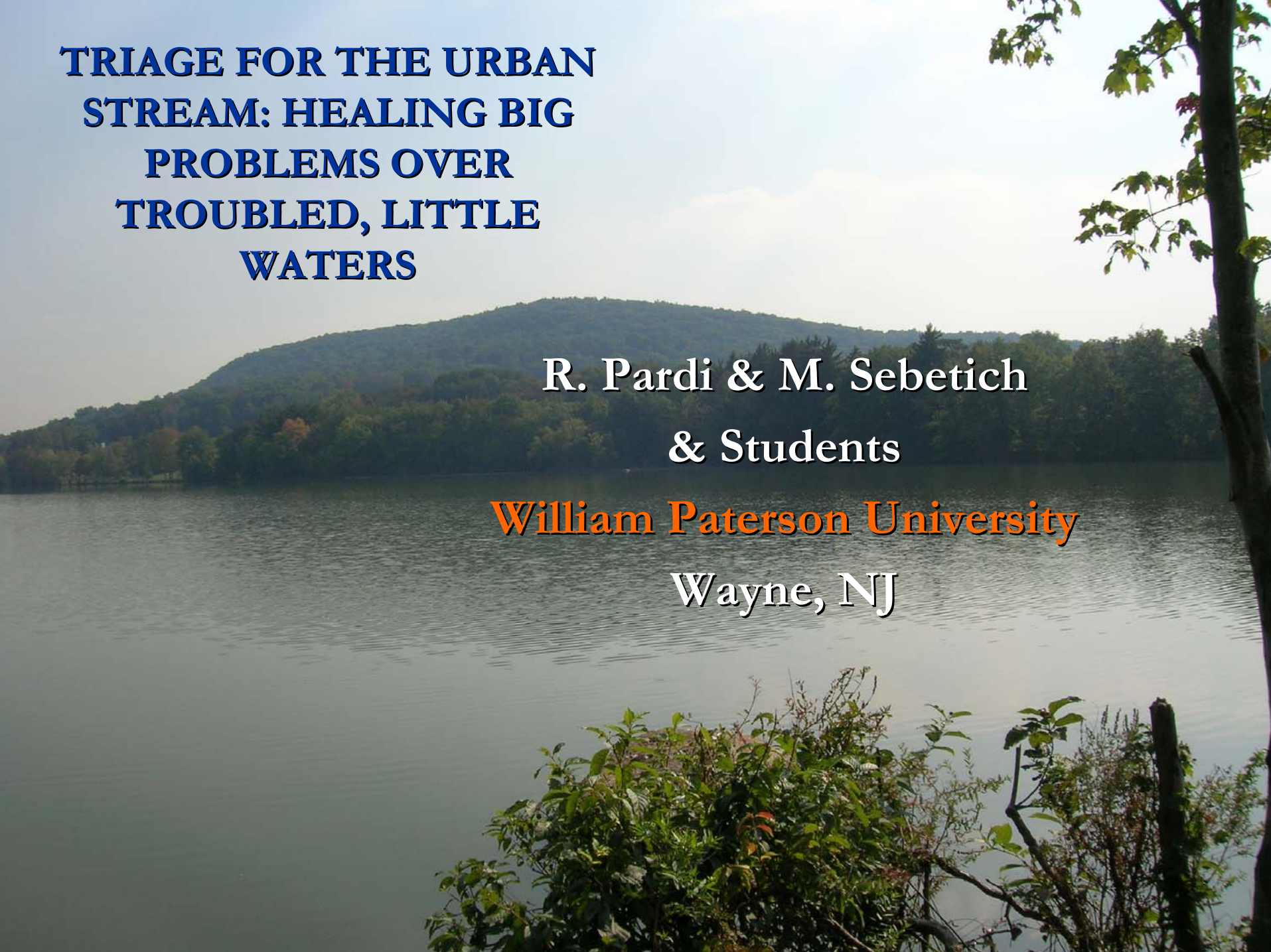

TRIAGE FOR THE URBAN STREAM: HEALING BIG PROBLEMS OVER TROUBLED, LITTLE WATERS

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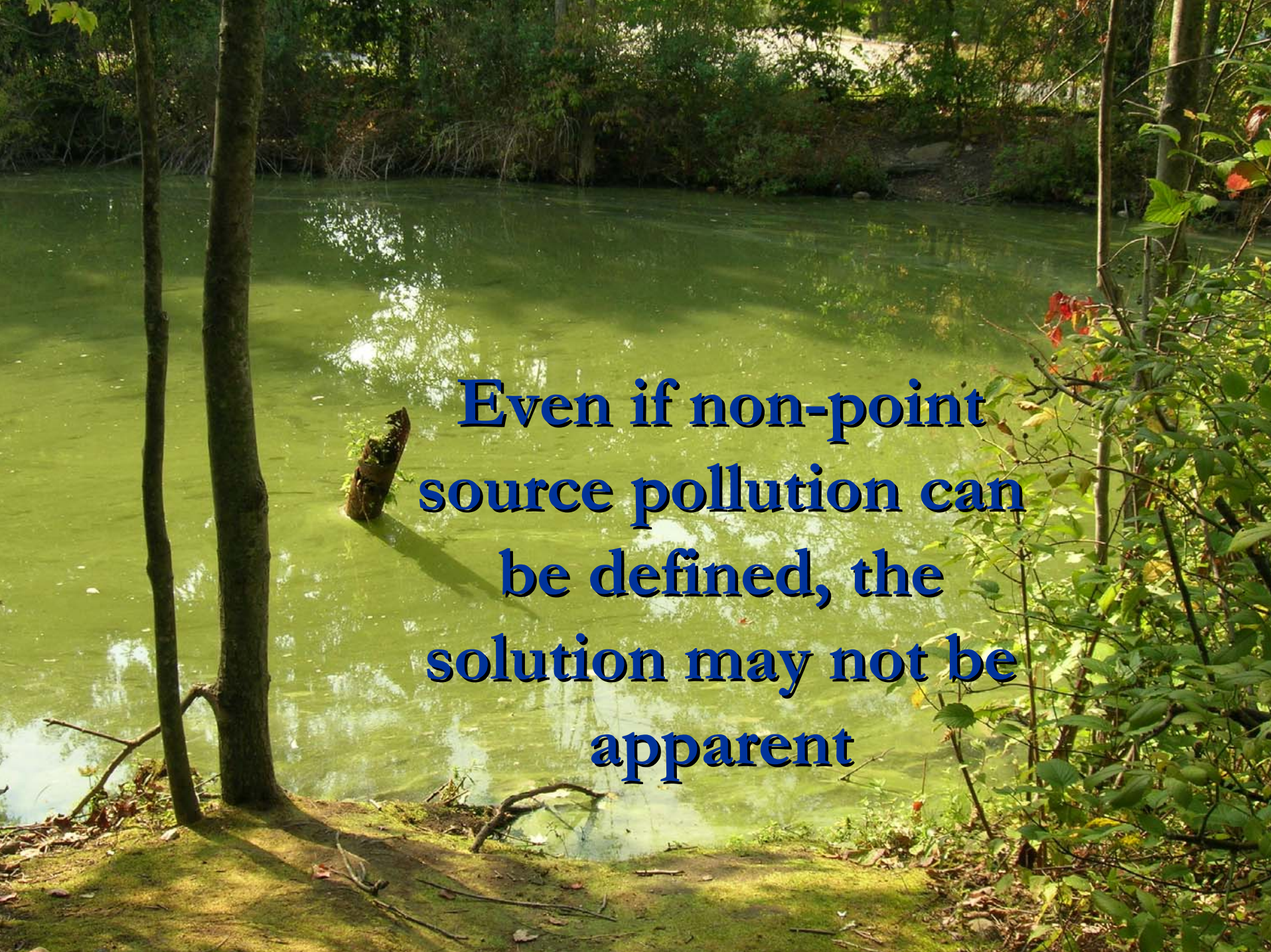
Regulatory-driven Monitoring

- Impairments are defined by focused monitoring at specific sites for specific indicators
- Restoration-project monitoring is directed to address those specific indicators
- Especially in terms of non-point source pollution, watershed restoration BMPs may be off-target or even counter-productive because they are, of necessity, based on limited information not driven by a holistic evaluation of overall watershed hydrologic and ecologic process.

