# IOWA NUTRIENT REDUCTION STRATEGY

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IOWA DEPARTMENT OF AGRICULTURE & LAND STEWARDSHIP

# Nutrient Reduction Strategy
## highlights

- Reduce nitrogen (N) and phosphorus (P) loads to Iowa waters and the Gulf of Mexico by at least 45% (*Gulf Hypoxia Task Force*)
- Led by Iowa Department of Agriculture and Land Stewardship, Iowa Department of Natural Resources, and Iowa State University
- Integration of non-point (*agriculture*) and point (*industrial and municipal wastewater treatment plants*) sources working together for common goal
    - Of 36M acres in Iowa, 90% in agricultural use and 24M acres in row crops

*The strategy is a dynamic document that will change over time as new information, data, and science is discovered and adopted

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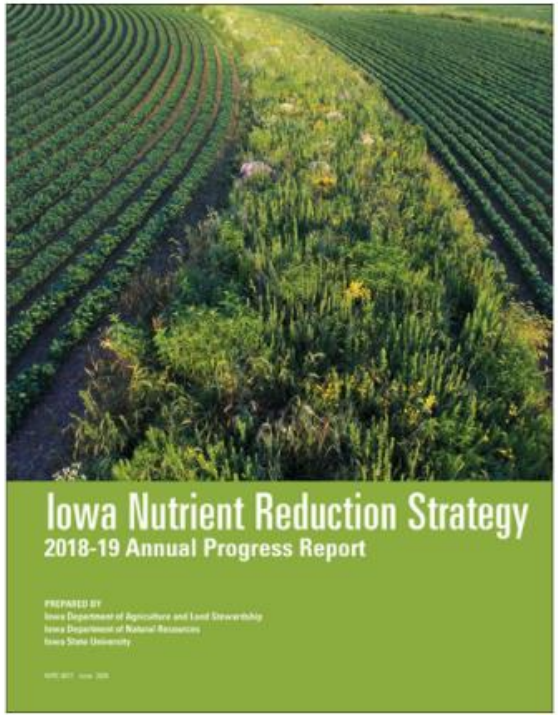
DNR

IOWA STATE UNIVERSITY

# Iowa Update

- Strategy Released in 2013
  - Collaborative, science-based assessment
- Iowa Legislature established Water Quality Initiative
  - Leveraging resources (RCPP, private $, other federal funding, and landowners)
- Engage partners, build capacity and overcome barriers to scale-up
- Accountability and tracking – Logic Model (www.nutrientstrategy.iastate.edu/documents)
- 2018 Legislative Session passes longer-term sustainable funding.
  - Over $270M over the next 12 years to advance Iowa NRS.



# Iowa Water Quality Initiative

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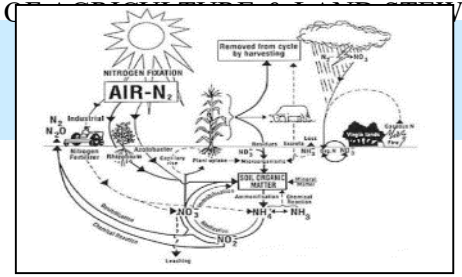
## Nitrogen Practices




## Phosphorus Practices

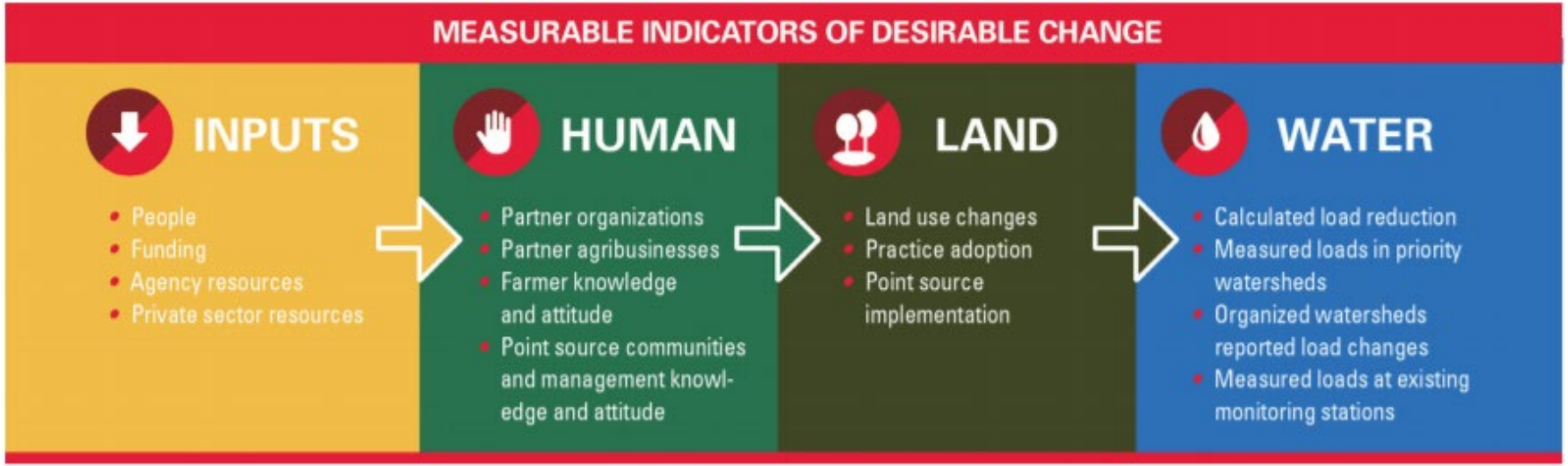
## Nitrogen moves primarily as nitrate-N with water

| | Practice | Comments | % Nitrate-N Reduction* | % Corn Yield Change** |
|---|---|---|---|---|
| | | | Average (SD*) | Average (SD*) |
| Nitrogen Management | Timing | Moving from fall to spring pre-plant application | 6 (25) | 4 (16) |
| | | Spring pre-plant/sidedress 40-60 split Compared to fall-applied | 5 (28) | 10 (7) |
| | | Sidedress – Compared to pre-plant application | 7 (37) | 0 (3) |
| | | Sidedress – Soil test based compared to pre-plant | 4 (20) | 13 (22)** |
| | Source | Liquid swine manure compared to spring-applied fertilizer | 4 (11) | 0 (13) |
| | | Poultry manure compared to spring-applied fertilizer | -3 (20) | -2 (14) |
| | Nitrogen Application Rate | Nitrogen rate at the MRTN (0.10 N:corn price ratio) compared to current estimated application rate. (ISU Corn Nitrogen Rate Calculator – http://extension.agron.iastate.edu/soilfertility/nrate.aspx can be used to estimate MRTN but this would change Nitrate-N concentration reduction) | 10 | -1 |
| | Nitrification Inhibitor | Nitrapyrin in fall – Compared to fall-applied without Nitrapyrin | 9 (19) | 6 (22) |
| | Cover Crops | Rye | 31 (29) | -6 (7) |
| | | Oat | 28 (2) | -5 (1) |
| | Living Mulches | e.g. Kura clover – Nitrate-N reduction from one site | 41 (16) | -9 (32) |
| Land Use | Perennial | Energy Crops – Compared to spring-applied fertilizer | 72 (23) | |
| | | Land Retirement (CRP) – Compared to spring-applied fertilizer | 85 (9) | |
| | Extended Rotations | At least 2 years of alfalfa in a 4 or 5 year rotation | 42 (12) | 7 (7) |
| | Grazed Pastures | No pertinent information from Iowa – assume similar to CRP | 85 | |
| Edge-of-Field | Drainage Water Mgmt. | No impact on concentration | 33 (32) | |
| | Shallow Drainage | No impact on concentration | 32 (15) | |
| | Wetlands | Targeted water quality | 52 | |
| | Bioreactors | | 43 (21) | |
| | Buffers | Only for water that interacts with the active zone below the buffer. This would only be a fraction of all water that makes it to a stream. | 91 (20) | |
| | Saturated Buffers | Divert fraction of tile drainage into riparian buffer to remove Nitrate-N by denitrification. | 50 (13) | |

## Phosphorus moves primarily with eroded soil

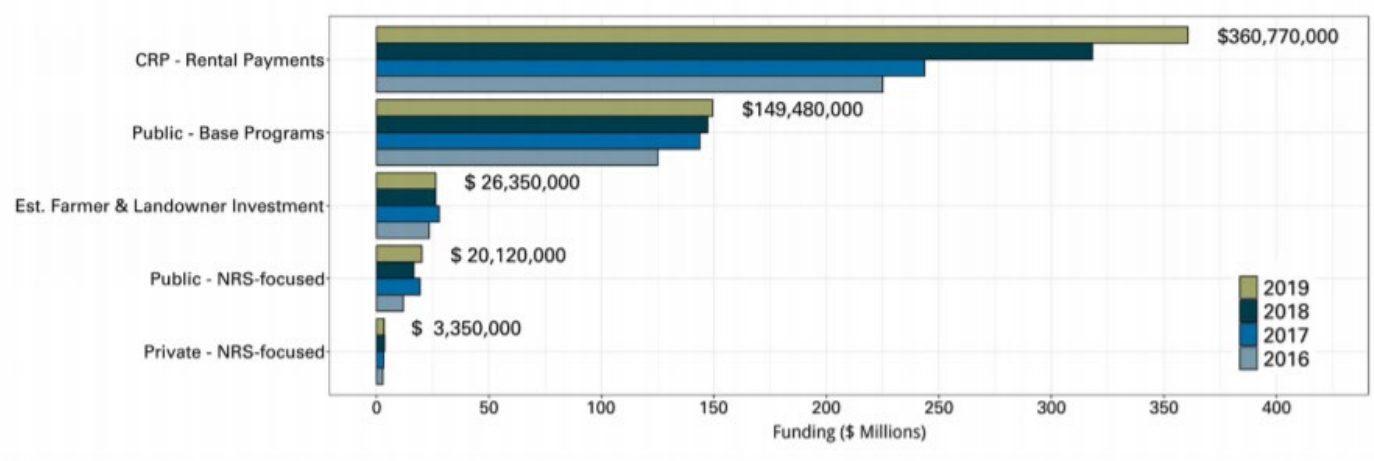
| | Practice | Comments | % P Load Reduction[a] | % Corn Yield Change[b] |
|---|---|---|---|---|
| | | | Average (SD[c]) | Average (SD[c]) |
| Phosphorus Management Practices | Phosphorus Application | Applying P based on crop removal – Assuming optimal STP level and P incorporation | 0.6[d] | 0 |
| | | Soil-Test P – No P applied until STP drops to optimum | 17* | 0 |
| | Source of Phosphorus | Liquid swine, dairy, and poultry manure compared to commercial fertilizer – Runoff shortly after application | 46 (45) | -1 (13) |
| | | Beef manure compared to commercial fertilizer – Runoff shortly after application | 46 (96) | |
| | Placement of Phosphorus | Broadcast incorporated within 1 week compared to no incorporation, same tillage | 36 (27) | 0 |
| | | With seed or knifed bands compared to surface application, no incorporation | 24 (46) | 0 |
| | Cover Crops | Winter rye | 29 (37 | -6 (7) |
| | Tillage | Conservation till – chisel plowing compared to moldboard plowing | 33 (49) | 0 (6) |
| | | No till compared to chisel plowing | 90 (17) | -6 (8) |
| Land Use Change | Perennial Vegetation | Energy Crops | 34 (34) | |
| | | Land Retirement (CRP) | 75 | |
| | | Grazed pastures | 59 (42) | |
| Erosion Control and Edge-of-Field Practices | Terraces | | 77 (19) | |
| | Buffers | | 58 (32) | |
| | Control | Sedimentation basins or ponds | 85 | |

