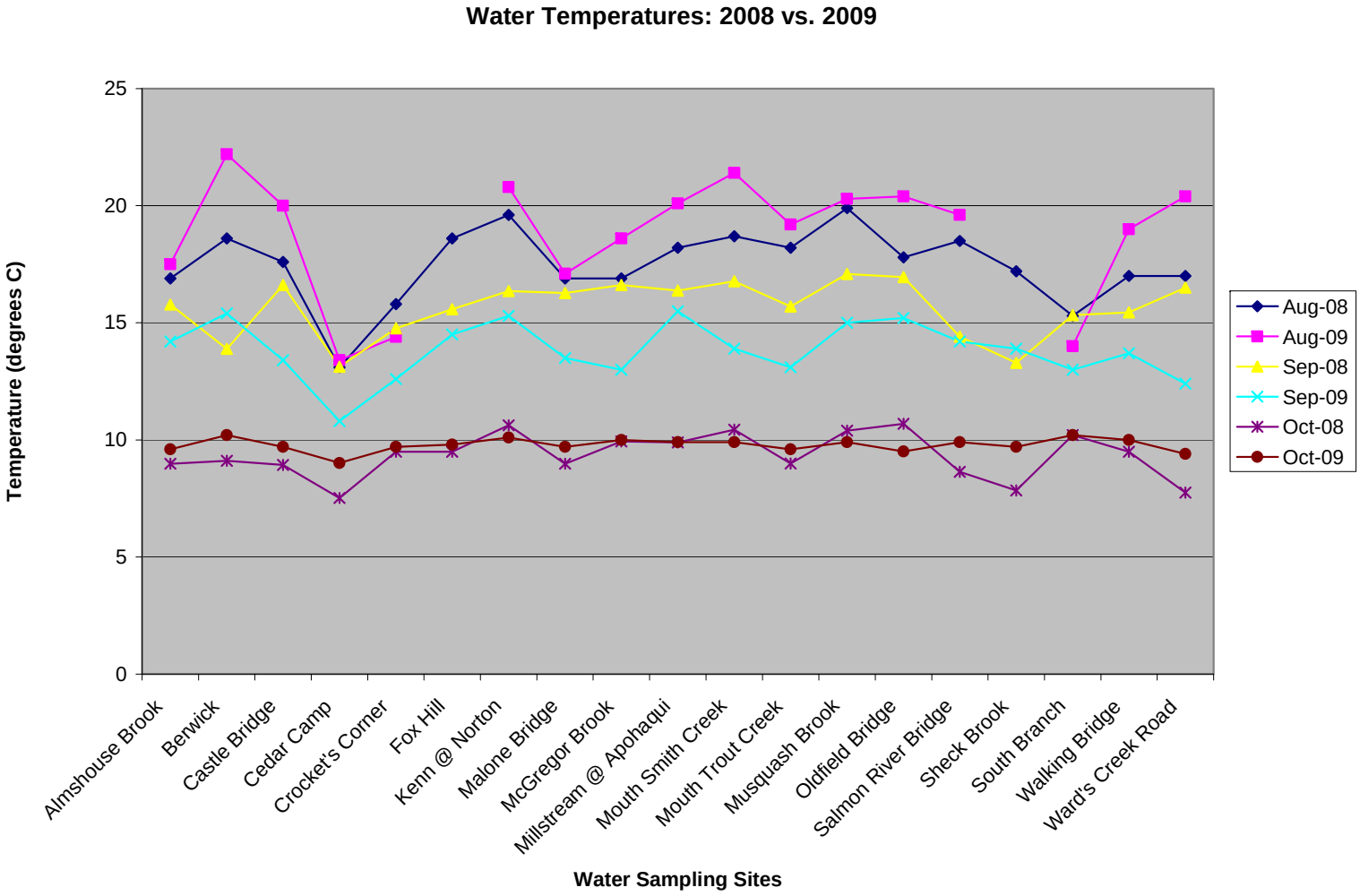
Family	**Common Name**	***Genus – Species***
Acipenseridae	*Shortnose sturgeon*	Acipenser brevirostrum
Anguillidae	American eel	*Anguilla rostrata*
Catostomidae	White sucker Long nose sucker	Catostomus commersoni Catostomus catostomus
Clupeidae	*Alewife (Gaspereau)* American shad	*Alosa pseudoharengus* Alosa sapidissma
Cottidae	*Slimy sculpins*	Cottus cognatus),
Cyprinidae	Creek chub Pearl dace Blacknose dace Fine-scale dace Common shiner Golden shiner	Semotilus atromaculatus *Semotilus margarita* Rhinichthys atratulus Chrosmus neogaeus Notropis cornutus Notemigonus crysoleucas
Esocidae	Chain pickerel	Esox niger
Gadidae	*Burbot*	Lota lota
Gasterosteidae	Fourspine stickleback Threespine stickleback Ninespine stickleback	Apeltes quadracus Gasterosteus aculeatus Pungitius pungitius
Ictaluridae	Brown bullheads	Ictalurus nebulosus
Percichthydae	Striped bass	Morone saxatilis
Petromyzontidae	Sea lamprey	Petromyzon marinus
Salmonidae	Brook Trout	*Salvelinus fontinalis*
	Atlantic salmon	Salmo salar
	Rainbow trout	*Oncorhynchus mykiss*