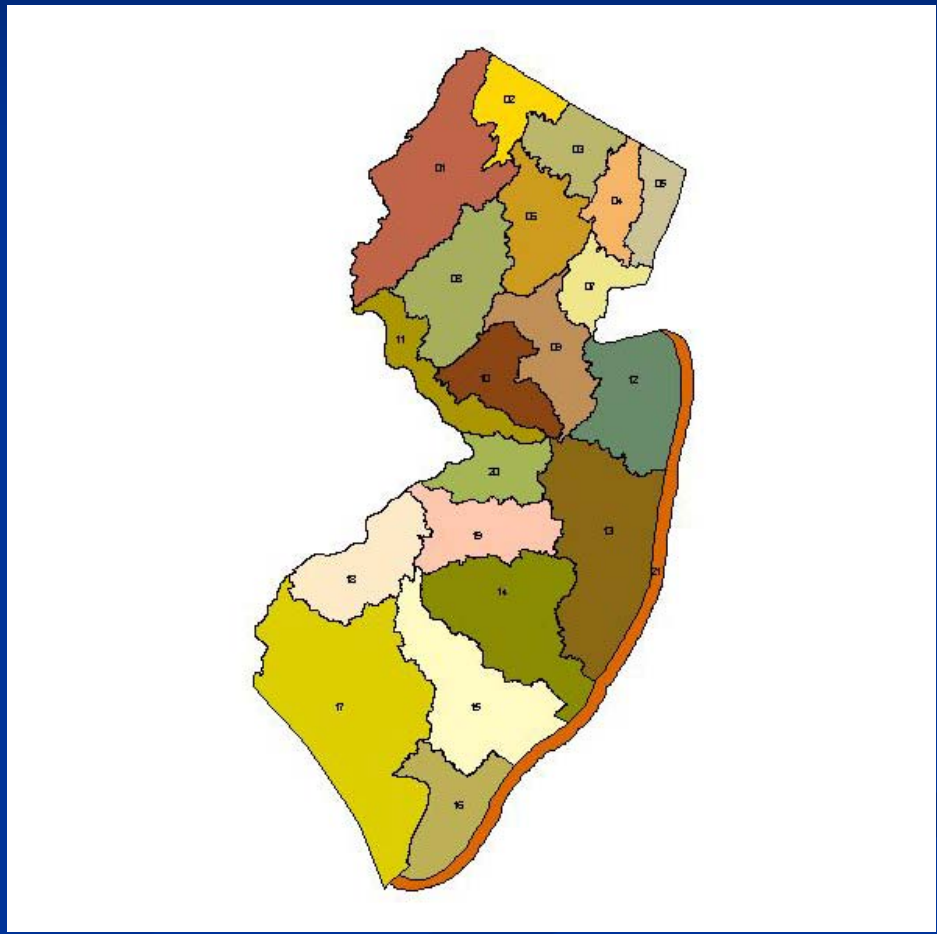

Both sources and solutions to point-source pollution are easily defined


Even if non-point source pollution can be defined, the solution may not be apparent

We use the triage metaphor not so much in terms of ranking restoration projects but in terms of the impact on restoration plans from assessments made on limited and focused monitoring programs