# Reporting Structure
## Logic Model



# Conservation Investment - Inputs
## the numbers

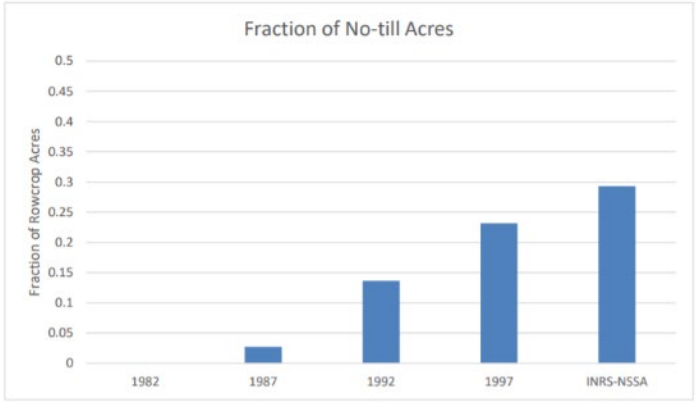
**Funding obligated for Nutrient Reduction Strategy efforts by partner organizations**

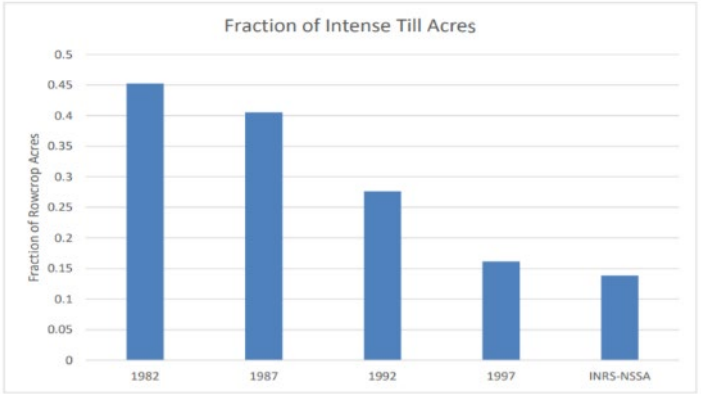


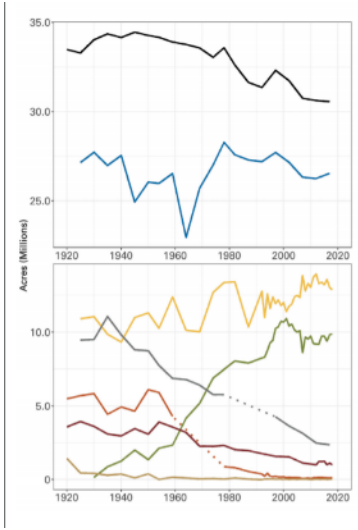

*Farmer & Landowner Investment accounts only for select practices that received cost-share funding.

# Updated Baseline Assessment

- NPS
- Historical progress on P loss from cropland
- Primarily driven by reduction in tillage

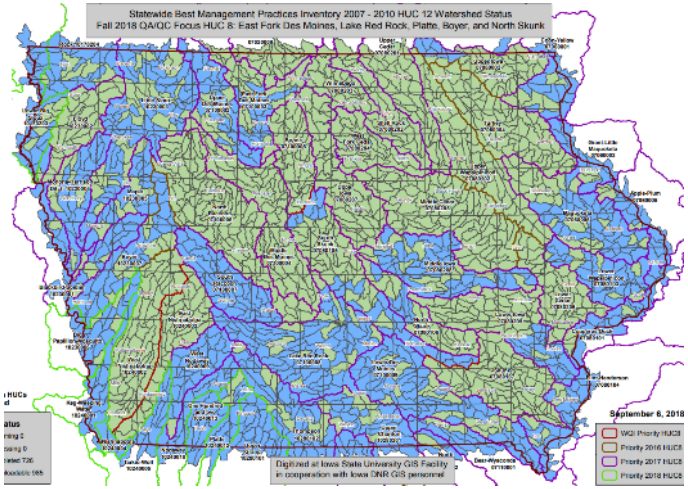




Iowa Land Use

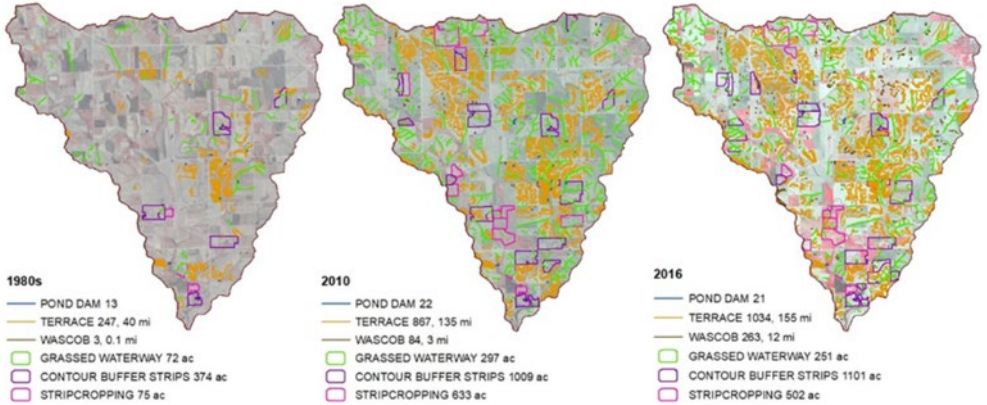
# BMP Mapping - Land

- Select BMPs identifiable w/ available data
- 2007-2010 Benchmark
- Documentation
- Historical
- WS Modeling




| Statewide Practice Summary | | | |
|---|---|---|---|
| Pond Dams (number) | Grassed waterways (ac) | Terraces (ft) | WASCOBs (number) |
| 114,423 | 327,904 | 469,257,556 | 246,139 |

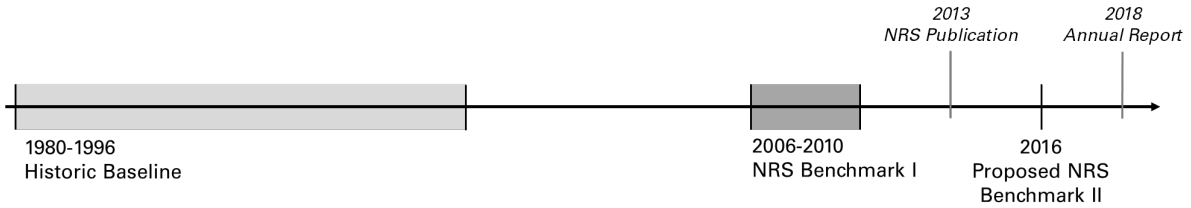
Estimated >$6B in investment based on today's costs.




**Learn more at**
***https://www.gis.iastate.edu/gisf/projects/conservation-practices***

# Updated Baseline Assessment

- NPS
- Historical progress on P loss from cropland
- Nitrogen needs more emphasis




| | | 1980-96 Baseline Load (tons) | 2006-10 Benchmark Load (tons) | Change, 1980-96 to 2006-10 | | Major cause of change |
|---|---|---|---|---|---|---|
| **Nitrogen** | NPS | 278,852* | 293,395 | 5.2% | Increase | Land use change |
| | PS | 13,170 | 14,054 | 6.7% | Increase | Flow increase |
| | **Total** | **292,022** | **307,449** | **5.3%** | **Increase** | |
| **Phosphorus** | NPS | 21,436 | 16,800 | 21.6% | Decrease | Reduced tillage and soil test P |
| | PS | 2,386 | 2,623 | 9.9% | Increase | Flow increase |
| | **Total** | **23,822** | **19,423** | **18.5%** | **Decrease** | |

*The method used to derive the total nitrogen estimate of 292,022 tons indirectly reflected the point source contributions.

# Water Quality Initiative
## highlights

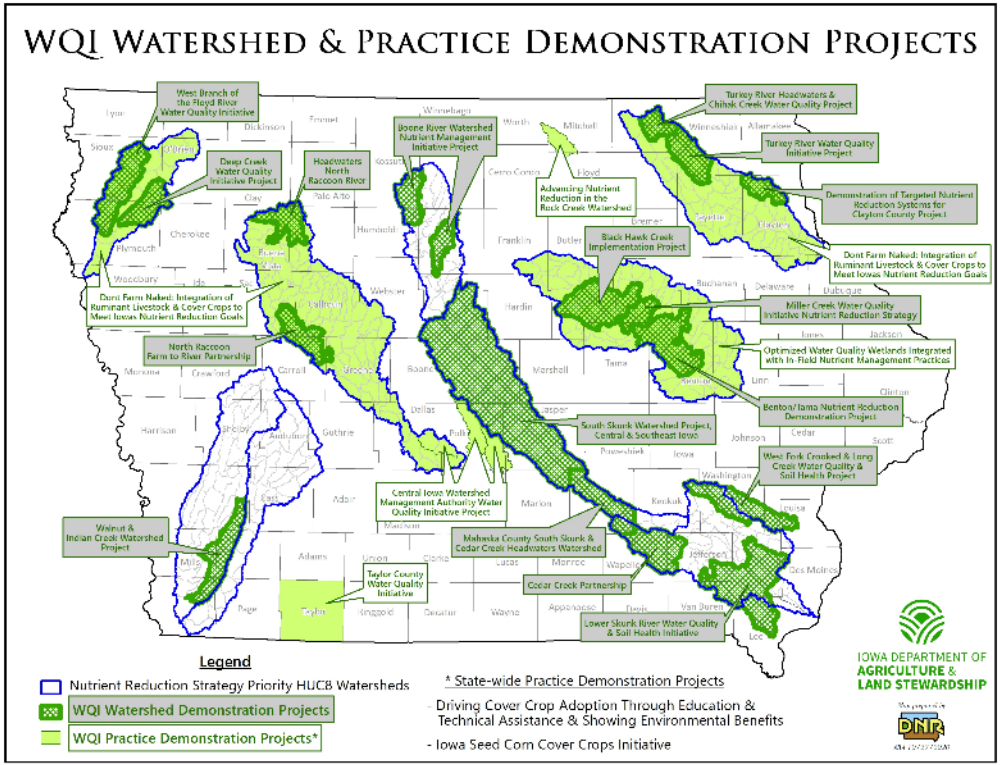
- **Addressing the scale needed to address the goals of the NRS**
  - Traditionally soil conservation and in-field nutrient management based
  - Advance understanding and critical practices and delivery of practices focusing on addressing nutrient reduction
  - **Leverage and expand state and farmer resources**

- **Tracking and documenting progress**
  - Collective effort of management and practice installation
  - ISU established measurement coordinator in 2015
  - **Utilize information to inform progress, but also inform/prioritize resources**

# Iowa Water Quality Initiative

IOWA DEPARTMENT OF AGRICULTURE & LAND STEWARDSHIP

## IOWA NUTRIENT REDUCTION STRATEGY



# Iowa Water Quality Initiative

IOWA DEPARTMENT OF AGRICULTURE & LAND STEWARDSHIP

## IOWA NUTRIENT REDUCTION STRATEGY

- **Over 250 partners engaged** in the process to date.
- **Water Quality Initiative (WQI) est in 2013** to begin implementation.
- **2 new groups** formed to help address key areas of the Iowa NRS

