New England Wetlands Webinar Series
Chicopee Watershed Monitoring and Assessment: Summary and Findings

May 12, 2016
Agenda

• Welcome and Introductions (10 min.)
• Chicopee Watershed Monitoring and Assessment: Summary and Findings (45 min.)
• Brief Q&A (5 min.)
• Discussion (30 min.)
• Wrap-Up
Webinar Moderator

Kimberly Roth,
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Today’s Presenter

Lisa Rhodes
Wetland Monitoring and Assessment Program Manager
Massachusetts Department of Environmental Protection

Lisa serves as MassDEP’s Wetland Monitoring and Assessment Program Manager, and in this capacity oversees the annual wetland monitoring and assessment effort. Lisa also led the soon to be released Wetland Mitigation Success Study and the recently released Chicopee Watershed Monitoring & Assessment study for MassDEP. Lisa is active in the development of wetland program guidance documents and her efforts have included the Massachusetts Inland Wetland Replication Guidelines (2002), MA Wildlife Habitat Protection Guidance for Inland Wetlands (2006), and Dam Removal and the Wetland Regulations (2007). Lisa’s experience prior to joining MassDEP includes Supervisor of the MassDOT Highway Division’s Environmental Compliance Section, environmental consultant at Howard Needles Tammen and Bergendoff (HNTB), and Conservation Administrator for the Town of Weymouth. Lisa has a B.S. in Natural Resources from the University of Rhode Island, and has completed graduate level courses in hydrogeology at Boston University’s Geology Department.
Wetlands Monitoring & Assessment: Chicopee Watershed – A Pilot Study

Ware River in Rutland, MA

NEIWPCC Wetlands Webinar Series – May 12, 2016
Lisa Rhodes, MassDEP Wetlands Program

Funding by EPA 2013 Wetland Program Development Grant
Why Monitor and Assess?

• Section 303 of Federal Clean Water Act (CWA): states must adopt standards to define the range of physical, chemical, biological condition in “normal” waters (including wetlands);

• MA: Water Quality Certification and MA Wetlands Protection Act regulations focus on dredge and fill, not wetland condition;

• MA Integrated Waters Report (305b, 303d);

• This study: Focus on biological condition of forested wetlands; Designated Use of “Fish, Other Aquatic Life and Wildlife” very important for wetlands.

Knowing the health and condition of wetlands allows knowledgeable management decisions to be made about wetland protection
MA Wetlands M&A Strategy
Tools and Acronym Cheat Sheet

- **Conservation Assessment and Prioritization System (CAPS)** – landscape level model (GIS & land cover mapping, 20 stressor/resiliency metrics)

- **Index of Ecological Integrity (IEI):** PREDICTION of ecological condition; CAPS output using all metrics combined - value for every 30m²

- **Site Level Assessment Method (SLAM):** Standard Operating Procedures (SOP) for data collection; currently have for forested wetlands, shrub swamps and salt marsh

- **Index of Biological Integrity (IBI)** – value for ACTUAL ecological condition based on field data, not modeled prediction

- **Continuous Aquatic Life Use (CALU):** defines expected (i.e. normal) range of variability based on ACTUAL condition (IBI) vs. PREDICTED condition (IEI) due surrounding land use; does site meet, exceed or fail expectations?
Study Part I: CAPS Landscape Level Analysis
Pilot – Chicopee Watershed

- Selected by DEP DWP rotating basin schedule, focus forested wetlands

- Average IEI 0.62, higher than most in MA
- Large Undeveloped areas due to Quabbin Reservoir and protected lands
• More developed subwatershed = lower IEI (red) = more stressed
  – Municipal centers
• Less developed subwatershed = higher IEI (blue) = less stressed
  – Quabbin Reservoir and protected lands
Loss of Connectedness

- Areas in Yellow/Brown = low connectedness = dense road networks and development
- Roads are significant barrier to wildlife movement

Loss of Connectedness or Fragmentation - Greatest cause of biological degradation to forested wetlands in the Chicopee Watershed
To improve connectedness, Critical Linkages Model Identifies Best Case Terrestrial Crossings

In this figure, the top 10% of potential best case terrestrial crossings within 500 feet of a forested wetland were identified. Installation of terrestrial wildlife crossing structures at these locations would be likely to improve biological condition of forested wetlands.
Improving Connectedness

Avoid new fragmentation
• Limit fills and culvert lengths
• Limited project: one crossing only

Reconnect Similar Habitats
Loss of Similarity

• Similarity a component of Connectedness (i.e. How similar the surrounding landscape is to the focal cell, weighted by distance)

• Similarity important for long term ecological integrity, and for flying organisms (e.g. birds, bats etc.)

