

What Has Been Done?

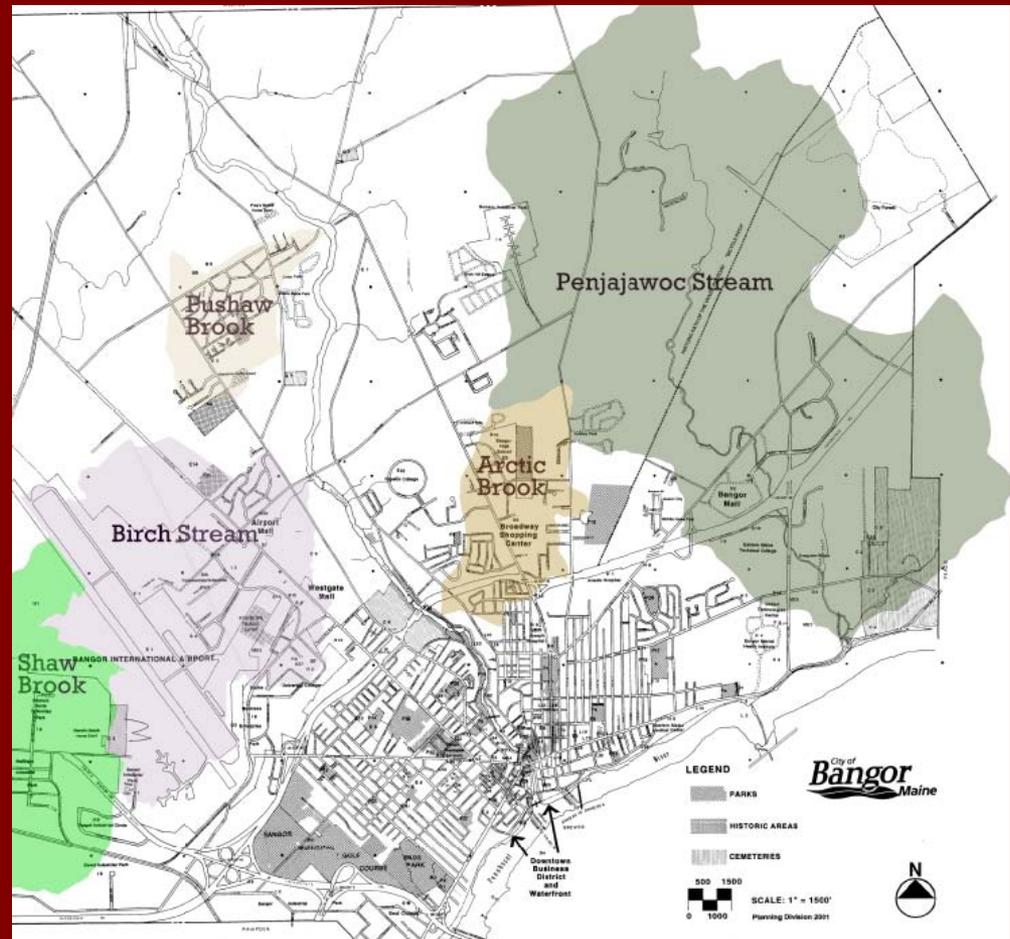
Citizen Review Panel

August 6, 2009

REGULATORY BACKGROUND

- Bangor Streams on the 303 d list include;

- Birch Stream
- Penjajawoc
- Arctic Brook
- Shaw Brook
- Capehart Brook
- Sucker Brook
(listed under Hampden)



Maine Water Classification

Class	DO	Bacteria	Habitat	Aquatic Life (Biological) Narrative Criteria
Class AA	as naturally occurs	as naturally occurs	free flowing and natural	No direct discharge of pollutants; as naturally occurs
Class A	7 ppm; 75% saturation	as naturally occurs	natural	as naturally occurs
Class B	7 ppm; 75% saturation	64/100 ml (g.m.*) or 427/100 ml (inst.*)	unimpaired	Discharges shall NOT cause adverse impact to aquatic life
Class C	5 ppm; 60% saturation	142/100 ml (g.m.*) or 949/100 ml (inst.*)	habitat for fish and other aquatic life	Discharges MAY cause some changes to aquatic life