  - **Iowa Agricultural Water Alliance (IAWA)**
    - Advance farmer-led watershed and water quality related activities
    - Increase the pace and scale of NRS practice adoption

  - **Iowa Nutrient Research and Education Council (INREC)**
    - Test and verify new and emerging technologies to reduce nutrient loss
    - Provide education to ag retailers, agronomists and CCAs to deliver NRS message and broaden adoption
    - Foster engagement in WQ practice delivery/messaging
    - Track and measure private implementation through network of ag retailers and co-ops (pilot phase)

# Conservation Infrastructure

**3 Working Groups to start**

- **Cover crops**
- **Conservation Drainage**
- **Strategy**

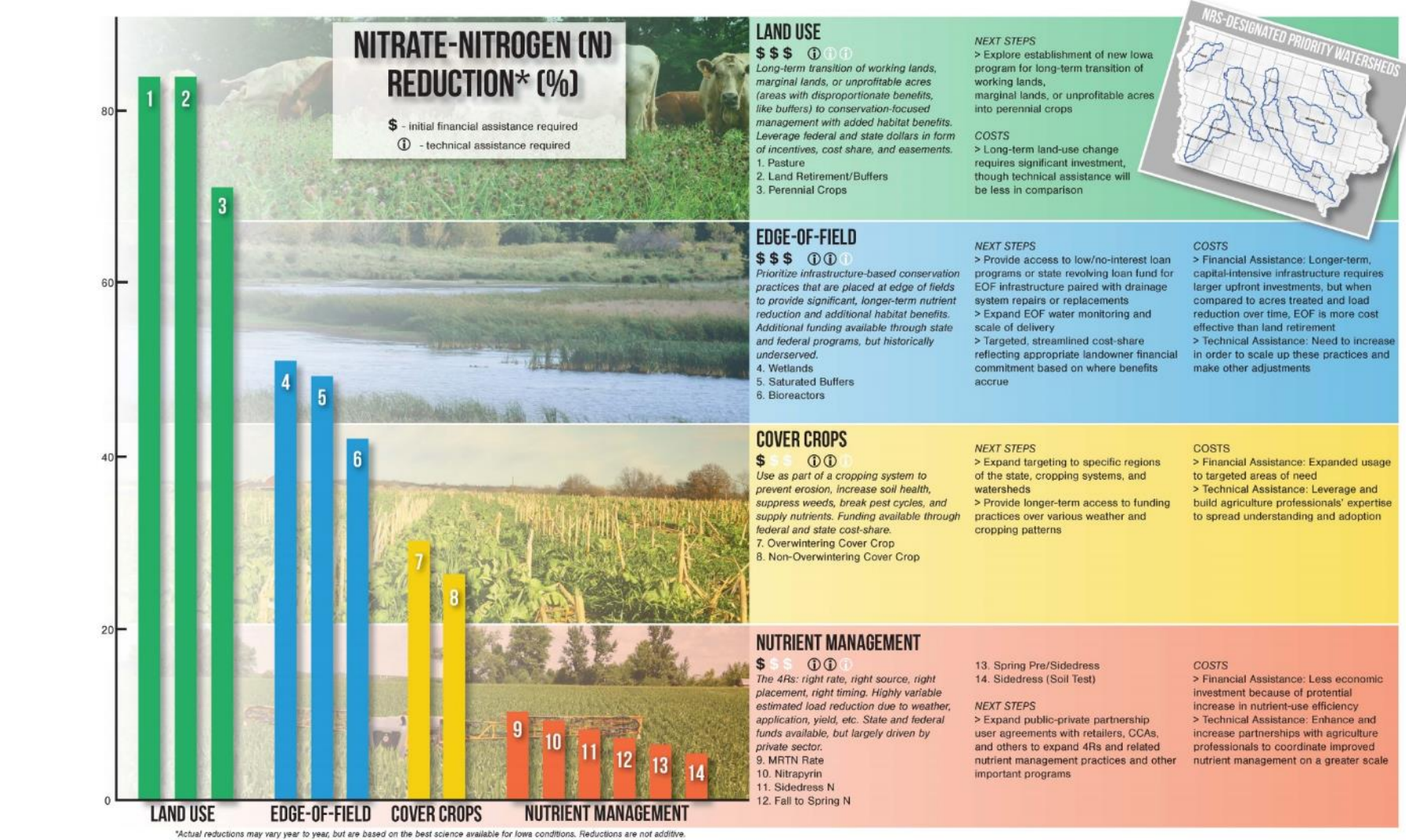
**Focus on key practices, identify and overcome barriers to adoption.**


Conservation practices are economically compelling and easier for farmers and landowners to implement and increased investments in conservation practices lead to healthy soil and improved water quality for the benefits of all Iowans and downstream communities.

## Nutrient Reduction Exchange

- Iowa League of Cities Conservation Innovation Grant in 2015
  - **Purpose: to register and track nutrient reductions resulting from installed best management practices (BMPs) that target INRS goals**

1) **Process** – NPDES permit integration (DNR) & application submittals (ISU and DNR)
2) **Incentives** – evaluation of regulatory authority and potential for use
3) **Database** – *USACE RIBITS Iowa Pilot* – ensuring an easy to use electronic application submittal process
4) **NRE placement** – evaluation of NRE placement in rule or policy
5) **Nutrient Load Reduction Model** – evaluation and implementation of a specific model or models for load reduction estimates.



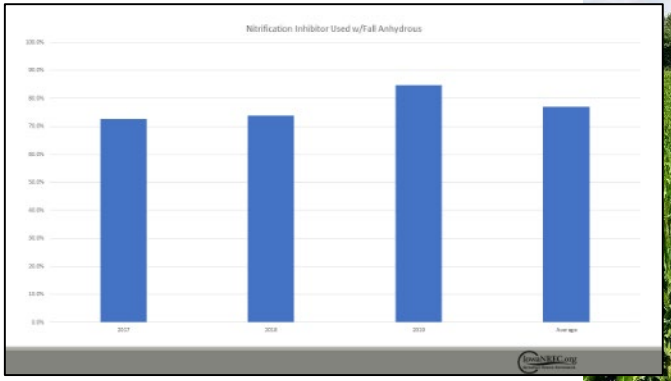

*Actual reductions may vary year to year, but are based on the best science available for Iowa conditions. Reductions are not additive.

# Nutrient Management

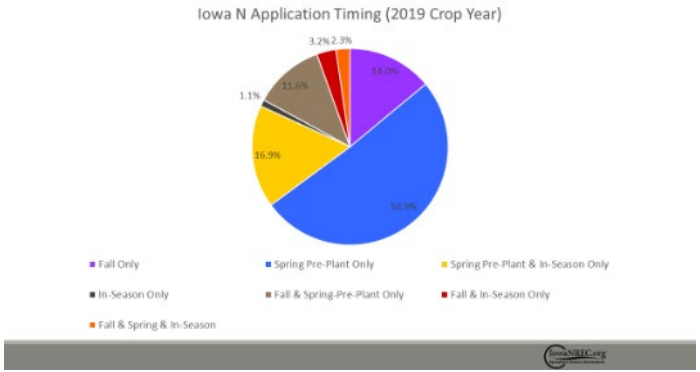
Meet the nutrient needs of the crop to be grown, while minimizing the loss of nutrients to surface and groundwater

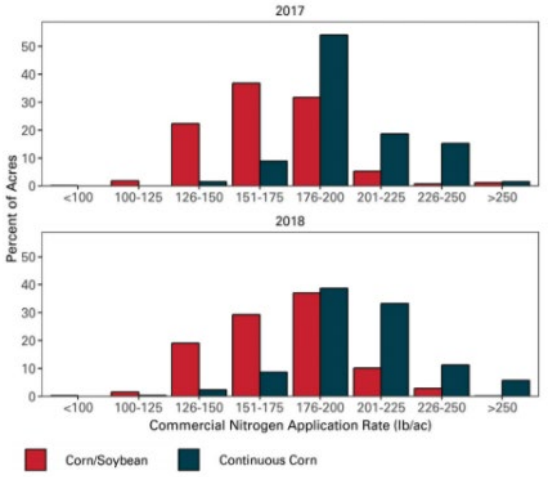
**4Rs**
Right source
Right rate
Right time
Right place

Sidedressing, Tillage, Spring-Applied Nitrogen, Nutrient Source, Soil-Test P, P Placement, Site-specific P Management, Nitrification Inhibitor, and Nitrogen Application Rate




IowaNREC.org
Agriculture. Science. Environment.



# Cover Crops

Reduce soil erosion

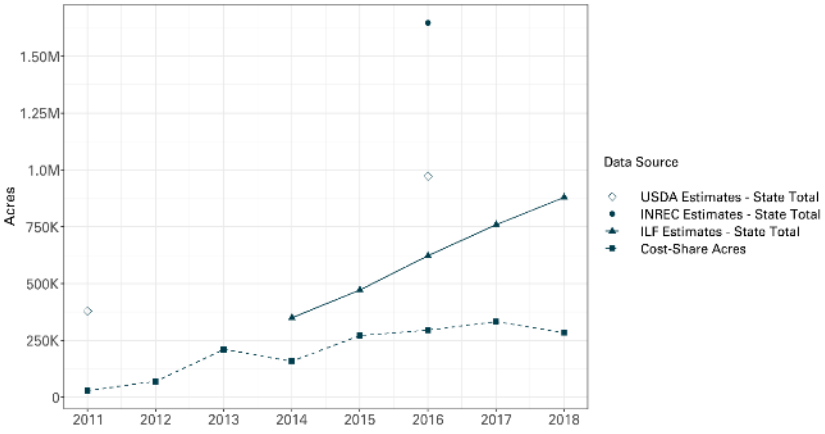
Improve soil structure & permeability

Provide ground cover

Scavenge residual nitrogen

Average of 28-31% reduction in N concentration and 29% reduction in P loss

*Source: CleanWaterIowa.org*


1.50M
1.25M
1.0M
750K
500K
250K
0
Acres
2011
2012
2013
2014
2015
2016
2017
2018
Data Source
USDA Estimates - State Total
INREC Estimates - State Total
ILF Estimates - State Total
Cost-Share Acres

# Bioreactors

**Bioreactors** are lined pits filled with woodchips; tile drainage water flows through and denitrifying bacteria converts nitrate into di-nitrogen gas.

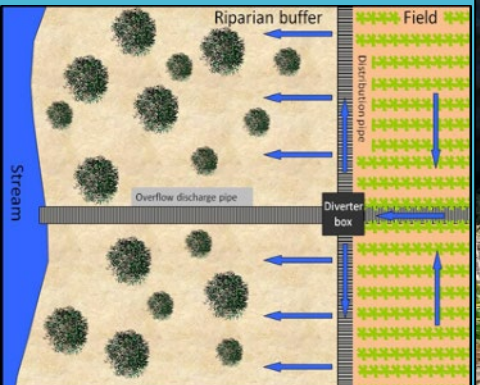
One bioreactor can treat up to 100 acres of tile-drained land.