• Low Similarity (yellow-green) = stressed forested wetlands. High similarity = less developed (blue).
Loss of Aquatic Connectedness

- Impacts from culverts, bridges and dams on fish and wildlife passability

MA Stream Crossing Standards require maintenance/improvement of stream flow and passage
Improving Aquatic Connectedness

- To improve aquatic connectedness, Critical Linkages Model Identifies Best Case stream crossing improvements;
- Graphics presents best case stream crossing improvements within 100 feet of forested wetlands
Map for each Municipality: Top 10% Terrestrial and Aquatic Crossing Improvements within 500 feet of Forested Wetlands
Invasive Plants

- Can become dominant and disruptive to native species
Invasive Plants – Not Most Common
Invasive Plants

Actions:

1. Work with landscapers to discourage use;

2. Monitor wetland projects;

3. Identify restoration funds for eradication;

Study Part II: Site Level Analysis

- 45 deciduous (<30% conifer) forested wetlands sampled using SLAM

- 40 have IEI value < 0.25; 5 have IEI value >0.75

- All drain into impaired waters

- Sampled 30m radius plot, 4-25m transects, plant data recorded every meter, 20 min. walk around
Site Level Analysis – IBI’s

• IBI Development involved biota sampling at 250 forested wetlands across MA

• Statistical analysis identified strong stressor-condition relationships

• 48/120 IBI’s developed across taxa and groups of taxa and stressor metrics performed reliably – plants especially strong

• Plant based IBI’s for forested wetlands performed well for:
  – IEI (all metrics combined)
  – Habitat Loss metric
  – Loss of Connectedness metric
  – Edge Predator metric
Continuous Aquatic Life Use (CALU)

- Framework for assessment of whether sites meet expectations (IEI v IBI);
- CAPS IEI = prediction of ecological condition & constraints on condition due to surrounding landscape
- IBI = actual ecological condition based on observation
- Range for Sites that “Meet Expectations” = “normal” range for 80% of training data; top 10% expected to exceed; bottom 10% expected to fail

CALU Concept
Chicopee Results

- All 40 low IEI sites met expectations
- Of 5 high IEI sites, 3 FAILED expectations, 2 met expectations
40 Low IEI sites Met Expectations, 3/5 High IEI sites failed, 2 met expectations
Low IEI Sites: Consider Restoration; High IEI Sites: Consider Preservation
Further investigation for 3 FAIL sites
High IEI Site 1 – Failed Expectations
High IEI Site 1 – Failed Expectations
High IEL Site 1 – Failed Expectations
High IEI Site 1 – Failed Expectations

- Beaver Lodge Constructed
- New Beaver Dam Under Construction
- Beaver Dam Constructed
- 2008 Aerial Image
- Mature Red Maple Dense Tree Canopy
  but showing signs of inundation
High IEI Site 1 – Failed Expectations

2011 Aerial Image

Beaver Dam Constructed

New Beaver Lodge Constructed

New Beaver Dam Constructed

Site Inundated and Tree Canopy Becoming Sparse
High IEI Site 2 – Failed Expectations
High IEI Site 2 – Failed Expectations

2005 Aerial Image
High IEI Site 2 – Failed Expectations

[Diagram showing aerial image with labeled areas: Pine trees dead, Area inundated, Beaver dam]
High IEI Site 2 – Failed Expectations
High IEI Site 5 – Failed Expectations
High IEI Site 5 – Failed Expectations

- No Obvious sources of pollution upstream
- No mapped 21E site nearby
- No beaver dams or other hydrologic change
- ROW up & downstream – utility?
- Model error?
Conclusions

• CAPS appears to be accurately predicting condition – flagged 2 of 3 High IEI sites predicted to fail, no corrective action needed;
• Third High IEI site with no obvious cause of degradation but plants do not seem typical of high IEI site – model error?
• Low IEI sites predicted to be low, were low (but low is not acceptable)
• Restoration opportunities = terrestrial and aquatic crossings, invasive species management
• Need to determine best sampling strategy (e.g. probabilistic, targeted etc.)
• Potential limitation – robustness of the IBI’s – can they be accurately used across MA – are they good enough?
• Limitation of CALU: Low IEI sites cannot fail
• Need Shrub IBI’s and Emergent SLAM and IBI’s
Questions?

Chicopee Monitoring and Assessment Report:

MassDEP Monitoring and Assessment Web Page:
http://www.mass.gov/eea/agencies/massdep/water/watersheds/wetlands-protection.html#2

UMassCAPS Web Page:
www.umasscaps.org

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New England Wetlands Webinar Series

Discussion
Thank you

Next Fall

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Questions and Comments?
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