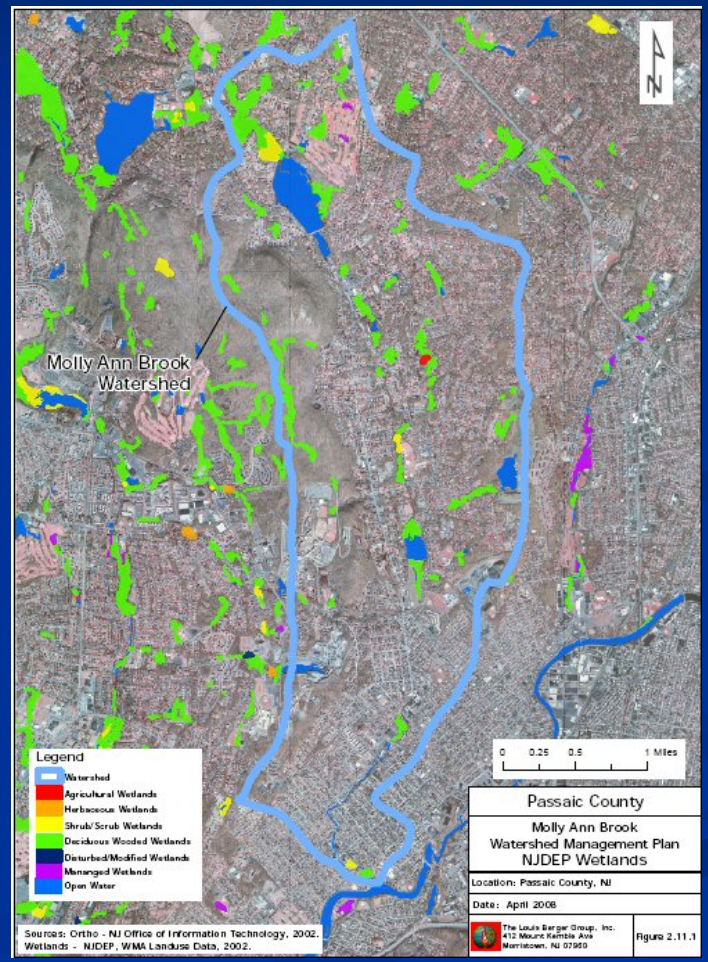
Watershed

- New Jersey Watershed Management Area #4
- Lower Passaic & Saddle River Basin
- This study part of non-tidal segment studies - Molly Ann Brook - one of six tributaries to non-tidal reach



Molly Ann Brook Watershed

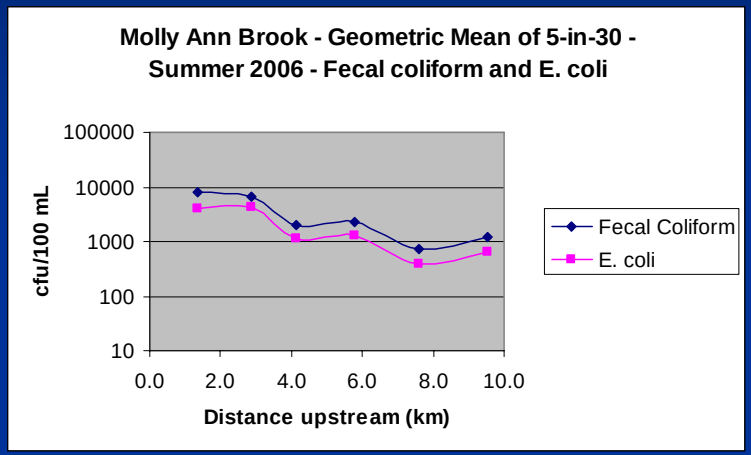
- Small (20 km^2) tributary watershed of the non-tidal segment of the Lower Passaic River
- Mean annual discharge (12 cfs)
- Along-stream profile from essentially rural to densely-urban land use.
- Frequent flooding resulted in a recently-completed ACE channelization project



Stream Monitoring – Molly Ann Brook, Passaic County, NJ
NJDEP 319(h) Project
Passaic County Grantee
Louis Berger Associates co-subcontractor

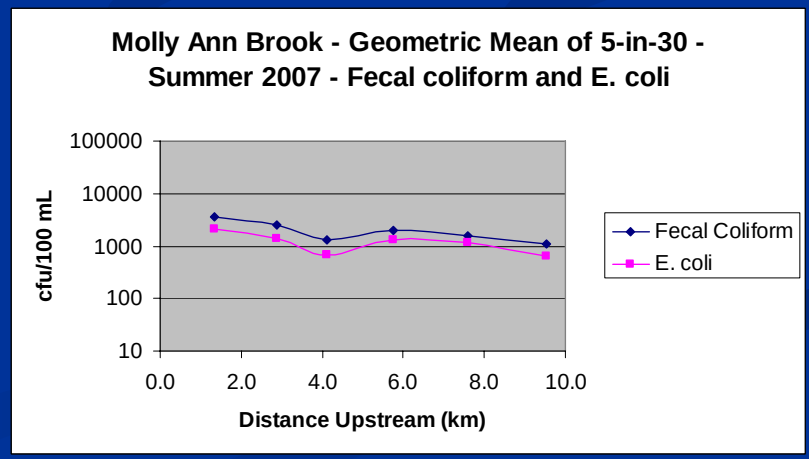
- Bacteriological sampling
- Macro-invertebrate surveys
- Water quality sampling
- Stressor identification
- Discharge (flow)