*Source: CleanWaterIowa.org*

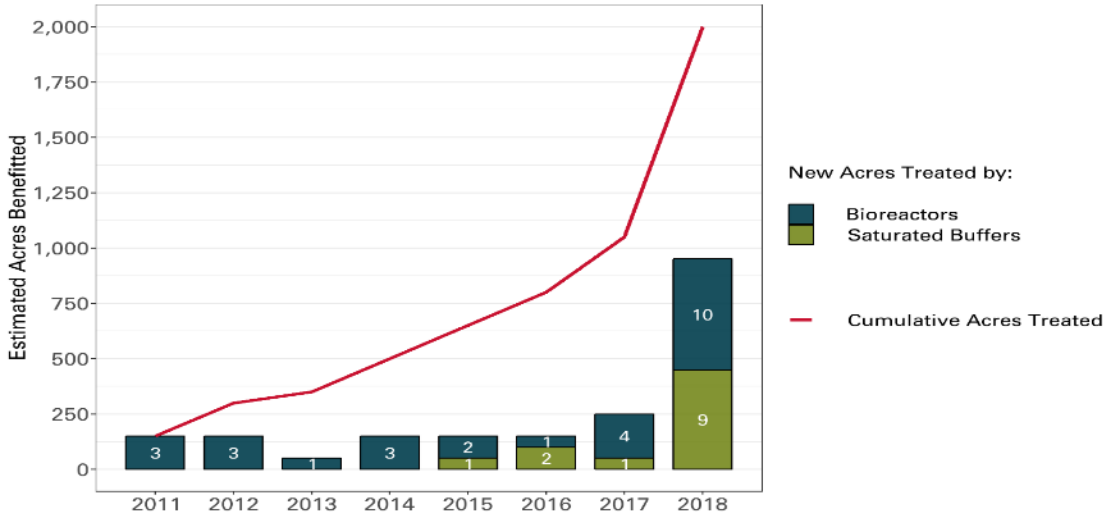
# Saturated Buffers

**Saturated Buffers** are lateral tile systems that re-distribute tile drainage water through the streamside buffer to denitrify before reaching the stream

One saturated buffer can treat up to 200 acres of tile-drained land.



- Expanded Technical Assistance Capacity
- ACPF/Watershed planning
- Focused outreach to landowners/farmers
- Flexibility through CRP and NRCS standards
- Adaptive to changes presented through research
- Prioritize Sat. Buffer over Bioreactor

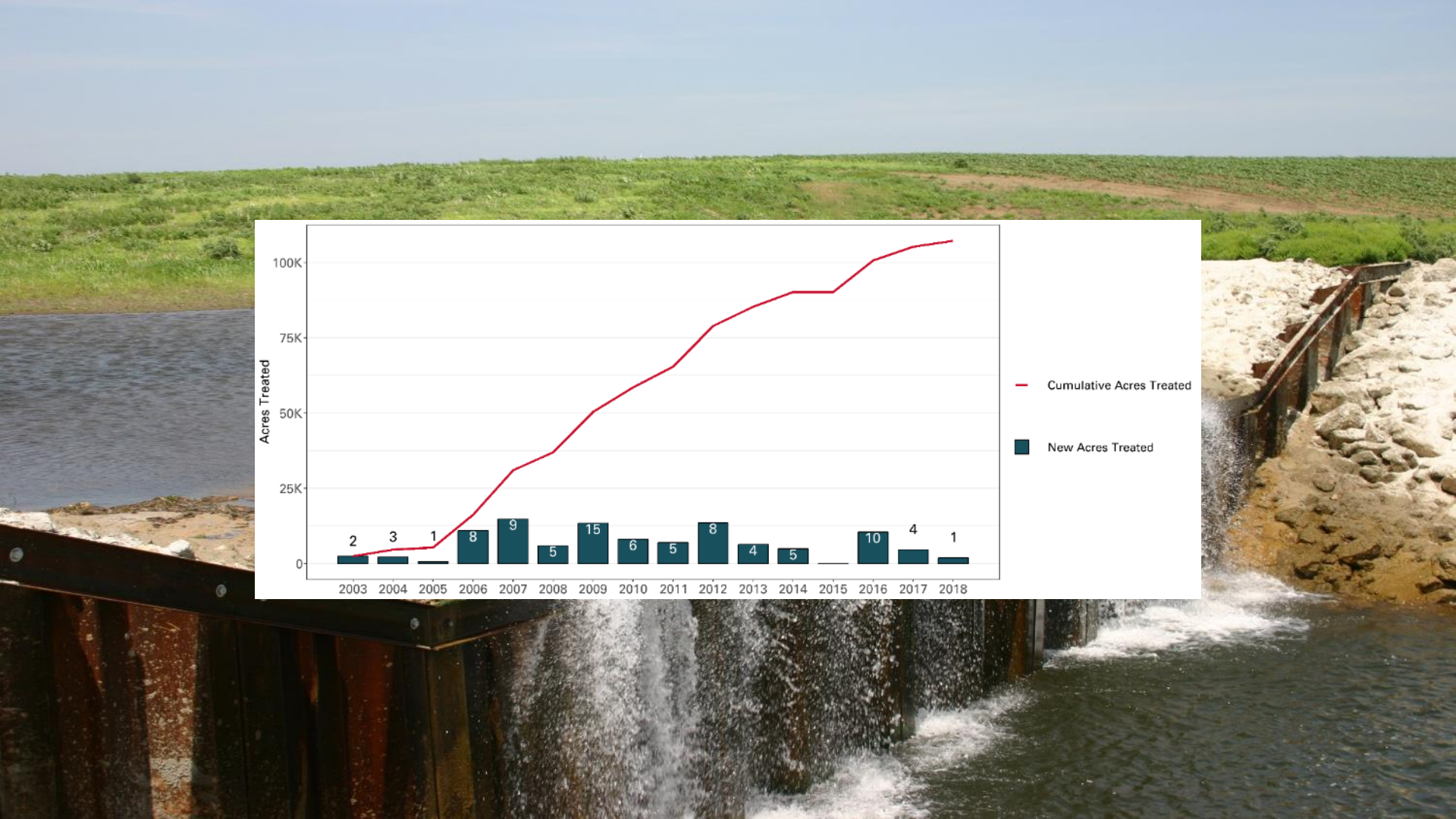



# Wetlands

**Wetlands** are strategically located and designed to remove nitrate from tile-drainage water from cropland areas.

The larger the wetland, the greater the percentage of N and P removal; nitrate concentration reduction averages 52%. Wetlands also provide improved aesthetics and Iowa game and waterfowl habitat.

*Source: CleanWaterIowa.org*


Acres Treated
100K
75K
50K
25K
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2
3
1
8
9
5
15
6
5
8
4
5
10
4
1
Cumulative Acres Treated
New Acres Treated

# Wetland Opportunities and Challenges

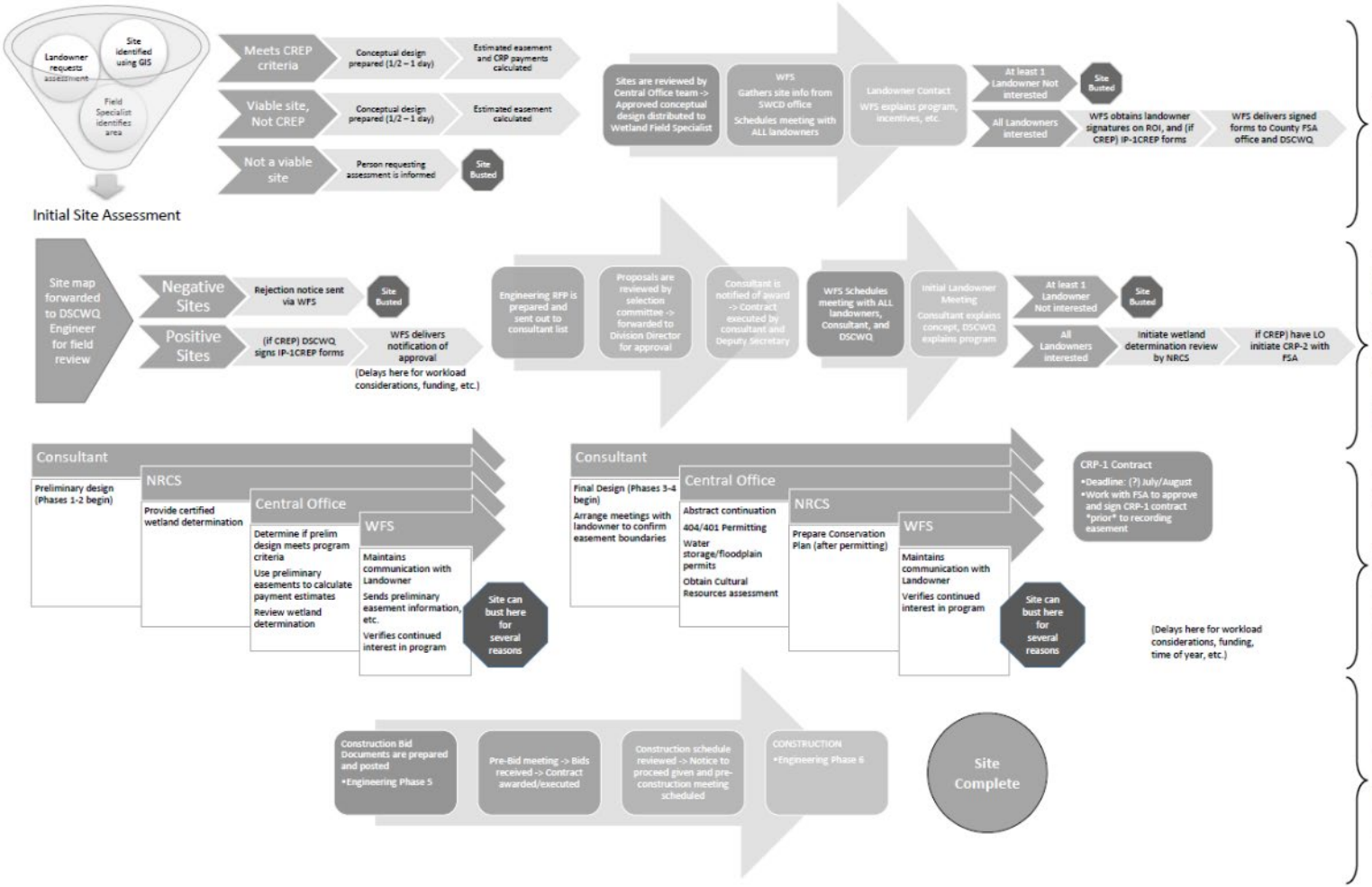
## options

- **Breakpoint (traditional)**
- **Created/Excavated or “Tile Zone”**
- **Floodplain**

- **Build off of current understanding from monitoring existing sites translated to new site concepts**

- **Pros and cons to navigate through all of these types of sites:**
  - Advantages: costs (easements, construction, etc.), improved performance, habitat value
  - Challenges: permitting, costs, private landowners, time

