Establishing Nutrient Trends in Iowa's Rivers in Support of Iowa's Nutrient Reduction Strategy

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10th National Water Quality Monitoring Conference Tampa, FL

Background

November 2012, Iowa releases the Nutrient Reduction Strategy in response to the Gulf Hypoxia Action Plan 2008, which called for the 12 states along the Mississippi River to reduce delivery of nutrients to the Gulf by 45%.





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Iowa Nutrient Reduction Strategy

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center

Strategy documents

Progress reports

- 2014-2015 Annual Progress Report (PDF, 37 pages, 1.8 MB)
 - Progress Report Attachment: WRCC/WPAC Activities (PDF, 108 pages, 4.3 MB)
- <u>2013-2014 Annual Progress Report</u> (PDF, 19 pages, 873 KB)
 <u>Progress report appendix</u> (PDF, 10 pages, 421 KB)
- <u>2014 Update to Science Assessment Practice List</u> (PDF, 2 pages, 195 KB)

Revised version - October 1, 2014

- · Complete strategy document (PDF, 207 pages, 4.3 MB)
 - Executive Summary and Section 1: Policy Considerations and Strategy
 - (PDF, 32 pages, 358 KB)
 - Section 2: Nonpoint Source Nutrient Reduction Science
 Assessment
 - (PDF, 160 pages, 3.6 MB)
 - <u>Section 3: Point Source Nutrient Reduction Technology</u> <u>Assessment</u> (PDF, 15 pages, 393 KB)

Revised version - May 29, 2013

The lowa Nutrient Reduction Strategy was developed by:

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http://www.nutrientstrategy.iastate.edu/documents

The strategy is a science and technology based approach to reducing nutrients in lowa's water and is based on two science assessments to guide and formulate the policy for lowa.

"The lowa strategy proposes a pragmatic, strategic and coordinated approach for reducing nutrient loads discharged from the state's largest wastewater treatment plants, in combination with targeted practices designed to reduce loads from nonpoint sources now while evaluating the need for nutrient water quality standards long-term." Water Quality Monitoring was a key component in developing the nutrient reduction strategy:

- I. What are the baseline conditions?
- 2. How will know if we are making progress?

Step I: Establishing the Baseline Iowa's Ambient Monitoring Network

- 98 Sites in Iowa varying consistency of sampling through time.
- Includes Sites Upstream and Downstream of Urban Centers
- Monitored on a fixed, monthly basis
- Mostly paired with USGS Gage locations
- Data from 2000-2011
- Only sites with "nearby" USGS gages, covering the length of record desired (2000-2011) were included. Using three load estimation methods.









Total N and P Loads for Iowa

- Sum up loads for 24 outer basins
 Total N = NO3-N/0.82
- Sum area of outer basins (83% of state)
- Scale up to State area

| | Stream load Tons/yr | Nutrient Yield Lbs/ac | Concentration (mg/l) |
|---------|------------------------|--------------------------|----------------------|
| Total N | 280,000 | 16.0 | 7.9 |
| Total P | 13,800 | 0.77 | 0.38 |

Point Source Load Calculation

- For 102 Major Municipal and 28 Industrial Facilities
- Load = Flow * Concentration
- Use Average Annual Flow = 2/3 Wet
 Weather Design Flow
- Use 25 ppm N and 4 ppm P in discharge from "Wastewater Engineering" Metcalf & Eddy



Non-point Source Calculation

Total State Load minus Point Source Load

| | Total stream load | NPDES load | Non-point source load |
|-----------|-------------------|---------------|-----------------------|
| Tons N/yr | 280,000 | 18,300 (6.5%) | 261,700 (93.5%) |
| Tons P/yr | 13,800 | 2,900 (21%) | 10,900 (79%) |

Final Nonpoint Sources Reduction Goals: Total Nitrogen 41% Total Phosphorus 29%

The Nutrient Reduction Strategy Contained Two Key Components:

I. The Water Resources Coordinating Council (WRCC) will prioritize watersheds for nitrogen and phosphorus reduction.

WRCC convened a subgroup to identify "priority" HUC8s for Water Quality Initiative Funding. Subgroup identified the following factors to set priorities:

- I. Elevated N and P loads
- 2. "Significant" Urban Impact
- 3. Geographic Distribution
- 4. Existing Watershed groups OR
 - watersheds with little activity to date.

HUC 8 Priority Watersheds



2. The Water Resources Coordinating Council will set <u>measures of success</u> and relate these to watershed improvement based on a mutually agreed upon set of indicators.

Task Force Team was convened to identify how lowa would measure load reduction/progress

- Iowa Department of Natural Resources
- Iowa Department of Agriculture and Land Stewardship
- University of Iowa
- Iowa State University
- USGS
- Iowa Soybean Association

The team examined three different load estimation techniques:

- I. Weighted Regression on Time, Discharge and Season
- 2. AutoBeale Ratio Estimator (Richards, 1998)
- 3. Linear Interpolation

Evaluation of Method was Based on:

I. Ease of Use (ability to generate loads and trends annually)

- 2. Accessible to non-technical audiences
- 3. "One" answer
- 4. How "stable" the answer is...

Boone River at Webster City, IA



North Raccoon River at Sac City, IA



North Raccoon River at Sac City, IA







Change in FW Nitrate Concentration 2000-2013





Next Steps

- I. Continue to Revise/Refine Load Estimation Methods
- 2. Explore use of surrogate measures for Total P
- 3. Expand Sensor Networks

Iowa Nutrient Sensor Network

Iowa WQIS (http://iwqis.iowawis.org/)



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