Penjajawoc Stream Studies

- 2001 – 2003 DEP Water Quality Monitoring
- 2003 Tetra Tech – IC & Loading Model
- 2003 Parish – Prelim Geomorphology Study
- 2004 Stressor ID Workshop – DEP
- 2006 Parish – Intensive Geomorphology
- 2006 ENSR - SWMM Modeling
- 2007 WBRC - Hydrocad Model & BMP Retrofits
- 2007 FB Environmental – Buildout and IC
- 2008 CH2MHill Technical Memorandum

DEP Monitoring

- Water Quality Monitoring
 - Temperature
 - Dissolved Oxygen
 - Sediment
 - Nutrients
 - Toxins
- Aquatic Life Monitoring
 - Bug count (macroinvertebrates)
- Maine has no numerical standards



Water Quality Monitoring

TABLE 4
Summary of Biomonitoring Results for Penjajawoc Stream

Station	Year				
	1997	2001	2002	2003	2006
511	-	NA	NA	NA	Class C
512	-	NA	NA	-	-
314	NA	NA	NA	NA	Class C
513	-	NA	NA	NA	-
315	Class B	Class B	Class C	NA	Class C
Notes:	NA = Non-Attainment Stations read from upstream to downstream				

With the exception of 2006, all of the sites in the upper and middle portions of the Penjajawoc were in non-attainment. Station 315 near the mouth of the stream was attaining Class C or B every year except 2003 when it was in non-attainment, which means the results indicated that none of the stream classifications were attained. All three sites sampled in 2006 showed attainment with Class C criteria.

Bugs are the Target



Tetra Tech – IC ~ Loading

P8 Urban Catchment Model -

Predicts generation and transport (“loading”) of stormwater pollutants based upon hydrological data + BMPs

Table 4.2. Unit area annual pollutant loads

WATERSHED	UPPER (REF.)	LOWER (IMPAIRED)	UNNAME D (REF.)	PERCENT REDUCTIO N¹
TSS (tons/acre/year)	0.048	0.148	0.057	64%
TKN (lb/acre/year)	2.150	5.786	2.480	60%
TP (lb/acre/year)	0.441	1.223	0.512	61%
Cu (lb/acre/year)	0.049	0.131	0.056	60%
Pb (lb/acre/year)	0.023	0.068	0.027	63%
Zn (lb/acre/year)	0.229	0.617	0.265	60%
Hydrocarbons (lb/acre/year)	2.856	8.504	3.373	63%

Parish - Geomorphology

- Stream bank Restoration
 - Specific techniques for targeted areas of the stream
 - Erosion Control
 - Improved Stormwater Management



Results of DEP Stressor Workshop

Stressors	Watershed		
	Upper	Middle	Lower
Temperature	Yes- minor	Yes- possible	Yes
Nutrients	Yes	Yes	Yes- related to stormflow (less of a problem here)
Dissolved Oxygen	Yes- wetland main source	Yes	No (meets standards)
Conductivity	Yes	Yes- sand/silt sources	Yes- salt sources
Toxics	Yes	Yes	Yes
Sediment	No	Yes	Yes-high suspended sediment during storms (probably from Meadow Brook)
Altered Hydrology	Yes	Yes- groundwater may mitigate low baseflow syndrome	Yes- from upper reaches
Habitat	Yes	Yes	Yes- more data needed

ENSR – SWMM

- Storm Water Management Model
- Predicts Total Annual Load of Nutrients based upon rainfall and existing BMPs

TABLE 1.1 – SWMM RESULTS

POLLUTANT	ANNUAL LOAD (LBS)			
	10+080	7+220	3+740	0+000
TSS	370.00	990.00	1,500.00	1,590.00
P	2.60	5.40	8.20	8.80
TKN	13.00	27.00	41.00	44.00
Cu	0.31	0.62	0.93	1.00
Pb	0.10	0.23	0.35	0.38
Zn	1.40	2.90	4.40	4.70
HC	12.00	29.00	44.00	47.00