  - **Focus on expanding opportunity, not one vs. the other**

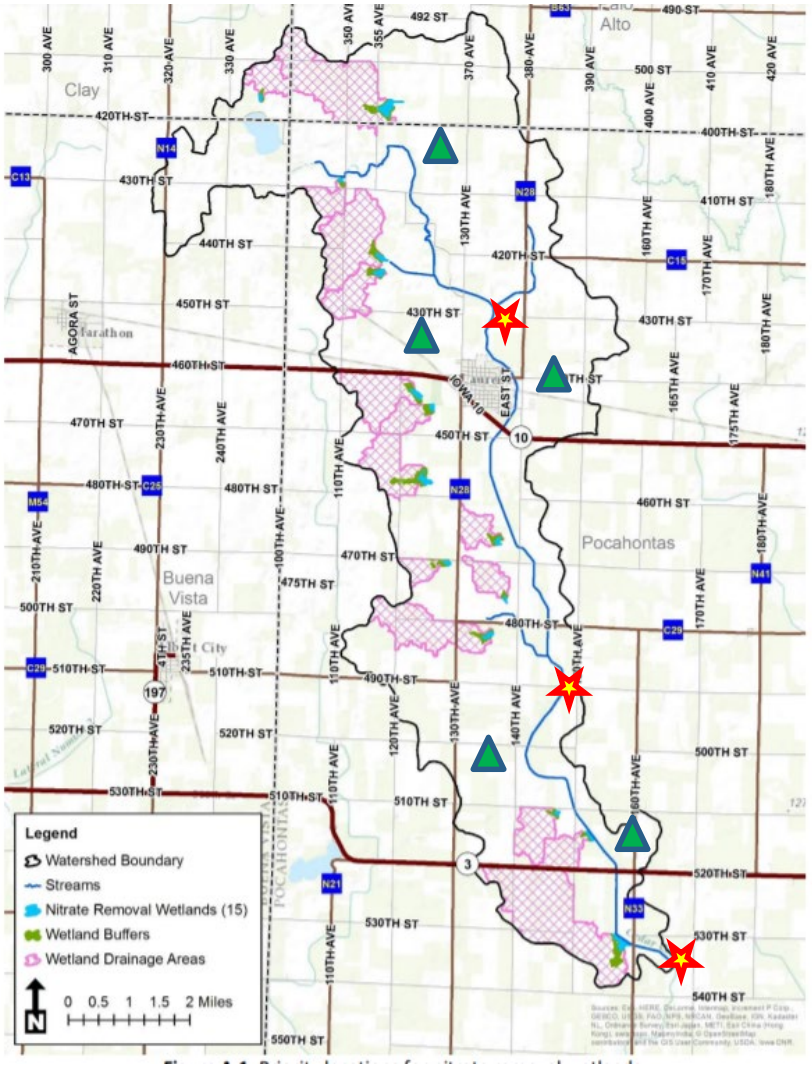

Landowner requests assessment
Site identified using GIS
Field Specialist identifies area
Initial Site Assessment
Meets CREP criteria
Conceptual design prepared (1/2 – 1 day)
Estimated easement and CRP payments calculated
Viable site, Not CREP
Conceptual design prepared (1/2 – 1 day)
Estimated easement calculated
Not a viable site
Person requesting assessment is informed
Site Busted
Sites are reviewed by Central Office team -> Approved conceptual design distributed to Wetland Field Specialist
WFS Gathers site info from SWCD office Schedules meeting with ALL landowners
Landowner Contact WFS explains program, incentives, etc.
At least 1 Landowner Not interested
Site Busted
All Landowners interested
WFS obtains landowner signatures on ROI, and (if CREP) IP-1CREP forms
WFS delivers signed forms to County FSA office and DSCWQ
1-2 Months
Site map forwarded to DSCWQ Engineer for field review
Negative Sites
Rejection notice sent via WFS
Site Busted
Positive Sites
(if CREP) DSCWQ signs IP-1CREP forms
WFS delivers notification of approval
(Delays here for workload considerations, funding, etc.)
Engineering RFP is prepared and sent out to consultant list
Proposals are reviewed by selection committee -> forwarded to Division Director for approval
Consultant is notified of award -> Contract executed by consultant and Deputy Secretary
WFS Schedules meeting with ALL landowners, Consultant, and DSCWQ
Initial Landowner Meeting Consultant explains concept, DSCWQ explains program
At least 1 Landowner Not interested
Site Busted
All Landowners interested
Initiate wetland determination review by NRCS
if CREP) have LO initiate CRP-2 with FSA
2-3 Months (without delay)
Consultant
Preliminary design (Phases 1-2 begin)
NRCS
Provide certified wetland determination
Central Office
Determine if prelim design meets program criteria
Use preliminary easements to calculate payment estimates
Review wetland determination
WFS
Maintains communication with Landowner
Sends preliminary easement information, etc.
Verifies continued interest in program
Site can bust here for several reasons
Consultant
Final Design (Phases 3-4 begin)
Arrange meetings with landowner to confirm easement boundaries
Central Office
Abstract continuation
404/401 Permitting
Water storage/floodplain permits
Obtain Cultural Resources assessment
NRCS
Prepare Conservation Plan (after permitting)
WFS
Maintains communication with Landowner
Verifies continued interest in program
Site can bust here for several reasons
CRP-1 Contract
•Deadline: (?) July/August
•Work with FSA to approve and sign CRP-1 contract *prior* to recording easement
(Delays here for workload considerations, funding, time of year, etc.)
6-8 Months (without delay)
Construction Bid Documents are prepared and posted
•Engineering Phase 5
Pre-Bid meeting -> Bids received -> Contract awarded/executed
Construction schedule reviewed -> Notice to proceed given and pre-construction meeting scheduled
CONSTRUCTION
•Engineering Phase 6
Site Complete
6 months – 1 year

# Wetland Opportunities and Challenges

## options

- **Expands the number of sites feasible in the basin:**

- **Conceptual watershed**
- **13 breakpoint sites**
- **+ 5 potential TZ sites**
- **+ 3 potential floodplain sites**



# Expanded Capacity in Iowa to Advance Wetlands

- ***Expanded Delivery Partnerships***
  - *Ducks Unlimited*
  - *Iowa Nutrient Research and Education Council (INREC)*
- ***Expanded Funding Opportunities:***
  - *Regional Conservation Partnership Program (RCPP)*
  - *Mississippi River Basin Healthy Watersheds Initiative (MRBI)*
  - *EPA-Gulf of Mexico Funding*
  - *Private sector (DU, TNC, IPPA, others)*

IOWA DEPARTMENT OF AGRICULTURE & LAND STEWARDSHIP

USDA NRCS Natural Resources Conservation Service

# Thank you

## Questions?

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IOWA DEPARTMENT OF AGRICULTURE & LAND STEWARDSHIP

# Minnesota's Nutrient Reduction Strategy

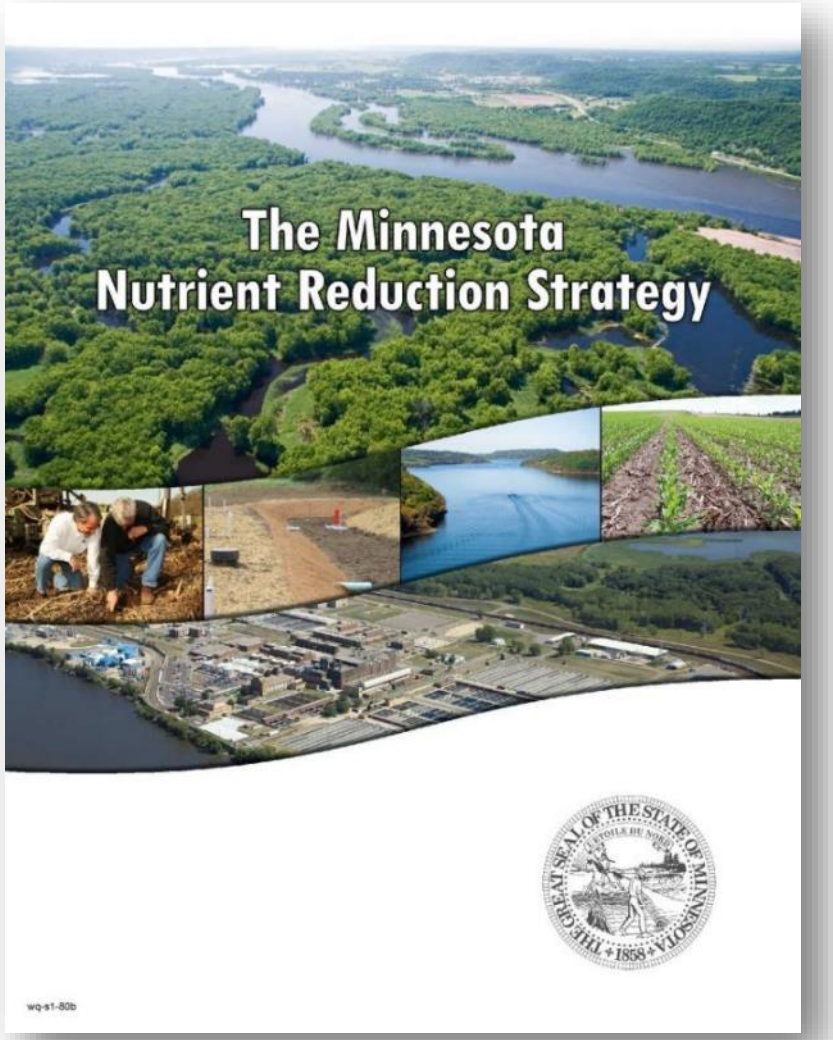
## Tracking Progress in the Mississippi Headwaters State

MINNESOTA POLLUTION CONTROL AGENCY

Dave Wall | Environmental Research Scientist

Photo by Karla Lundstrom

# NRS finalized in 2014 by 11 organizations




Minnesota Pollution Control Agency

MINNESOTA DEPARTMENT OF AGRICULTURE

Minnesota Board of Water & Soil Resources

NRCS

FSA FARM SERVICE AGENCY

Minnesota DEPARTMENT OF NATURAL RESOURCES

MINNESOTA MDH DEPARTMENT OF HEALTH

PFA Minnesota Public Facilities Authority

UNIVERSITY OF MINNESOTA Driven to Discover℠

METROPOLITAN COUNCIL

USGS science for a changing world

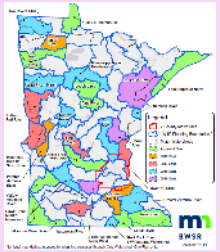
https://www.pca.state.mn.us/water/nutrient-reduction-strategy

