Time to Act: Integrated Water Management

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Background:

History

- Historically, solid and sewer waste was dumped directly into rivers and other water bodies without treatment
- Clean Water Act (1972) made significant progress in addressing water pollution from point sources

Cuyahoga River Fire Nov. 3, 1952. Source: Cleveland Press Collection at Cleveland State University Library

Background:

Point Source

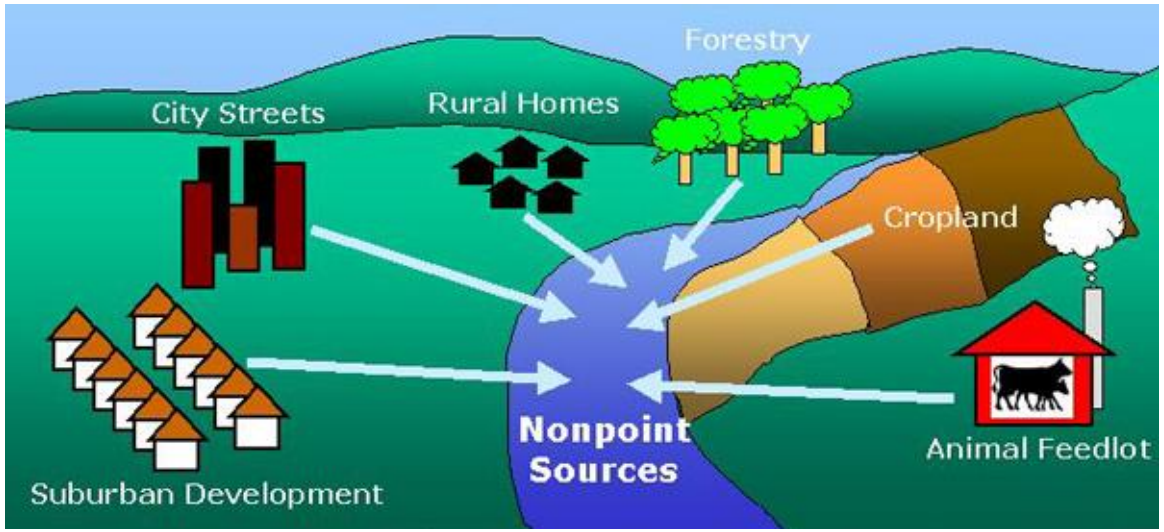
- **Point Source** – any discernible, confined and discrete conveyance from which pollutants are or may be discharged (usually cities' WWTPs or industry)
- National Pollution Discharge Elimination System (**NPDES**) Permit
  - The Clean Water Act prohibits the discharge of pollutants through a point source without an NPDES permit
  - Limits what can be discharged, monitoring, and reporting requirements to protect water quality and public health
  - A program of the U.S. EPA; usually permits issued by states

Source: Puget Soundkeeper and Cedar Rapids/The Gazette

Background:

Non Point Source

- **Non Point Source** - Diffuse sources of water pollution
- Difficult to regulate; typically pollutants are removed downstream at a WWTP



Source: National Oceanic and Atmospheric Administration (NOAA)

Background:

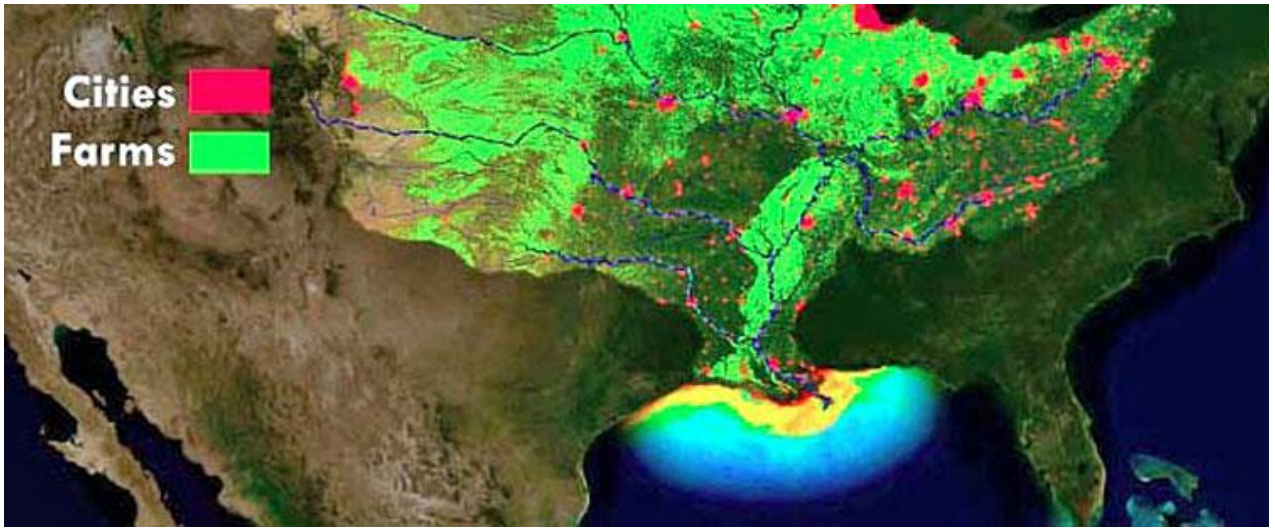
Terminology & Acronyms

- Total Maximum Daily Load (**TMDL**)
  - "A calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards."
  - TMDL is the term used when numeric limits on pollutants for a body of water are set by the EPA
- Total Suspended Solids (TSS)
- Total Nitrates (TN)
- Total Phosphorus (TP)

The Problem:

Nationally

- Gulf of Mexico Hypoxia (Dead Zone)
  - Excessive nutrients → more algae growth → insufficient oxygen to support most marine life
- Clean Water Act (regulating point sources) has made progress, but there is more progress to make
- Hypoxy Task Force (EPA)



Source: National Oceanic and Atmospheric Administration (NOAA)

The Problem:

Iowa

- EPA ***requirement*** to reduce combined phosphorus & nitrate by 45% by 2035
- EPA is allowing Iowa to determine how we meet these requirements **for now**
  - Iowa DNR oversees voluntary trading system for point sources, but nothing for non-point; no forced trading in Iowa currently
  - Iowa not yet facing TMDL's (***in which case the burden will fall on cities to reduce more pollutants at WWTPs***)
- Without demonstrated progress, numeric standards (TMDLs) will be required
  - The slower the progress, the sooner the EPA will mandate TMDLs and decide the way forward

The Problem:

Locally

- Our collective failure to act creates more problems downstream (usually dealt with by cities)
- If national problems like the Dead Zone and state compliance with EPA mandates still seem like someone else's problem, consider these related local issues-
  - Algae blooms
  - Biodiversity
  - Flooding
  - Water quality
  - Water clarity
  - Stream erosion

Path Toward Compliance:

First Steps

- Creation of the Iowa Nutrient Reduction Strategy (NRS)
  - Integrated strategy that relies on Non-Point Source and Point Source voluntary efforts
  - Recommends a variety of best management practices (BMPs)
  - Nutrient strategies designed to bring point and non-point together (otherwise, if you regulate one, they blame the other – have to tackle both at the same time)
- Breakdown of NRS Goal to comply with EPA's required 45% reduction by 2035:

Nitrogen pollutants	Phosphorus pollutants
8% point source	20% point source
92% nonpoint source	80% nonpoint source

- The only thing the Strategy requires of cities is a **feasibility study**

Path Toward Compliance:

Integrated Water Management

- It is not a singular problem with a singular solution
- Water quality does not follow jurisdictional boundaries - Partnerships help!
- Implementation of one strategy has multiple benefits
  - These strategies need to be supported by all parties
- Benefits for the "public good" must be supported by public entities with public resources; there is no private motivation to act

Path Toward Compliance:

Taking Responsibility

- It's "our" water
- Who needs to be involved in the solution?
  - Point Sources and Non-Point Sources
  - Government and businesses
  - Upstream and downstream
- Integrated water management is required for success

Path Toward Compliance:

Costs

130 Iowa point sources

(102 targeted major municipal WWTPs + 28 industrial facilities):

- $1.5 billion of capital costs
- $114 million in annual costs
- Anticipated results:
  - 11,00 tons N reduction per year (4%)
  - 2,170 tons P reduction per year (16%)

Non-point sources

- $1.2 to 1.4 billion initial investment
- Anticipated results:
  - 41% N reduction
  - 29% P reduction
- *Challenge*: Who is responsible to pay for non-point solutions?

Call to Action:

Cities

- Reducing nutrient and water runoff is a public good
- Effective strategies do not bring enough benefit to farmers to inspire action
  - Cities must invest or incentivize implementation of these strategies
- It is cheaper to address the problem on the front end, rather than on the back end with WWTP upgrades, repairs after flood events, dredging lakes, etc.
  - Don't want mandatory action like Wisconsin
- **Ultimately taxpayers will pay, it's just a question of when and at what price**

What's the hurry?

