The Pennichuck Watershed Restoration Plan – Past, Present & Future

Presented by Rebecca Balke, P.E., Comprehensive Environmental Inc. Telephone (800)725-2550 or see www.ceiengineers.com
Overview

I. Water Supply Background
II. Watershed/Supply Protection Alternatives
III. Past Efforts
IV. Watershed Restoration Plan
V. Conclusions
I. Water Supply Background

• Primary water supply is Pennichuck Brook – series of four dammed ponds
• 17,000 acre watershed located across five towns
• Supplemental supply from the Merrimack River during high summer demands
• Raw water treated through conventional filtration
II. Watershed/Supply Protection Alternatives

- **Land Purchase** – $$$$
- **Regulatory Changes** – Minimal – Cost carried by developer to incorporate controls
- **LID** – Similar cost as conventional development but with long-term benefits
III. Past Efforts

- 1998 Watershed Management Plan & follow-on subwatershed studies
  - Qualitative
- Implemented several prevention and remediation practices
Overview of Pennichuck’s Efforts
Where Do We Go From Here?
Current Direction

• Prioritize future spending
• Quantified program approach
  – How much pollution is entering the water body?
  – Where is it coming from and in what quantities?
  – How much pollutant load is ok?
  – How much do we need to remove?
  – Alternatives to reduce loads?
  – Which solutions provide the greatest impact at the lowest cost?
IV. Watershed Restoration Plan
Objective:
Prioritize spending to meet water quality goals
TMDL Approach

• Phosphorus loads and reductions
• Storm Water Management Model (SWMM)
Flow Estimation

- Estimated flows based on watershed characteristics
  - Land use
  - Soil infiltration rates
  - Local stream geometry
  - Local precipitation
- Calibrated with observed streamflows from data loggers
Flow Calibration Points
Pennichuck Brook Watershed Average Annual Water Budget

- Runoff: 13%
- Evapotranspiration: 32%
- Evaporation: 8%
- Groundwater Flow: 47%

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Sandy Soils
Pollutant Estimation

• Published land use based values
• Loads by subwatershed and town
• Tells us where the majority of pollutants are coming from
• Lake response model
• Match predicted in-pond concentrations to observed
Phosphorus Loadings
Additional Developable Areas
Water Quality Goals

Observed

• Phosphorus – 0.005 – 0.35 mg/L

Goals

• What is Realistic?
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What Provides the Greatest Benefit at the Least Cost?

• Increased maintenance
  – Street sweeping
  – Catch basin cleaning

• Retrofits to existing BMPs
  – Detain *and* treat
  – Top 10 sites
  – Tinker Road detention basin retrofit
What Provides the Greatest Benefit at the Least Cost?

- LID for commercial redevelopment
  - Pennichuck Square demonstration
  - Initiate grant program for communities to foster LID in redevelopment projects
  - Pennichuck to provide LID review and comments
What Provides the Greatest Benefit at the Least Cost?

• Local adoption of State Stormwater standards
• Aeration
• Public education
  – Social marketing
  – Web site
  – Door hangers
  – School education program
  – Coordination with Phase II Coalition
  – Garden Club coordination
Other Recommendations

• Evaluate sediment accumulations
  – Ponds
  – Stream bank erosion
• Evaluate stormwater utility feasibility
• Long-term monitoring
Final Plan

• Quantifiable – $/lb of phosphorus removed – identifies best alternatives

• Clear and concise implementation
  – Who, when, where, how much?

• Easy to update

• Prioritizes future spending to get the greatest benefit
V. Conclusions

• Watershed protection requires intelligent planning
  – Understanding of hydrology
  – Understanding of contaminant loading
• Quantified improvements lead to better spending