Penjajawoc Watershed Overview

Stakeholder Work Group Meeting

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Thanks to Non-point Education for Municipal Officials (NEMO) for sharing slides

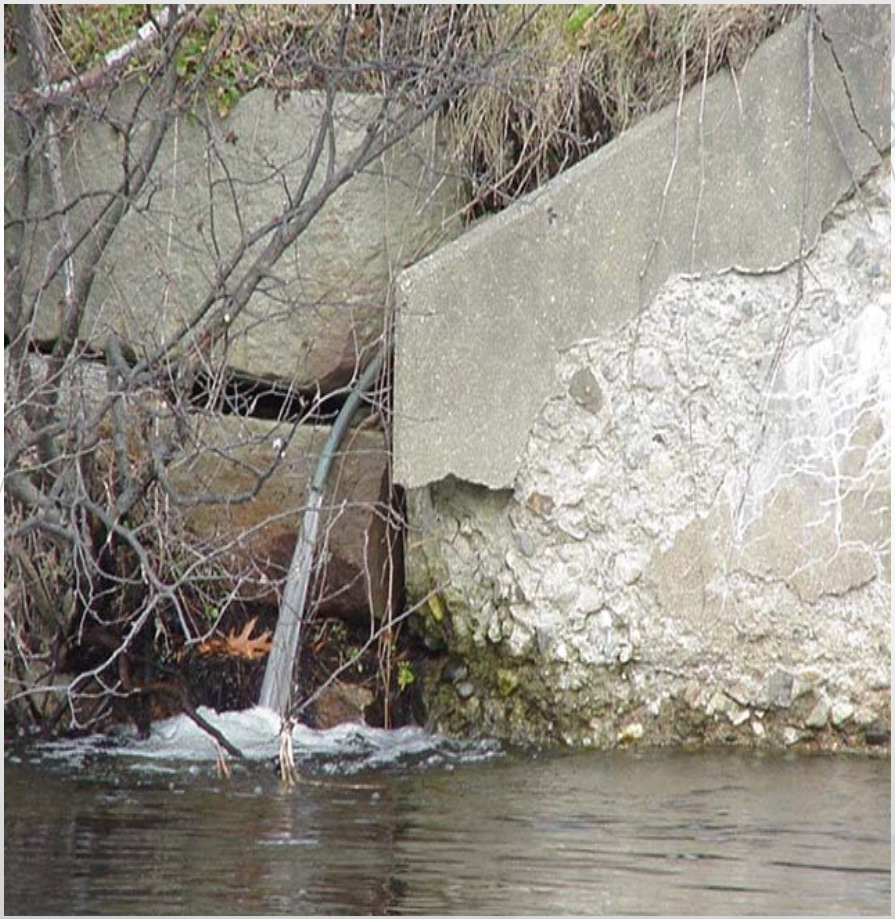
WHY IS STORMWATER REGULATED?

- Stormwater = <u>greatest source of pollutants</u> in U.S. waters
- Carries chemicals, oils, debris, soils, and other pollutants, at raised temperatures
- Flows directly and indirectly to water bodies
- May harm human health & environment

STORMWATER = NON-POINT SOURCE DISCHARGE

Point source is a stationary facility from which pollutants from a specific point are discharged into a receiving water

