Role of Visual Assessments in the Identification of Restoration Sites in the Metedeconk River Watershed

By Eileen Althouse for Low Impact Development Symposium, Philadelphia PA

Tuesday, September 27, 2011

Funded by the New Jersey Department of Environmental Protection Watershed Restoration Program
Presentation Outline

1. Introduction and Key Findings
2. Metedeconk River Watershed Restoration and Protection Plan Overview
3. Stream Visual Assessment Plan and Results
4. Stream Visual Assessments and Relationship to Water Quality
5. Examples of Restoration Site Candidates
6. Final Conclusions
Introduction & Key Findings

• Visual assessments of the streams throughout the Metedeconk Watershed were a valuable tool in screening candidate sites for restoration
  – Provided an evaluation of watershed condition
  – Created a database of field observations, site photographs, and stormwater infrastructure that could be later used to analyze candidate restoration sites
• Visual assessment scores followed land use and development trends
• Visual assessment scores followed water quality trends
Metedeconk River Watershed Restoration and Protection Plan

- Plan developed in multiple phases with stakeholder input
- Regional watershed approach with defined goals
- Characterization of the watershed
  - Stream visual assessments
  - Water quality data
  - Land use data
  - Stream flow data
- Identify candidate sites for restoration
  - Structural and non structural best management practices (BMPs)
- Partner with Brick Twp Municipal Utilities Authority (BTMUA)
- Funded by the NJDEP Watershed Restoration Program
The Metedeconk River Watershed

- Within WMA (Watershed Management Area) 13
- Ocean and Monmouth Counties
- Drains to the Barnegat Bay
The Metedeconk River Watershed

- 11 sub-basins
- Approximately 78 sq. mi.
- Primarily within Brick, Freehold, Howell, Jackson and Lakewood Twps
The Metedeconk River Watershed

- Category One (C1) waterway
  - Protected from any measurable degradation in water quality
- Primary source of drinking water for BTMUA
- Discharges to Barnegat Bay
  - Nitrogen issues
- TMDLS for phosphorus and pathogens
  - Stormwater primary source
- Previous investigations suggest
  - A need for land use and regional stormwater management
  - Increasing impervious cover an issue
    - (12% to 15% from 1995/1997 to 2007)
  - Baseflow declining while runoff increasing
- Most land use change within previous 10 years forest to residential
  - Although, approximately 50% remains forest, wetlands, or other open space
Land Use / Land Cover 2007

- Urbanizing watershed
- 15% Impervious cover
- A level which can lead to flashy flow, water quality and bio-diversity problems

<table>
<thead>
<tr>
<th>Land Use</th>
<th>2007 (1995/97)</th>
</tr>
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<tbody>
<tr>
<td>Forest:</td>
<td>23% (29%)</td>
</tr>
<tr>
<td>Wetlands:</td>
<td>26% (27%)</td>
</tr>
<tr>
<td>Residential:</td>
<td>30% (25%)</td>
</tr>
<tr>
<td>Agricultural:</td>
<td>3% (4%)</td>
</tr>
<tr>
<td>Commercial:</td>
<td>4% (3%)</td>
</tr>
<tr>
<td>Urban Open:</td>
<td>4% (3%)</td>
</tr>
<tr>
<td>Water:</td>
<td>3% (3%)</td>
</tr>
<tr>
<td>Trans/Utility:</td>
<td>2% (2%)</td>
</tr>
<tr>
<td>Mixed Urban:</td>
<td>2% (2%)</td>
</tr>
<tr>
<td>Industrial:</td>
<td>2% (1%)</td>
</tr>
</tbody>
</table>
VAPP – Visual Assessment Project Plan

• Field evaluations of stream reaches
  – Detailed observations of stream physical conditions and surrounding area
  – Obvious problems are documented
  – Practical means of identifying opportunities for protection and restoration projects

• Performed in accordance with a Visual Assessment Project Plan (VAPP)
  – Purpose/objectives
  – Data quality criteria
  – Training
  – Methods/Protocol
  – Sites
  – QA/QC
  – Data management
  – Reporting
VAPP – Visual Assessment Project Plan