- Citizens and Local Governments are already spending money to deal with consequences like:
  - Algae blooms
  - Flooding
  - Water quality
  - Water clarity
  - Stream Erosion
- If Iowa doesn't take action to make significant progress, the EPA will set mandatory requirements to upgrade WWTP to meet numeric criteria set by the EPA

Practical Steps: Point Sources

Suggestions for how to take action & make progress.

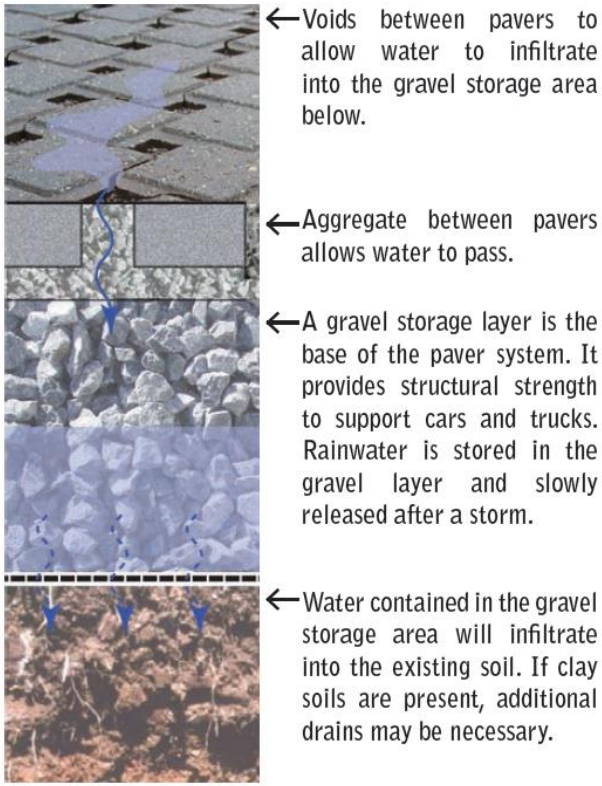
How should **point** sources (cities) act?

- Have an up-to-date Comprehensive Plan
  - What are the priority projects and where should money be spent first?
- Green Infrastructure or Storm Water Plan
  - Aids in grant acquisition
- Address flooding AND nutrients
- Monitor water flow and nutrient load NOW
  - Good to have data before and after a project is in place (benchmarking)
- Change your frame of mind
  - Not just "Get the water out of town" but "Slow it down and treat it"
- Point and non-point sources work together to achieve the goal

Green Infrastructure: Permeable Paving

Benefits:

- Runoff Reduction: 60% - 100%
- Rate Control: Up to 99%
- TSS Reduction: 55% to 100%
- TP Reduction: 35% to 100%



Source: Conservation Design Forum

Green Infrastructure: Bioretention

Benefits:

- Runoff Reduction: 60% to 100%
- Rate Control: up to 99%
- TSS Reduction: 80% to 100%
- TP Reduction: 50% to 100%


Parking Lot Islands


Medians


Rain Gardens


Bumpouts


Planters

Source: Conservation Design Forum

Rain Water Harvesting

- Cisterns
- Cost to Install:$2,000 - $15,000
- Nitrogen removal rate:
- Phosphorus removal rate:
- Cost per capita (10,000 population):

Below Ground Cistern

Above Ground Cistern

Source: Conservation Design Forum

Bioswales / Naturalized Swale

Benefits

- Runoff Reduction: up to 25%
- Rate Control: Nominal
- TSS Reduction: 65%
- TP Reduction: 25%
- Bioswale Cost: $12.00/sq. ft.

Source: Conservation Design Forum

Practical Steps: Non-Point Sources

Suggestions for how to take action & make progress.

How should **non-point** sources act?

- Change your frame of mind
  - Not just "Get the water off my property" but "Slow it down and treat it"
- Many options for farmers
- Green funding for businesses/non-profits
- Start seeking cost effective ways (grants & partnerships) to implement nutrient reduction strategies, or be prepared to pay higher taxes and water bills in the future to cover cities' required capital costs

Buffers

- Cost : $13.96/acre/year (+ land out of production)
- Nitrogen removal rate: 91%
- Phosphorus removal rate: 58%
- "Establishing a 35ft wide buffer on each side of agricultural streams that are currently not buffered would reduce P load 18% overall at a farm-level annual cost of $88,044.000/year."

Source: Indiana State Department of Agriculture and Natural Resources Conservation Service

Cover Crops

- Cost to Install: $29 - $32.50 /acre per year
- Nitrogen removal rate: 866 tons or 1,732,000 lbs (28-32%)
- Phosphorus removal rate: 24.7 tons or 49,348.3 lbs.
- "Implementing rye cover crops on all corn following soybean and corn acres is estimated to reduce nitrate load 26% overall with an annual cost of approximately $1,025 million/year."