Non-point source (NPS) has no single point of origin

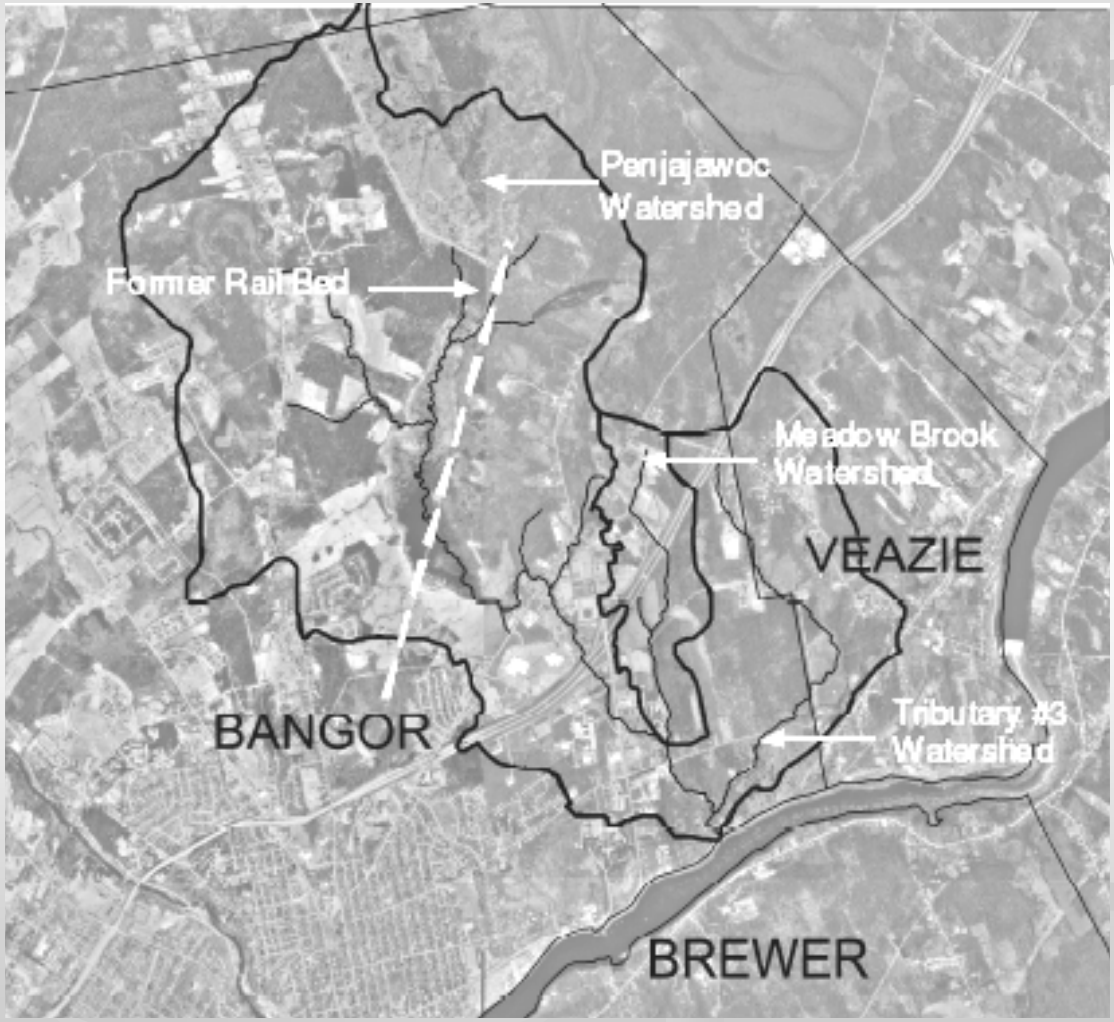


DEP Targets Urban Streams

- *Urban streams **fail** to meet water quality standards because of effects of **stormwater runoff** from developed land.*

DEFINITION OF WATERSHED

The total of all areas that drain directly or indirectly to a water body.