# Strategy implementation to reduce nutrients in water

**Large-scale Program Advances**

MINNESOTA

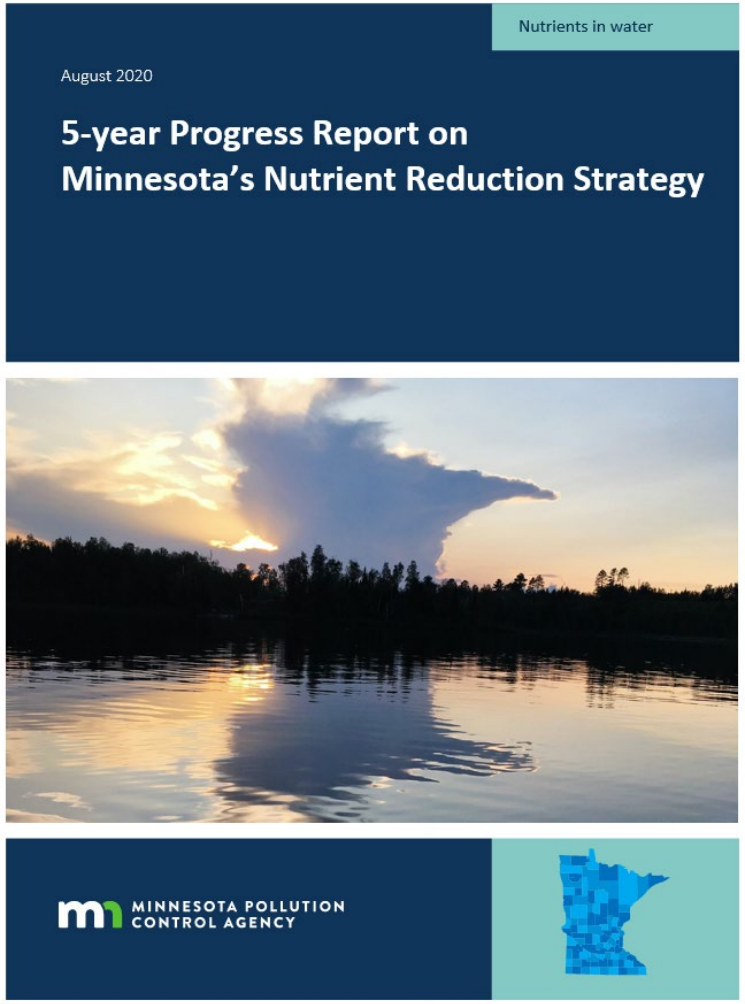
**Local Watershed Approach**

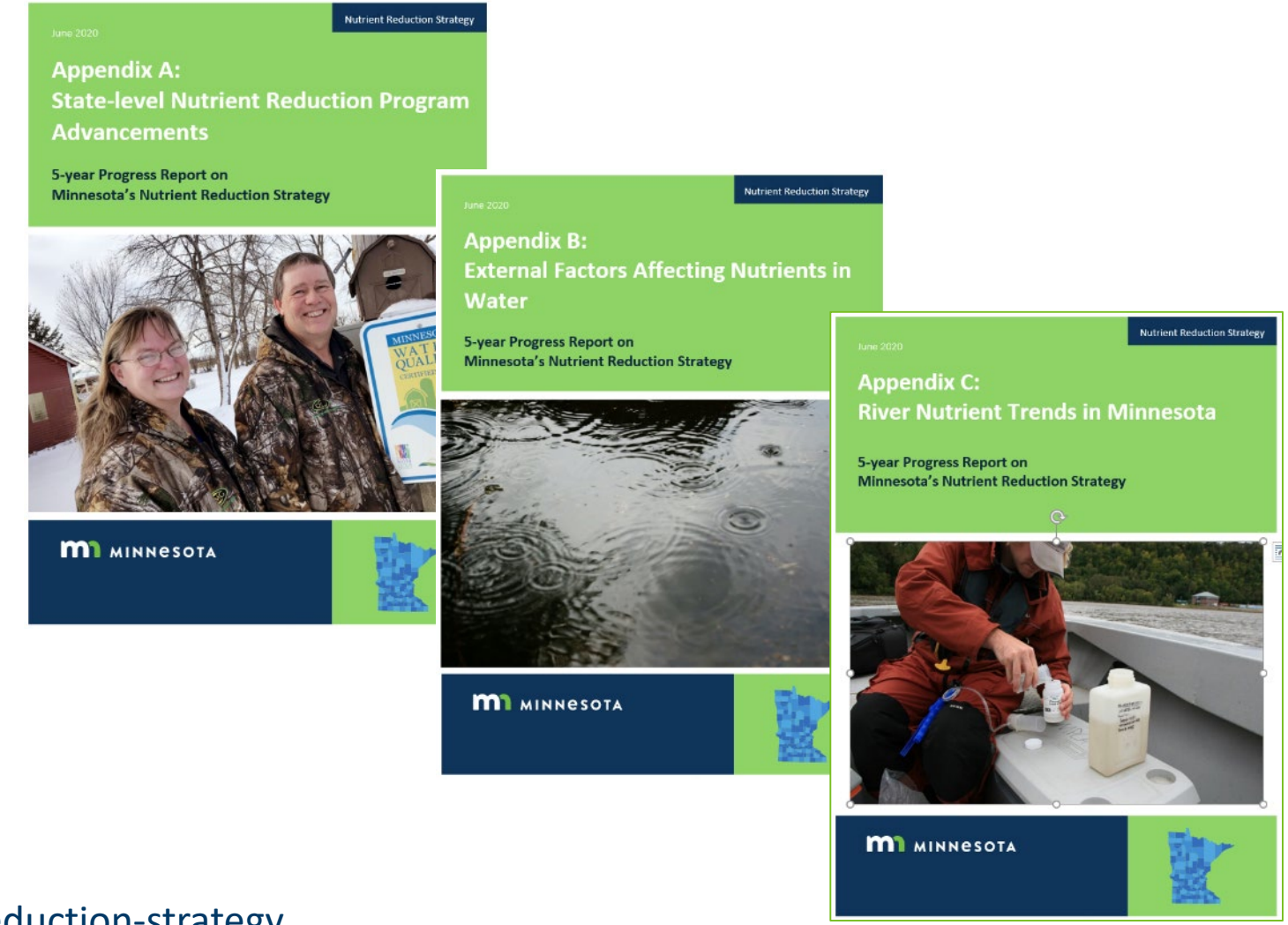


**Changes in Rural & Urban Lands**

**Changes in Water**

# Nutrient Reduction Strategy 5-year Progress Report




https://www.pca.state.mn.us/water/nutrient-reduction-strategy

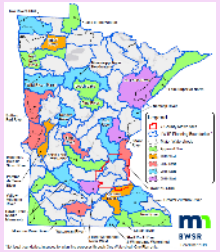
# Presentation Outline

**Progress Part 1**

Large-scale Program Advances


**Progress Part 2**

Local Watershed Approach



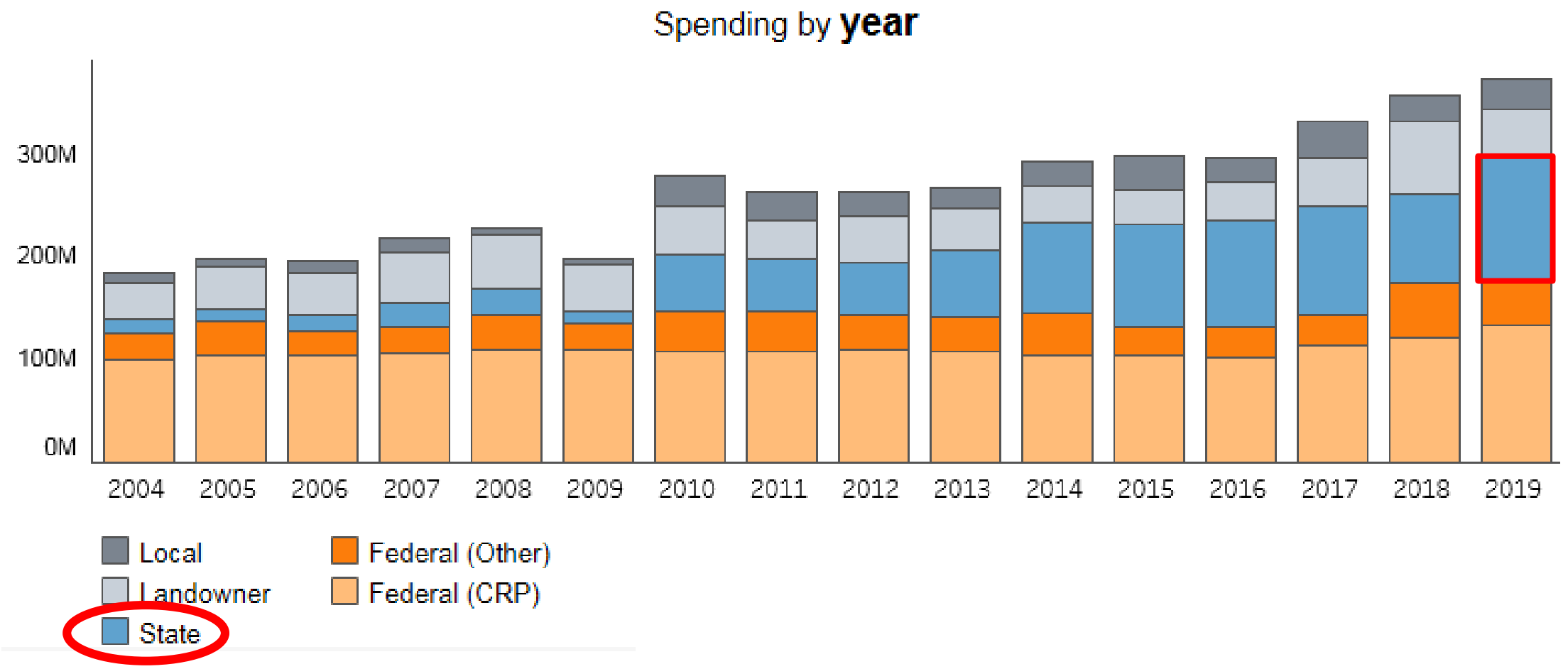
**Progress Part 3**

Changes in Rural & Urban Lands

**Progress Part 4**

Changes in Water

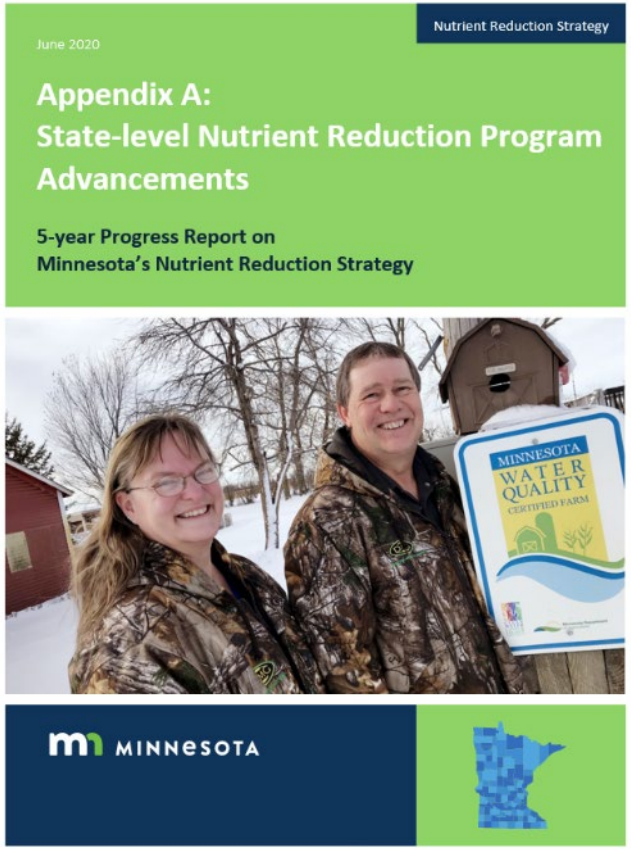
# Minnesota Clean Water Fund – boosted state BMP $$



# More than **30** program advances since 2014

| Education, Outreach and Research | Voluntary Programs | Regulatory Programs | Watershed Partnerships and Tools |
|---|---|---|---|
| • Nitrogen Smart training for farmers and farm-advisors<br>• Annual nutrient management and conservation tillage conferences<br>• Forever Green Initiative<br>• Discovery Farms<br>• Minnesota Office of Soil Health<br>• Guidance manuals for agricultural best management practices, drainage, urban stormwater management<br>• Conservation professionals training and certification<br>• Nutrient Management Initiative<br>• Center for Changing Landscapes | • Minnesota Agricultural Water Quality Certification<br>• 4R Certification led by private industry (cropland nutrient management)<br>• Red River Basin Initiative and Red River Valley Drainage Water Management<br>• Minnesota Conservation Reserve Enhancement Program<br>• Board of Water and Soil Resources Cover Crop Demonstration Program<br>• Clean Water Fund – increases for BMP implementation<br>• Point – nonpoint trading<br>• Reinvest in Minnesota<br>• Multi-purpose drainage water management | • Municipal and Industrial Wastewater Program<br>• Groundwater Protection Rule (Nitrogen Fertilizer)<br>• Minnesota Riparian Buffer Law<br>• Feedlot and land application of manure rules and program<br>• Urban Stormwater Runoff Program<br>• Subsurface Sewage Treatment Program | • Watershed Restoration and Protection Strategies (WRAPS) in over 50 HUC-8 watersheds<br>• One Watershed, One Plan (1W1P) Program<br>• Groundwater Restoration and Protection Strategies<br>• Watershed Conservation Planning Initiative<br>• Small focus watersheds – Federal Section 319 Program (20 watersheds)<br>• Guidance on Lake Protection for WRAPS and 1W1P<br>• National Water Quality Initiative and Mississippi River Basin Healthy Watershed Initiative<br>• Watershed-based Funding Implementation Program<br>• Root River Field to Stream Partnership |