Source: Iowa State University via Ag Fax

No Till

- Cost : $12 - $14.69/acre
- Nitrogen removal rate: N/A
- Phosphorus removal rate: .9 tons or 1,850.1 lbs
- "Conversion of all tillage to no-till is estimated to reduce the P load by 39% overall at an annual farm-level cost of approximately $186,390,000/year"

Source: Ag Web

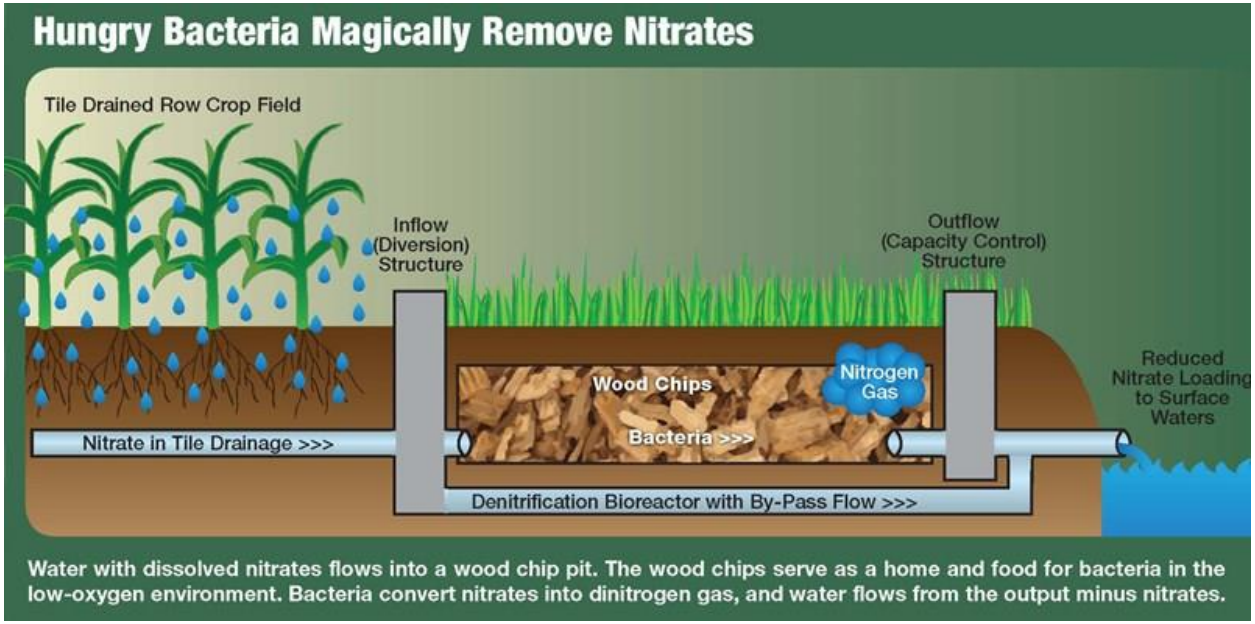
Constructed Wetlands

- Cost to Install: $14.94/treated acre per year
- Nitrogen removal rate: 34.7 tons or 69,450 lbs. (52%)
- Phosphorus removal rate: N/A
- "Installing wetlands to treat 45% of ag acres is estimated to reduce the N load by 22% overall at an annual cost of approximately $190,795,000"

Source: Iowa Department of Agriculture and Land Stewardship

Bioreactors

- Edge of field practice
- Of no benefit to farmers
- Cost to Install: $8,000 - $15,000
- Reduces 43-45% of nitrogen leaving through tiles
- 10-20 year lifespan (woodchip replacement)



Source: Iowa State University via Ag Web (graphic) and The Gazette (photo)

Backyard Strategies

- Even individual citizens can be part of the solution!

Rain Garden

Rain Barrel

Source: Conservation Design Forum

The Bottom Line

1. Cities will have to get more engaged to avoid mandated TMDLs and the related capital costs to comply.
2. Cities may have to go so far as to -
    1. Incentivize non-point sources to implement nutrient reduction strategies
    2. Guide non-point sources in securing available grant funds and building relationships with partner agencies
    3. Increase focus on green infrastructure opportunities in local projects

Need more motivation?

A few more thoughts on why to act now.

Coming Soon: Nutrient Exchange Program

- Managed through Iowa DNR
- Track your progress now to be able to earn credits when the Exchange opens

Works Cited

- Iowa Department of Natural Resources
- Iowa League of Cities
- Iowa Nutrient Reduction Strategy
- Clean Water Act
- Iowa State University
- University of Iowa
- Delta Institute