Stream Monitoring Bacteriological Sampling



- Brook was sampled five times within 30 days per TMDL sampling standard at 6 sample locations along the length of the main channel.
- Note log scale to bacteriological counts

- During both sampling seasons, mean bacteriological counts exceeded the maximum allowable levels at all of the six stations
- There was a general exponential increase in bacteriological counts going down stream



Bacteriological Survey Conclusions

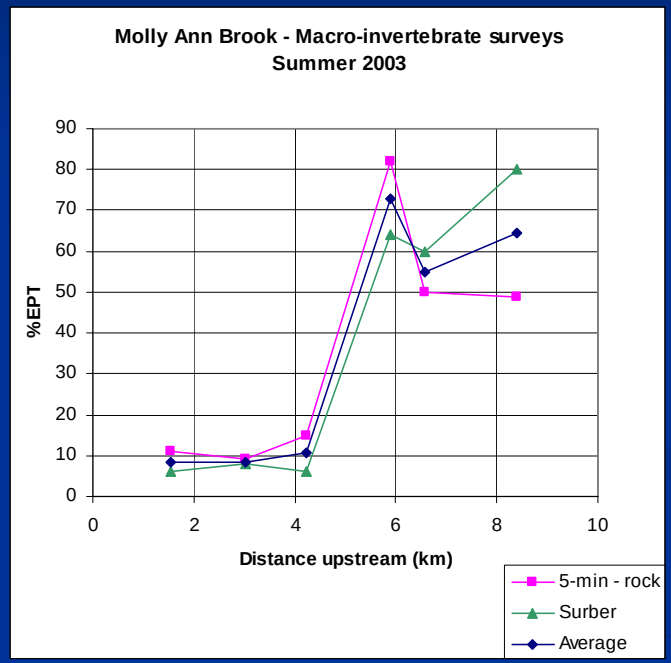
- Fecal contamination is watershed-wide
- Concentration follows typical pattern of positive correlation with discharge, % impervious surface and population density
- Appears to be non-human based on surrogate analysis such as fluoride and optical brighteners
- Wildlife, pet and landscaping waste are likely sources

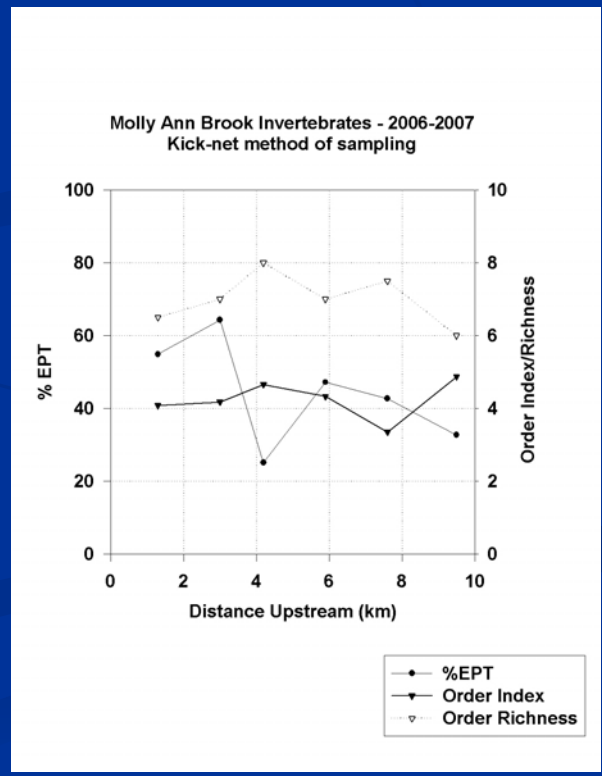
Stream Monitoring – Macroinvertebrate Sampling

