The Rock River NWQI Project in Vermont

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The problem...
The Rock River NWQI Watershed in Vermont

- Located in Vermont portion of the Lake Champlain Basin
- Long-term phosphorus reduction efforts, including a revised TMDL to be released in 2014
- Rock River Watershed is a bi-national watershed
- As a priority watershed it has been the focus of several monitoring efforts
Topo of Rock River Watershed
Phosphorus TMDL for Lake Champlain
Rock River Watershed
Key Attributes

- A total of 36,000 acres (22,700 in U.S.), 8,800 acres of which are in annual crops and hay
- Intensive livestock (dairy) agriculture
- Has the highest concentration (mean of about 170 ug/l) and loading rate of phosphorus of any major tributary in the LC Basin
- Is listed on the State’s 303(d) list as impaired due to nutrients and sediment due to agriculture
- Was selected for the National Water Quality Initiative (NWQI) program in 2012.
The NWQI Program
Summary

- NWQI is a partnership between NRCS, state water quality agencies and the EPA
- Program started in 2012, continuing in 2015
- Program targets NRCS conservation funding (EQIP) and technical assistance to these priority areas
- The purpose of which is to accelerate conservation practice implementation by farmers in the watershed
- The state water quality agencies support the projects through increased monitoring and targeted funding
Key Accomplishments in The Rock River NWQI

- NRCS has worked with 15 farmers
- $364,200 in NWQI funding from 2012 to 2014
- 1,363 acres of cover crops
- 6,335 feet of fence
- Nutrient management plans written on 1,178 acres
- 75 acres of reduced tillage
- 130 acres of conservation crop rotation
- About 3,200 of annual cropland and 5,200 of hay
Partnership Efforts

- Targeted one to one outreach to farmers in the watershed by FNLC and other partners
- Identification of resource concerns on farms in a selected subwatershed by UVM-Ext
- Installation of an additional monitoring station at the subwatershed level by VTDEC/USGS/LCBP
- Farmer organized farm field days to discuss issues and new conservation practices
- Development of a Tactical Basin Plan for the Rock River Watershed by VTDEC/NRCS
Goal: Assess WQ impacts of agricultural conservation practices for nutrients, sediment, and/or pathogens in NWQI watersheds: (NWQI & other practices)

- **Objective 1** - Have WQ-related conservation practices resulted in the change? (causal relationship) This usually requires:
  - Local knowledge of practices in the landscape
  - Having a project with an adequate baseline database or good controls

- **Objective 2** – Have WQ conditions significantly improved over time in NWQI watersheds?
  - Show an association between the level of implementation and change in WQ
  - Multiple lines of evidence can be provided by biological, chemical, and physical (flow, scouring, etc., and habitat parameters) indicators
Rock River WQ Assessment / Conditions Summary

- HUC12 = 41504081101
- Rock River watershed - 22,850 ac (VT) – 36,000 ac overall
- Rock River (WBID VT05-01) - 37.4 total stream miles
- Most recent assessment report (9/2012) indicates: monitored miles (22.8) & evaluated miles (14.6); bio-monitoring & nutrient sampling
- Rock River on 2014 303d list (approx. 17 miles); pollutants (nutrients & sediment); surface WQ problems (algal growth, agricultural runoff, nutrient enrichment, fish kills); uses impaired (aesthetics, aquatic life)
- Saxe Brook (tributary to Rock River) on 2014 303d list (1 mile); pollutants (nutrients); surface WQ problems (agricultural runoff); use impaired (aquatic life)
Rock River – WQ Planning Documents

- Missisquoi Bay Basin WQ Management Plan (March 2013)  
  http://www.vtwaterquality.org/mapp/docs/mp_Basin06Plan.pdf  
- Critical Source Areas in Missisquoi River Basin (December 2011)  
  http://www.lcbp.org/techreportPDF/63B_Missisquoi_CSA.pdf  
- Missisquoi Areawide Plan (NRCS, January 2008)  
  http://www.nrcs.usda.gov/wps/portal/nrcs/detail/vt/technical/dma/?cid=stelprdb1176944  
  https://anrnode.anr.state vt.us/SGA/finalReports.aspx
Rock River - WQ Monitoring

- Lake Champlain Long Term Monitoring
- Ambient Bio-Monitoring
- Rock River Monitoring
- Edge of Field Agricultural BMP Effectiveness Monitoring
- Quebec MDDEFP Monitoring (2006)
• Water quality monitoring in NWQI watershed (Rock River) involves 5 levels that have been in place for varying lengths of time

• Bio-monitoring is part of VT DEC’s on-going statewide rotational assessment
Lake Champlain Long Term Monitoring (2007)