- Extensive field evaluations based on USDA – Stream Visual Assessment Protocol (SVAP)
- Network of 83 sites – mostly coincide with BTMUA sampling stations
- Georgian Court College students
- Spring & summer 2010
- Reach length – min 12x the active channel width & max 200 yds
- Documented watershed characteristics
  - Nearby land use, infrastructure, possible contamination, appropriate mitigation BMPs, weather conditions
- Scored attributes on a scale of 1 – 10
  - Hydraulic, habitat, or water quality conditions
VAPP – Visual Assessment Project Plan

- Each reach assigned an assessment score
- Average of visual assessment indicators – scale 1-10
  - Channel condition
  - Hydrologic alteration
  - Riparian zone
  - Bank stability
  - Barriers to fish movement
  - Instream fish cover
  - Pools
  - Invertebrate habitat
  - Canopy cover
  - Water appearance
  - Nutrient enrichment
  - Riffle embeddedness
- Excellent (≥9), Good (7.5-8.9), Fair (6.1-7.4) or Poor (≤6.0)
- Quantitative measure applied to something qualitative
- Also identifies
  - Pollutant sources/litter/dumping
  - Stormwater infrastructure
    - Outfalls, drainage ditches, basins
  - Utility infrastructure/easements
    - Sanitary sewer (potential pollutant source)
VAPP Sheet – Site SPC1
VAPP Results

Overall reach scores
1  Excellent (1%)
33  Good (40%)
30  Fair (36%)
19  Poor (23%)
## VAPP Results

<table>
<thead>
<tr>
<th>Sub-basin</th>
<th>Score</th>
</tr>
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<tbody>
<tr>
<td>NB-1</td>
<td>7.1</td>
</tr>
<tr>
<td>NB-2</td>
<td>6.8</td>
</tr>
<tr>
<td>NB-3</td>
<td>5.5</td>
</tr>
<tr>
<td>NB-4</td>
<td>6.4</td>
</tr>
<tr>
<td>NB-5</td>
<td>7.0</td>
</tr>
<tr>
<td>SB-1</td>
<td>7.8</td>
</tr>
<tr>
<td>SB-2</td>
<td>7.8</td>
</tr>
<tr>
<td>SB-3</td>
<td>7.1</td>
</tr>
<tr>
<td>SB-4</td>
<td>6.6</td>
</tr>
<tr>
<td>SB-5</td>
<td>7.3</td>
</tr>
<tr>
<td>CNFL1</td>
<td>5.6</td>
</tr>
<tr>
<td>Overall</td>
<td>6.8</td>
</tr>
</tbody>
</table>

### Map

The map shows the Metedeconk Watershed Stream Visual Assessment Scores by HUC14 Subwatershed. The colors indicate different visual assessment scores, with higher scores represented in lighter colors and lower scores in darker colors. The map also shows the distribution of visual assessment sites across the watershed.
VAPP Sites
Summary of VAPP Results

- Scores lower on smaller tributaries, higher on main stems of river
- Very few obvious pollution sources identified
  - Waterfowl and livestock suspected to contribute to fecal problems
  - Stream impairments related to stormwater/NPS
  - Antiquated stormwater infrastructure opportunities for retrofit
    - Direct stormwater outfalls, drainage ditches, detention basins
- Trash and floatables are a major problem
  - Storm grate retrofits will help
  - Numerous cases of dumping documented
- Utility facilities in good condition and very well maintained
- Lakes have water quality issues, sedimentation and nuisance aquatic plant growth
Surface Water Monitoring

- BTMUA Monitoring Program
  - Extensive, including 68 sampling stations
  - North and South Branches
- Routine samples collected at or immediately upstream of intake
- USGS, EPA stations
Surface Water Quality - Issues