- Sampling was conducted on multiple occasions along the main stem of the stream during summer 2006 & 2007
- Macro-invertebrates were collected via the kick-net method illustrated here
- Identification was made primarily at the order level

Stream Monitoring – Macroinvertebrate Sampling

- There was a marked difference in results between sampling done for this study (2006-2007) and previous studies (2003)
- The results may reflect changes in precipitation (2006/7 were exceptionally wet years) or be a consequence of the dredging done over the winter of 2006/7





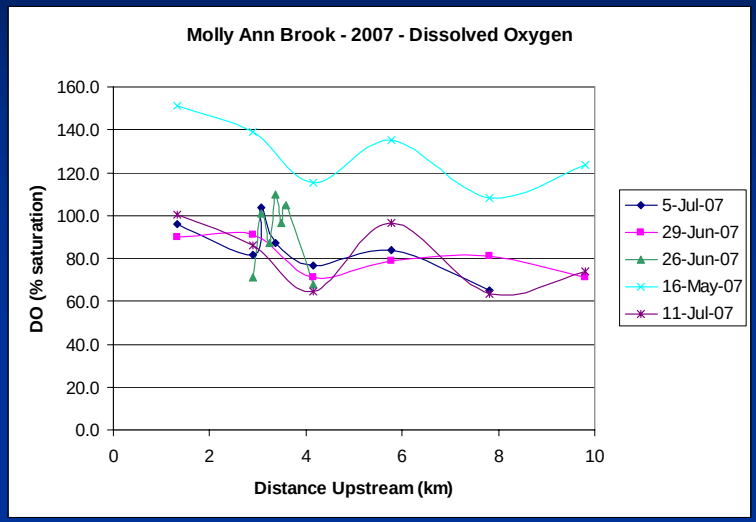
Stream Monitoring – Water Quality Sampling

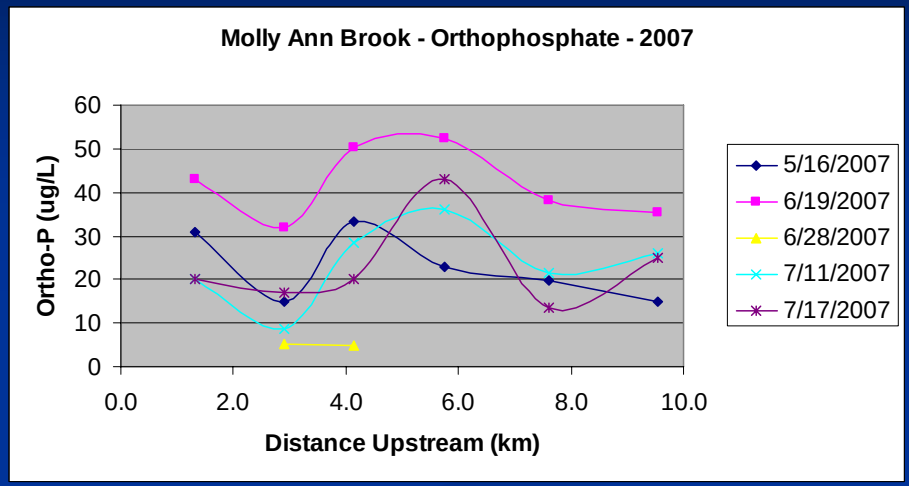
- Field variables (pH, dissolved oxygen, conductivity, turbidity and temperature) were measured frequently at all main-channel stations
- Only major ions were measured – no trace metals or organics
- Continuous monitoring was carried out at a few locations to observe diurnal variations in field variables