- Program supported by Lake Champlain Basin Program
- Rock River monitoring station - one of 22 tributary sites monitored throughout the lake’s basin
- All tributary sampling stations associated with continuous stream flow gages operated USGS or by the Province of Quebec* (MDDEFP)
- WQ data to estimate loads of phosphorus & other constituents and for evaluation of long-term trends
- Parameters sampled: TP, DP, TN, Cl, Alk, TSS, Ca, Mg, Na, K, Cond, pH

*Rock River gage
Vermont Ambient Bio-Monitoring (1985)

- Confined to ‘wadeable’ streams
- Purposes: (1) monitor long-term trends in WQ as revealed in changes over time to ambient aquatic fish and macro-invertebrate communities; (2) evaluate site-specific impacts of PS + NPS discharges to aquatic communities; (3) establish baseline data to assist DEC with VT-specific biological criteria for WQ classification/use attainment in rivers & streams
- Sites are monitored every 5 years (sept-oct) in conjunction with DEC’s statewide rotational assessment, river basin planning or more frequently as needed
- Parameters sampled: macro-invertebrate & fish biological metrics, TP, DP, TN, TSS, TURB, Alk, Hardness, Earthmetals, ICPMS-priority metals, As, Zn, Sn
Rock River Monitoring (aka ‘Project Rock’)  

- Initiated by DEC in 2010 – FNLC sampling assistance
- Evaluate WQ improvements expected from targeted agricultural BMP implementation in a small catchment (about 3,700 ac)
- Two stations allowing a before-after, upstream-downstream nested paired watershed design.
- A continuous USGS stream flow gage station installed at the downstream station to account for concentration covariance with flow & to support loading estimates.
- Parameters sampled: TP, DP, TSS. PP (calculated).
Rock River Study Watershed
Edge of Field Agricultural BMP Effectiveness Monitoring

- Two 4 year (2012-2015) NRCS projects located in the Rock River watershed:
  - **Project A**: water and sediment control basin (WASCOB*) treating runoff from conventional till corn land. Above-below monitoring design. Watershed area: 5 ac
  - **Project B**: reduced tillage with manure injection and cover crops on corn land.** Paired watershed monitoring design. Control watershed area (15 ac) & treatment watershed area (13 ac)
- Parameters sampled at both: TP, DP, TN, TDN, TSS, Cl, flow.

*NRCS practice standard #638
**NRCS practice standards #329, #633, #340
LCBP Initiatives Supporting the Rock River NWQI Project

- Edge of Field Monitoring and CIG Projects
- SWAT based Critical Source Area Mapping
- Water Quality MOU with all agency partners
- NRCS/Partner database
- Implementation of two new RCPP projects
- New focus on tile drainage
- Basin-wide strategic plan which targets priority areas
- VT specific APEX model, allows for field level estimates of P loading
Edge of Field (EOF) Monitoring

- 8 projects;
- Focused on practices important for VT with little or no data on practice effectiveness;
- Including Cover Crops, Reduced Tillage Systems and manure incorporation on hayland;
- Two years of baseline data with interesting results
- Just now moving into the treatment phase
A Closer Look: SWAT Field Level P Loading (74% of P load from 24% of Fields)
Water Quality MOU between NRCS and State Partners

**Purpose:** to promote greater and more efficient cooperation among partners in Vermont on addressing agricultural water quality concerns.
Partner Shared Database

- A farm and conservation database derived primarily from NRCS’s NPAD, funded by a national CIG;
- Shared among state partners who are signatories to State Water Quality MOA (and 1619 agreements);
- Will include additional data supplied by conservation partners;
- Intended to be a complete repository of farm and conservation data for the State;
- Will prevent “double counting” of practices;
- Will be used to track and access progress, including its use for future watershed modelling efforts
RCPP in Vermont’s LCB

- Vermont Association of Conservation District’s project will target nutrient management planning on small farms in the Basin ($800,000)

- Vermont Department of Environmental Conservation will target P reduction in 3 challenged watersheds ($16 million)
  - will use a combo of EQIP, ag easements, and wetland restoration
  - success to be measured using APEX tools and other methods

- Both projects will provide more technical assistance to farmers
Tile Drainage

- Have not considered as a source of P (almost all soluble)
- Currently no controls on tile drainage installation
- Tile Drainage being installed at an increased rate
- New Tile Drainage Systems now spaced as close as 20 ft.
- New research shows it is a major contributor of P
Keys to Success

- Easier to develop a comprehensive project if the HUC-12 watershed is already a priority (ex. on 303dlist) and/or located in a basin that is a priority
- The involvement of state and local partners is critical, as is willing landowners (voluntary program)
- A multi-tiered monitoring program is crucial to be able to document log and short term changes in water quality
- All significant sources of contaminants need to be identified and addressed, easier if it is a rural, predominantly ag watershed
- The use of models, such as APEX and SWAT, can help target conservation efforts and evaluate the water quality impacts of practices
Questions?