## All 30+ programs described in:




**https://www.pca.state.mn.us/water/nutrient-reduction-strategy**

# Minnesota Agricultural Water Quality Certification

Photo from MDA

## Voluntary Partnership:

- Producers
- Government agencies
- Private sector

## WQ certified farmers get:

- 10 yrs of regulatory certainty
- Priority $ for new practices
- Community recognition

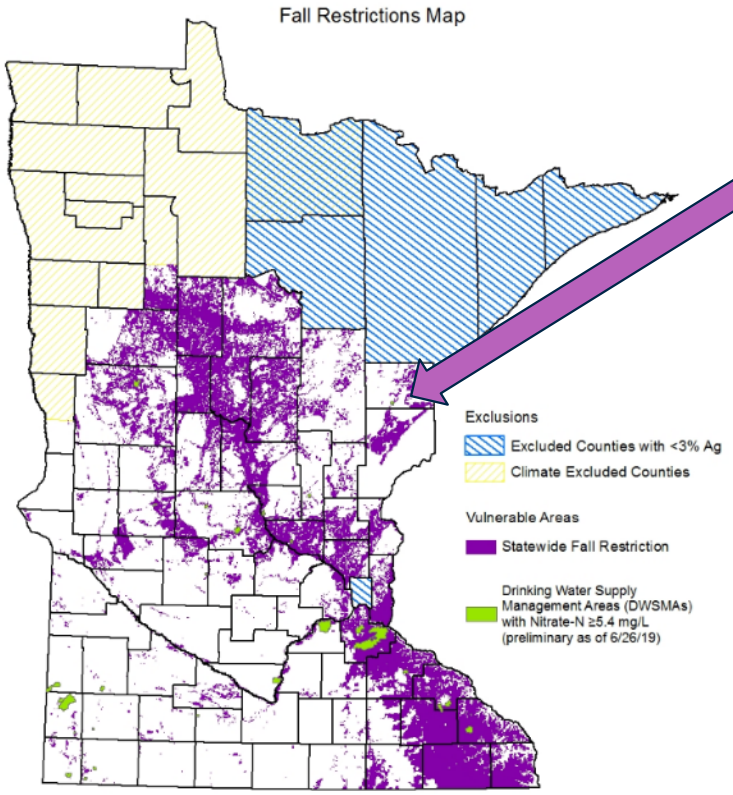
## Growth since 2015:

- 900+ farms
- 600,000+ acres
- 1800+ new practices
- 46,000+ lbs P reduced

# Forever Green Program


- Developing new cropping systems for continuous living cover
  - plant breeding
  - agronomic systems
  - food science
  - economics
- Supply Chain Development
- Market Development

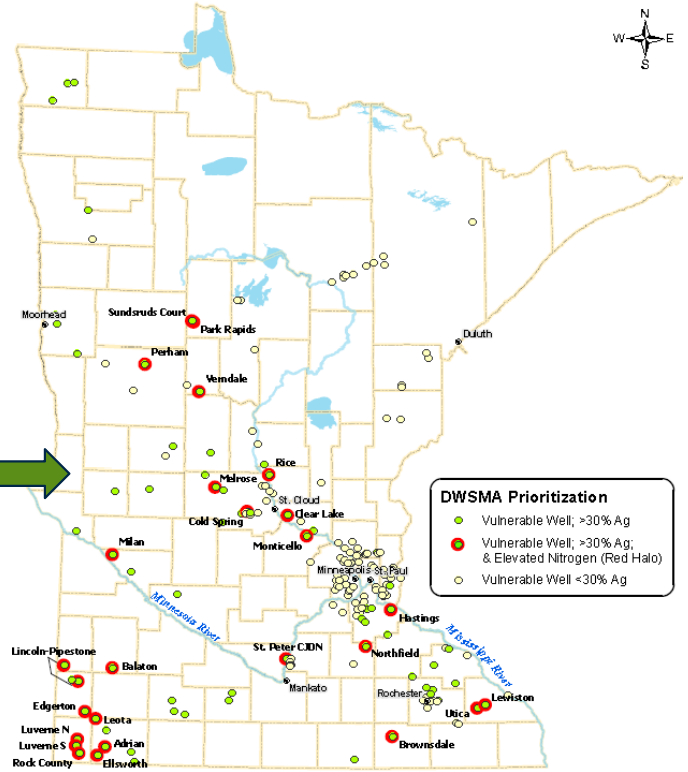
# MN Groundwater Protection Rule
# Nitrogen fertilizer restrictions adopted in 2019




2.6 million acres

**Fall N fertilizer restrictions in vulnerable areas**

**BMPs can phase from voluntary to regulatory in drinking water supply management areas, depending on nitrate levels/trends & BMP adoption rates**

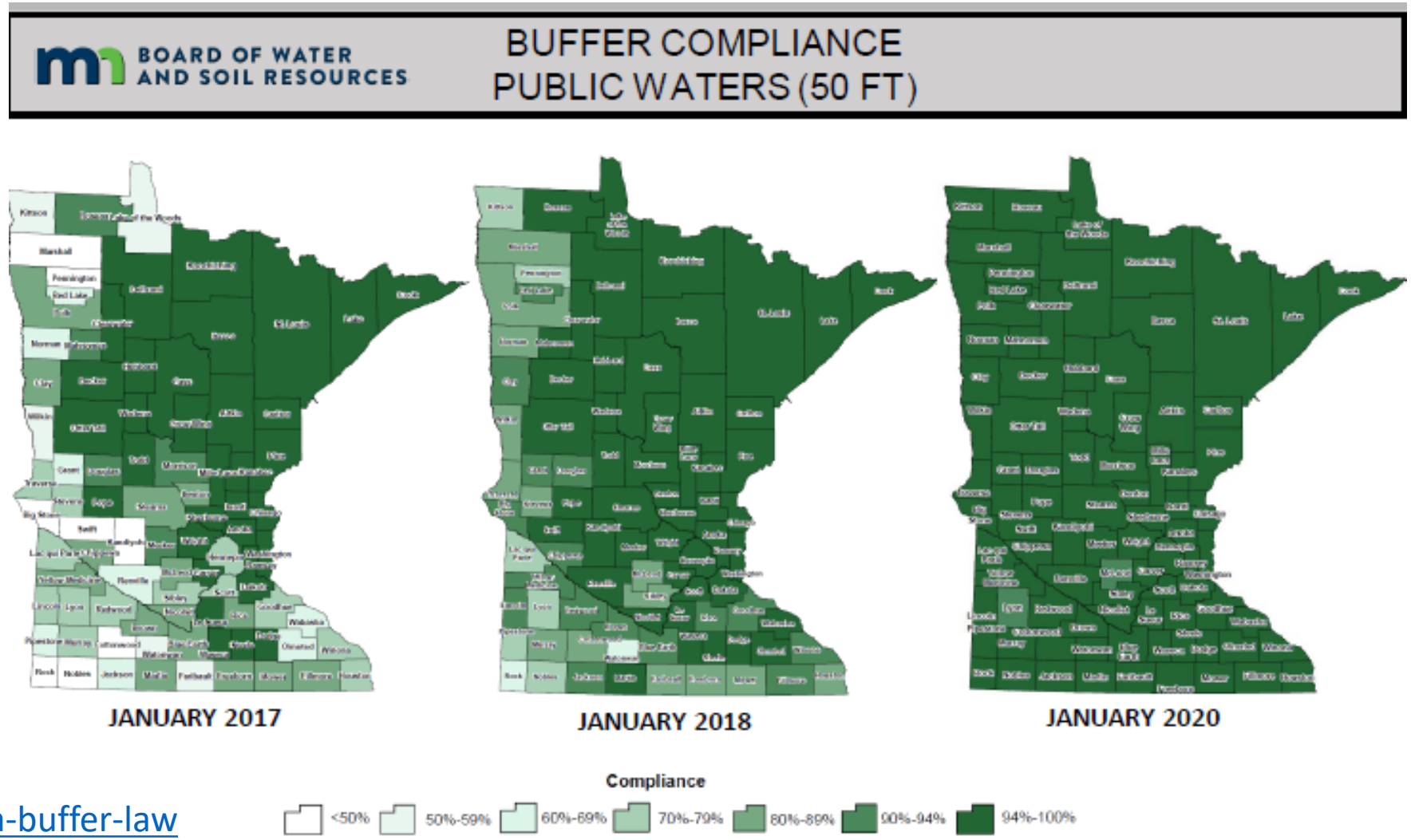



<100,000 acres

https://www.mda.state.mn.us/nfr

# Minnesota Buffer Law

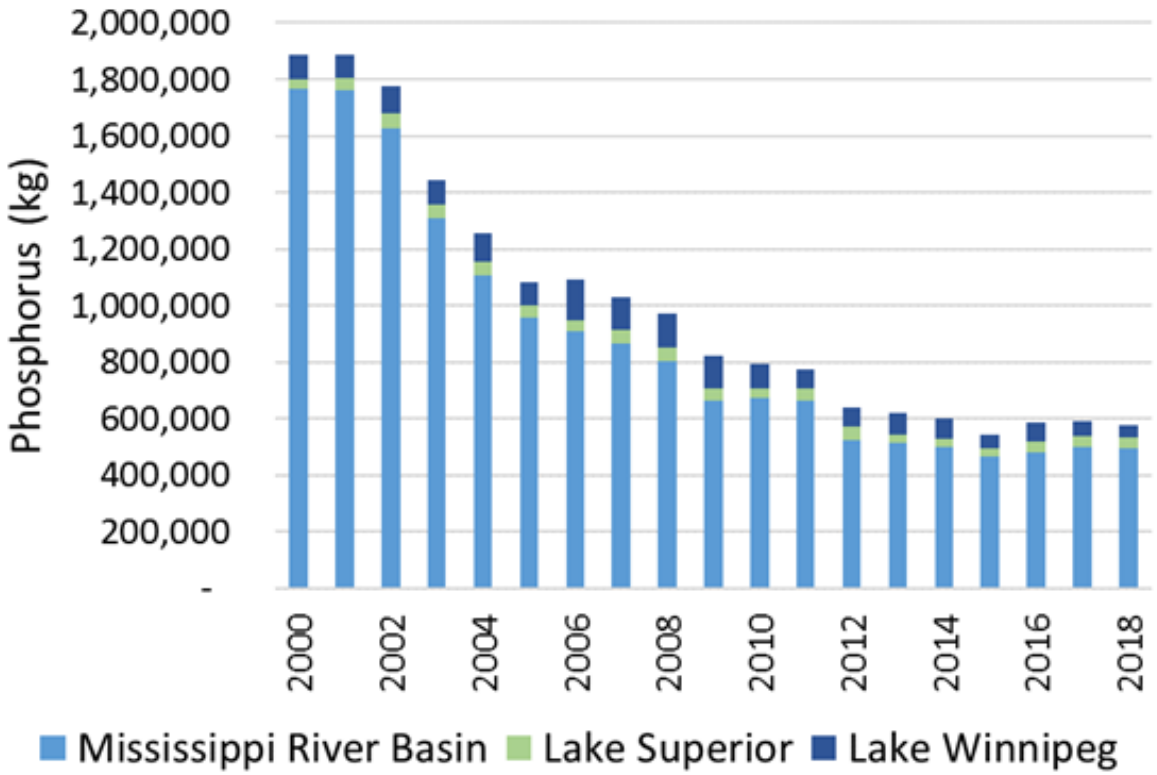
- 2015 – law passed
- **50 ft** – rivers, lakes & streams
- **16.5 ft** - public ditches
- Alternatives allowed
- Financial support