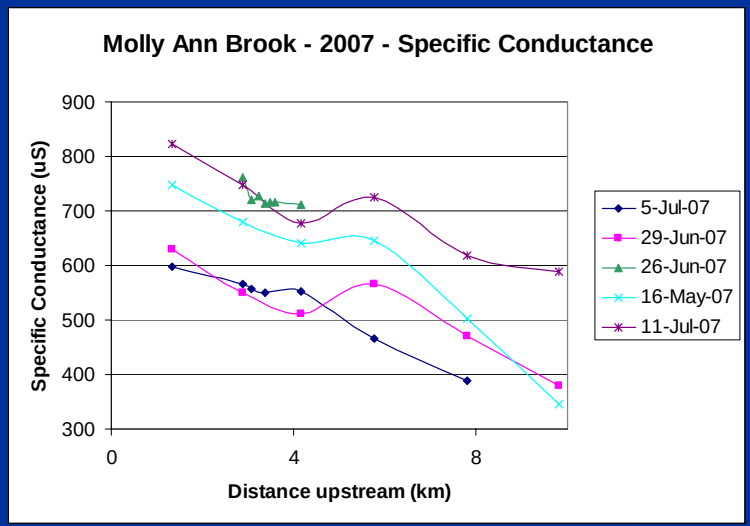
Stream Monitoring – Water Quality Sampling - Results

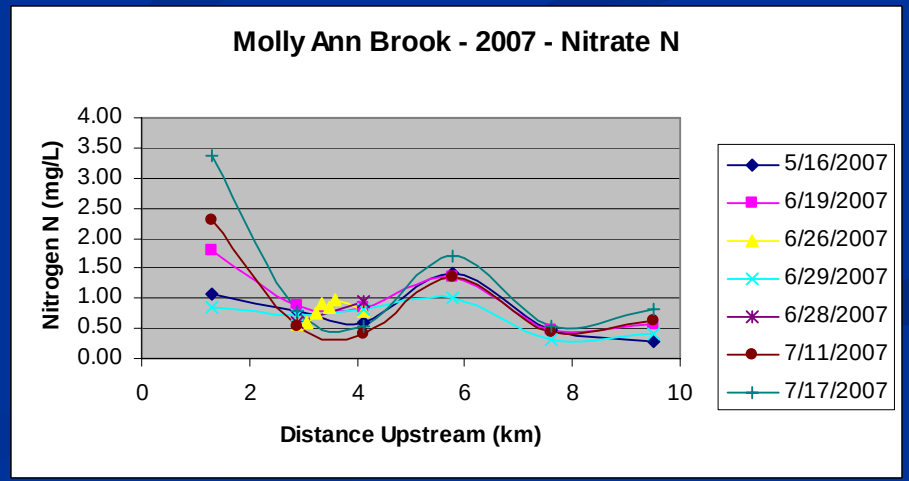
- Oxygen levels were, in general, high, but showed night-time declines which indicated high levels of organic decomposition
- Nutrient (P & N) levels were, in general, low, except that nitrate was consistently high at the lowest (Preakness Ave.) site
- No specific trends or spikes were noted in fluoride concentration which would suggest there are no strong septic inputs into the stream