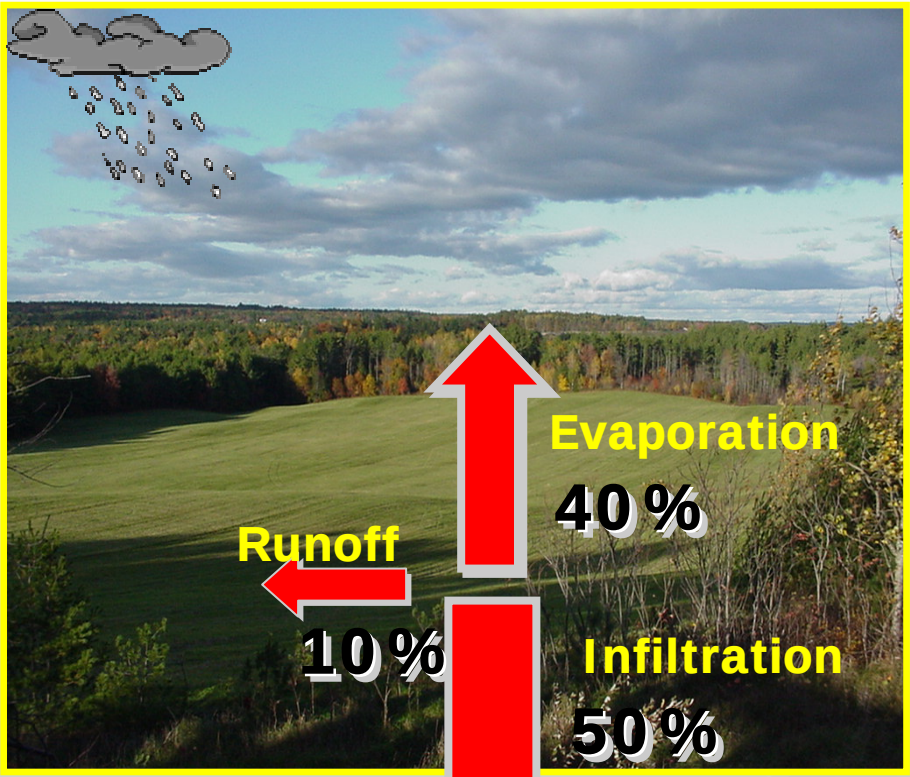


Penjajawoc Watershed

- Watershed = All areas draining to stream (5,600 acres)
- Headwater = Freshwater Marsh (300 acres)
- Stream is 5.2 miles + 10 tributaries
- Soils = Group C (Silt/Clay)
- Slope = 1% average

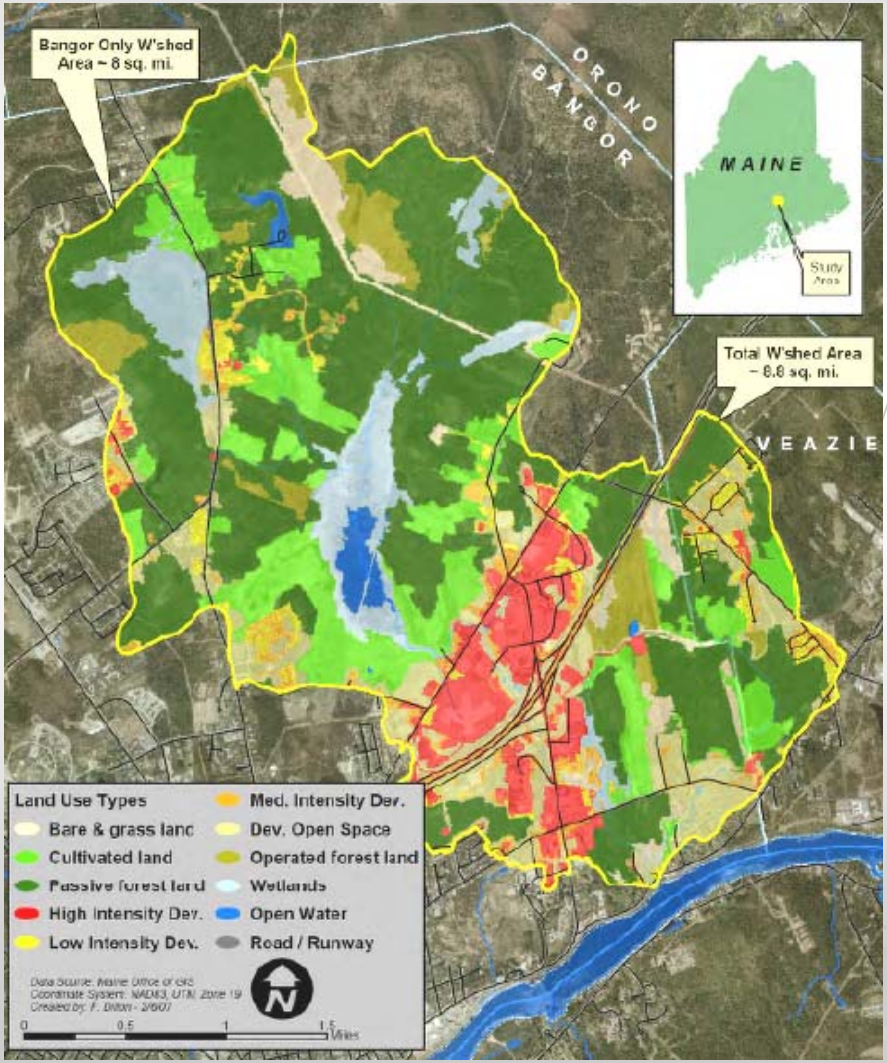
Maine's Water Budget
Impacts of Development

Natural Cover



75-100 % Impervious Surface

Urban Land Use & Impervious Cover (IC)



> 10% IC = Poor water quality (non- attainment)

Penjajawoc ~ 13%

Skewed due to Marsh

Some areas much higher

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

DEP Monitoring

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

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)	UNNAMED (REF.)	PERCENT REDUCTION[1]
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

DEP Stressor Workshop Results

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

	ANNUAL LOAD (LBS)			
POLLUTANT	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

Next Step

Become familiar with tools/solutions

Take a Balanced Approach