Numbers at top of columns represent sections of the stream

WBRC Architects & Engineers

Based upon Hydrologic Model -
Provides Retrofits and Low Impact
Development BMPs that will:

- Reduce nutrients from stormwater
- Reduce volume of stormwater during frequent storm events
- Increase base flow
- Improve thermal conditions



FB Environmental - 2006

Impervious Cover Buildout Analysis



1. Determine current IC ~ 13%
2. Estimate increase in IC if fully developed under current zoning ~ 23%
3. IC increases by 77% if zoning does not change

CH2MHill Tech Memo

- To review & summarize existing data
- To tease out gaps in data
- To recommend alternative models

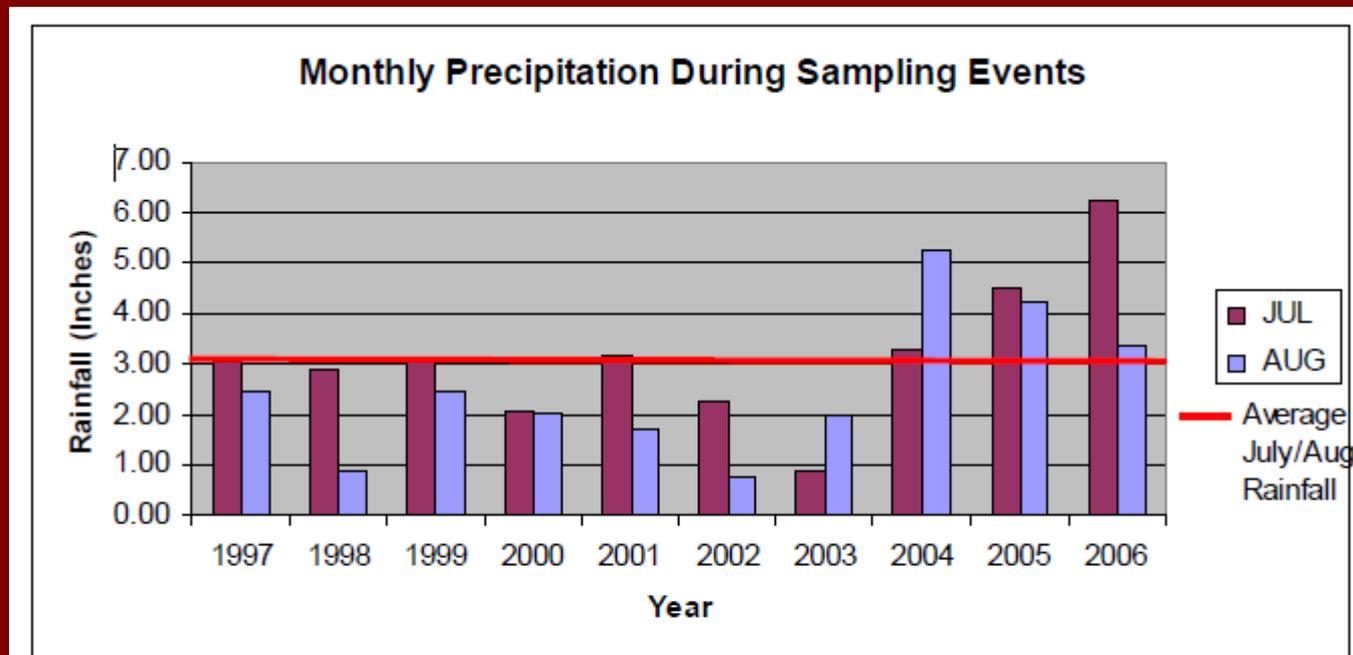


FIGURE 3

Monthly precipitation data during the months of biomonitoring from the Bangor and Orono gauges (Northeast Regional Climate Center, 2008)