Some water quality results

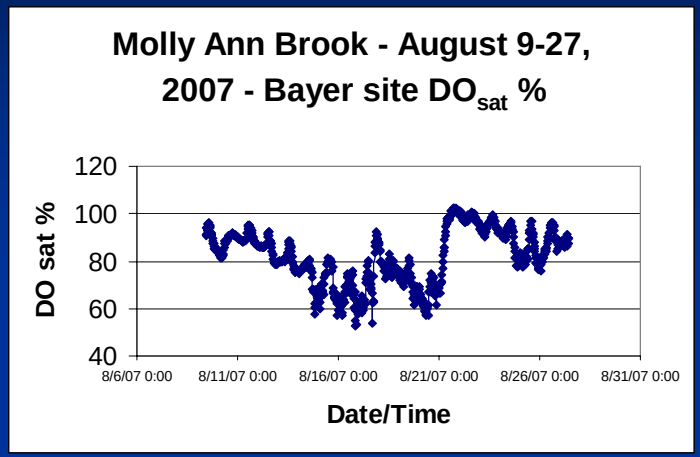


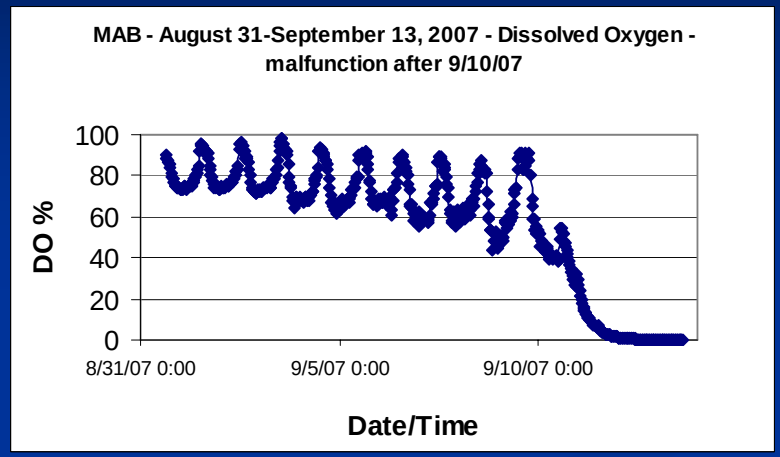


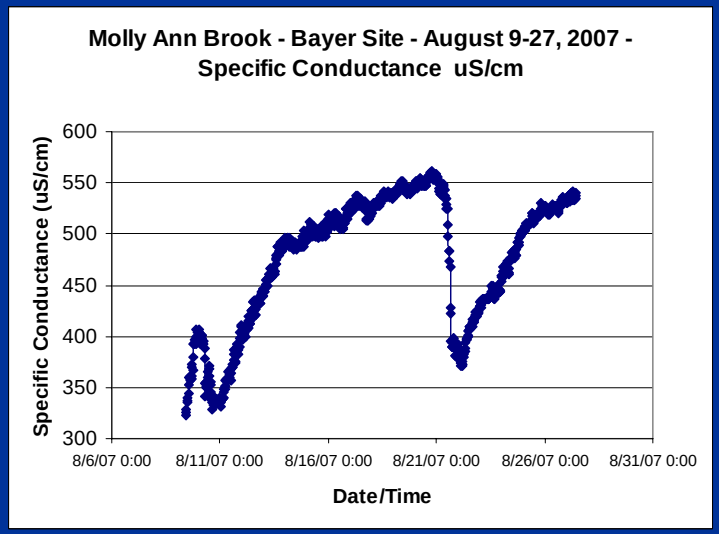


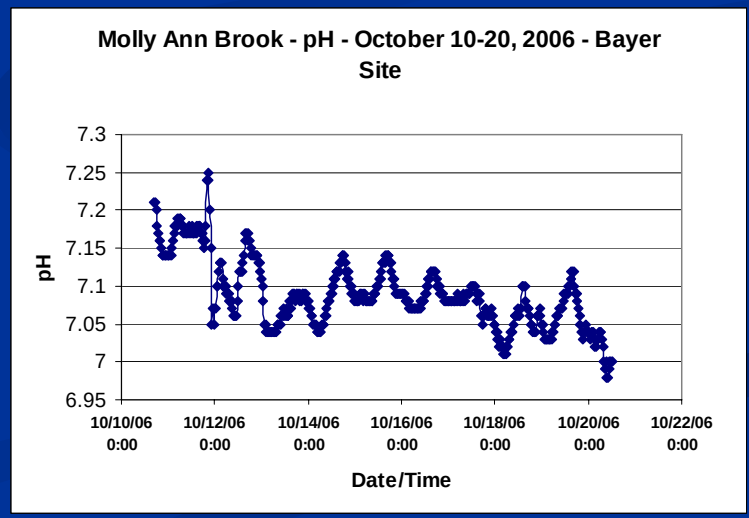


Continuous Monitoring









Restoration Plan

- BMPs that address specific impairments accompanied by continued monitoring defined by those original impairments.
- In part, those BMPs must be based on generalizations based on other watersheds and studies that at best don't contradict observations made on this watershed.

Education may be the key to a solution, but "Why bother?" may be the key obstacle

- Impact on Passaic River
- Potential health impact
- Is a sound environment worth anything?