• Nitrogen
  – Increasing downstream trend
  – Nitrate concentrations have exceeded 2.5 mg/L at BTMUA intake, although typically between 0.5 and 1.0 mg/L
    • Great for drinking water (MCL = 10 mg/L)
    • Problematic to Barnegat Bay
  – Ammonia exceeds the surface water quality criteria (SWQC)

• Specific Conductance/TDS
  – Increasing downstream trend
  – Increases as development increases – over 200 uS/cm on tributaries
  – Much higher in winter and early spring due to road salting
North Branch – Water Quality

- Conductance and nitrate are elevated downstream of station NI
- VAPP scores are mostly Fair and Poor along the tributaries downstream of station NI
- Land Use transitions to medium-density residential at station NI

**Nitrate (as N)**

- 4 Good
- 9 Fair
- 11 Poor

**Specific Conductance**

**Total Dissolved Solids**
South Branch – Similar Results

• Conductance and Nitrate are elevated downstream of SI
  Nitrate: SK = 0.06 mg/l → SG = 0.49 mg/l → SD = 0.44 mg/l → SA = 0.52 mg/l

• VAPP scores are mostly Fair and Poor along the tributaries downstream of station SI
  8 Good (4 are upstream of NI)
  9 Fair
  5 Poor

• Land use transitions to medium-density residential at station SI
VAPP and Water Quality

- Fair and Poor VAPP scores on the tributaries associated with water quality degradation
  - Nitrate
  - Conductance
  - TDS
- Although Good VAPP scores predominantly along main stems, water quality degradation is apparent downstream
- A shift to more intense land use (medium-density residential) associated with lower tributary VAPP scores and downstream water quality degradation
- VAPP data indicate the condition of the watershed at the tributary level - Fair
Examples of Restoration Candidates

- 32 sites identified as potential candidates for restoration in preliminary phase
- *Including*
  - Site
  - Score/Rank
  - Description
  - Restoration Suggestion
Example #1 - Site SPC-1
Newbury Elementary School

- Candidate restoration site
- VAPP Poor (3.2)
- Sub-basin NB3
- Downstream nitrate 0.66 mg/l at MF1
- HS5 – conductance 221 uS/cm
Example #1 – Site SPC-1

- Sparrow Creek
- Trib to Haystack Brook (HS)
- Stormwater from neighborhood may discharge directly
- No stormwater retention basins observed
- Solutions: Bioretention basin at school, rain gardens in neighborhood, disconnect impervious surfaces, etc.
- Tool for education and outreach
Example of a Bioretention retrofit at Baker School in Moorestown, NJ
Example #2 – Sites CP-3 & TR21-2

VAPP tells us:
- Poor sites - CP-3 (3.9) TR21-2 (3.6)
- No vegetative buffer
- Waterfowl present
- Sediment and debris
- Homes within 30 ft of stream (Flooding reported)
- Culvert under road crossings

- Sub-basin SB4
- High-density area – 40% ISC
- Upstream of SD – nitrate = 0.44 mg/l

Solutions:
- Restore buffer
- Discourage geese
- Onsite stormwater management
Example #2 – Sites CP-3 & TR21-2
Summary of Water Quality and VAPP

- Water quality degradation associated with low scoring VAPP sites along tributaries
- Visual assessment scores follow land use and development trends
- Further investigate areas suspected to be contributing to stream degradation
  - Inadequate buffer, algae, bank erosion, sediment, etc.
- Pinpoint areas for restoration
  - Issues and potential restoration opportunities documented for each assessment site – field notes, stormwater infrastructure
- Qualitatively in VAPP sheets and quantitatively in a GIS tool
- Photo database
Final Conclusions

• Data gained from the VAPP are valuable in identifying restoration sites to achieve the goals and objectives of the Metedeconk River Watershed Restoration and Protection Plan
  – Especially water quality – nitrogen
  – BMP retrofit opportunities
  – New stormwater systems address water quality, minimize downstream flow, and promote groundwater recharge
• Low cost assessment method!!!!!
Questions??

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Special thanks to Rob Karl
Source Water Supervisor BTMUA