APPENDIX D

Sampling Results and Graphs
2009 Water Quality Monitoring

Water Quality Monitoring Results 2009

			Coordinates		June 22		July 27		August 20		Sept. 15		October 9		Nov 3	
Site ID	**Description**	**NAQUADAT**	**N**	**W**	**DO**	**Temp**	**DO**	**Temp**	**DO**	**Temp**	**DO**	**Temp**	**DO**	**Temp**	**DO**	**Temp**
KV-28	Almshouse Brook	00AP0289	45.37972	65.42587	0.7	14.7	9.68	18.7	8.52	17.5	8.79	14.2	12.04	9.6	14.05	4.8
KV-24	Berwick	00AP0247	45.46795	65.35928	0.6	15.6	9.56	20.1	9.3	22.2	8.64	15.4	11.62	10.2		
KV-10	Castle Bridge	00AP0258	45.43296	65.3028	0.7	14.9	100%	18.7	10.72	20	8.97	13.4	11.91	9.7	14.13	4.7
KV-26	Cedar Camp	00AP0256	45.40876	65.22118	0.1	11.6	11.2	13.7	11.5	13.4	10.91	10.8	12.96	9.01	14.27	5.5
KV-02	Crocket's Corner	00AP0242	45.47367	65.2079	0.7	13	10.73	16.9	10.75	14.4	9.61	12.6	11.82	9.7		
KV-61	Fox Hill	00AP0282	45.42926	65.33461	0.7	15.1	9.1	18.9	n/a	n/a	9.11	14.5	10.11	9.8	13.12	5.5
KV-16	Kenn @ Norton	00AP0240	45.38283	65.41805	0.7	16	8.52	19.8	7.31	20.8	9.26	15.3	10.39	10.1	12.87	5.7
KV-30	Malone Bridge	00AP0291	45.45477	65.12207	0.7	13.3	9.75	17.5	9.75	17.1	8.85	13.5	12.05	9.7		
KV-49	McGregor Brook	00AP0281	45.44542	65.32309	0.7	14.6	9.15	18.6	10.06	18.6	8.66	13	10.97	10		
KV-14	Millstream @ Apohaqui	00AP0248	45.42303	65.35998	0.7	15.8	8.24	20.3	6.48	20.1	8.46	15.5	10.7	9.9	13.09	5.1
KV-07	Mouth Smith Creek	00AP0254	45.44882	65.30764	0.6	15.8	9.12	21.2	8.91	21.4	8.03	13.9	10.97	9.9		
KV-11	Mouth Trout Creek	00AP0257	45.43441	65.3045	0.85	14.8	9.19	17.1	9.75	19.2	8.52	13.1	11.92	9.6	13.71	5.3
KV-13	Musquash Brook	00AP0250	45.42443	65.34027	0.7	14.9	9.98	18.8	12.1	20.3	9.21	15	12.1	9.9	14	4.8
KV-47	Oldfield Bridge	00AP0279	45.49818	65.26642	0.5	14.5	10.37	20.6	12.41	20.4	9.84	15.2	12.16	9.5		
KV-06	Salmon River Bridge	00AP0244	45.44704	65.29848	0.6	14.8	9.36	19.2	8.91	19.6	9.36	14.2	9.51	9.9		
MR-01	Sheck Brook	01AP0309	45.53023	65.31411	0.6	15.1	8.25	19.3	n/a	n/a	7.93	13.9	11.58	9.7		
KV-43	South Branch	00AP0275	45.45305	65.18084	0.7	12.2	10.52	16.8	10.4	14	8.91	13	11.8	10.2		
KV-12	Walking Bridge	00AP0238	45.43569	65.32202	0.6	15	9.02	18.9	8.36	19	8.2	13.7	9.31	10	12.87	5.4
KV-40	Ward's Creek Road	00AP0272	45.41264	65.30543	0.7	14.5	9.68	18.2	10.94	20.4	9.13	12.4	12.23	9.4		


Water Temperatures: 2008 vs. 2009
Temperature (degrees C)
25
20
15
10
5
0
Aug-08
Aug-09
Sep-08
Sep-09
Oct-08
Oct-09
Almshouse Brook
Berwick
Castle Bridge
Cedar Camp
Crocket's Corner
Fox Hill
Kenn @ Norton
Malone Bridge
McGregor Brook
Millstream @ Apohaqui
Mouth Smith Creek
Mouth Trout Creek
Musquash Brook
Oldfield Bridge
Salmon River Bridge
Sheck Brook
South Branch
Walking Bridge
Ward's Creek Road
Water Sampling Sites