https://bwsr.state.mn.us/minnesota-buffer-law

# Wastewater Permitting Program - Phosphorus

## P

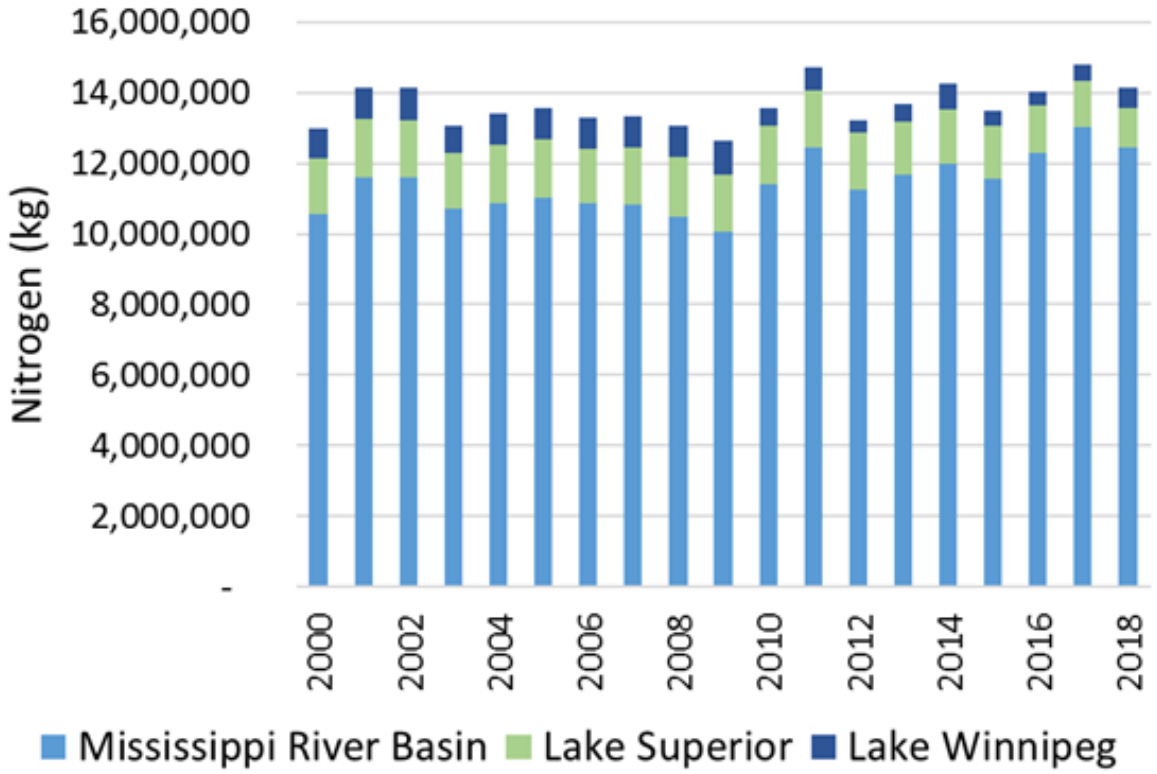



**Over 70% reduction from:**

- **2000** - 1 mg/L effluent performance standard for new/expanded plants
- **2008** - Lake Eutrophication Standards & wastewater rules
- **2014** - River Eutrophication Standards
- **2014** - Nutrient Reduction Strategy

# Wastewater Permitting Program – Nitrogen (N)

## N




### Wastewater N strategy - steps:

1. Monitor influent & effluent nitrogen
2. Evaluate N reduction optimization
3. Develop N management plan templates
4. Encourage voluntary N removal when upgrading facility
5. Establish N effluent limits – after nitrate water quality standards developed
6. Develop point/nonpoint trading options

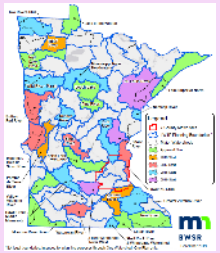
# **Presentation Outline**: Progress with our watershed approach

**Progress Part 1**

Large-scale Program Advances


**Progress Part 2**

Local Watershed Approach



**Progress Part 3**

Changes in Rural & Urban Lands

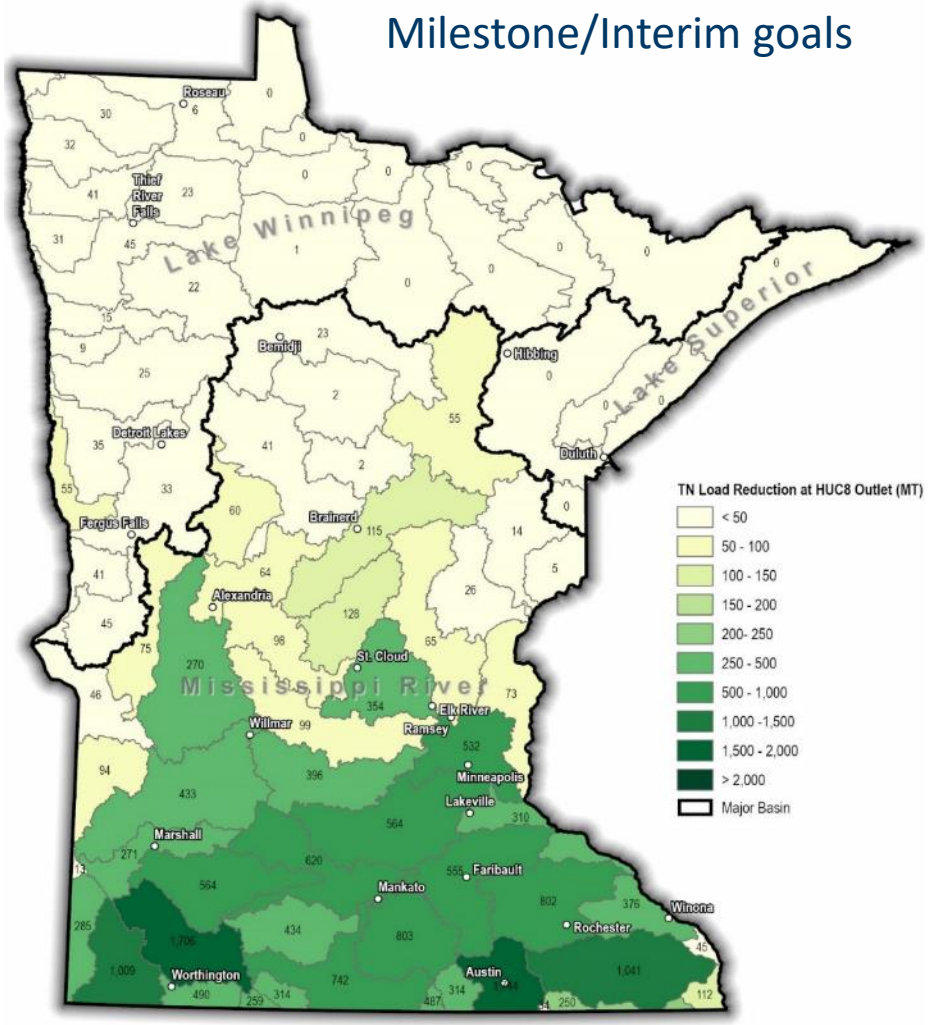
**Progress Part 4**

Changes in Water

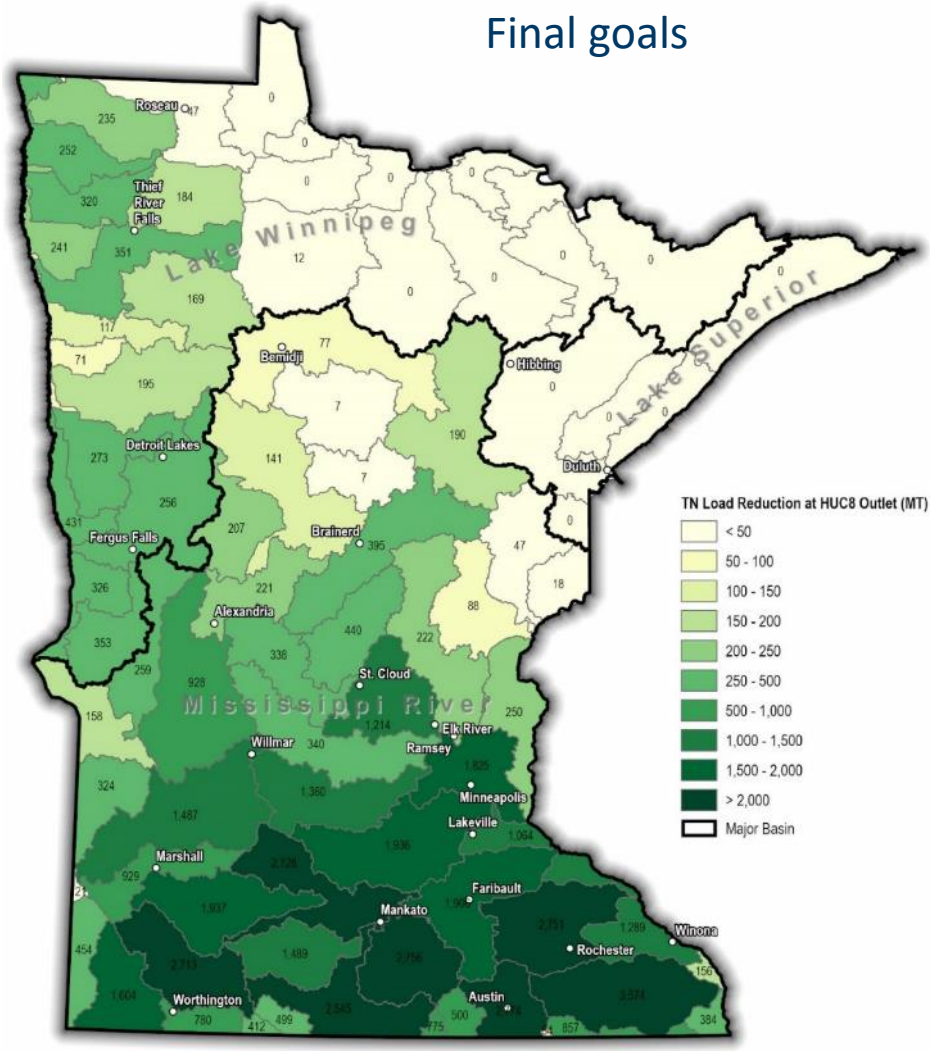
# Minnesota's watershed approach aims to meet local & downstream needs

# Watershed load reduction targets – to collectively achieve downstream load reduction goals

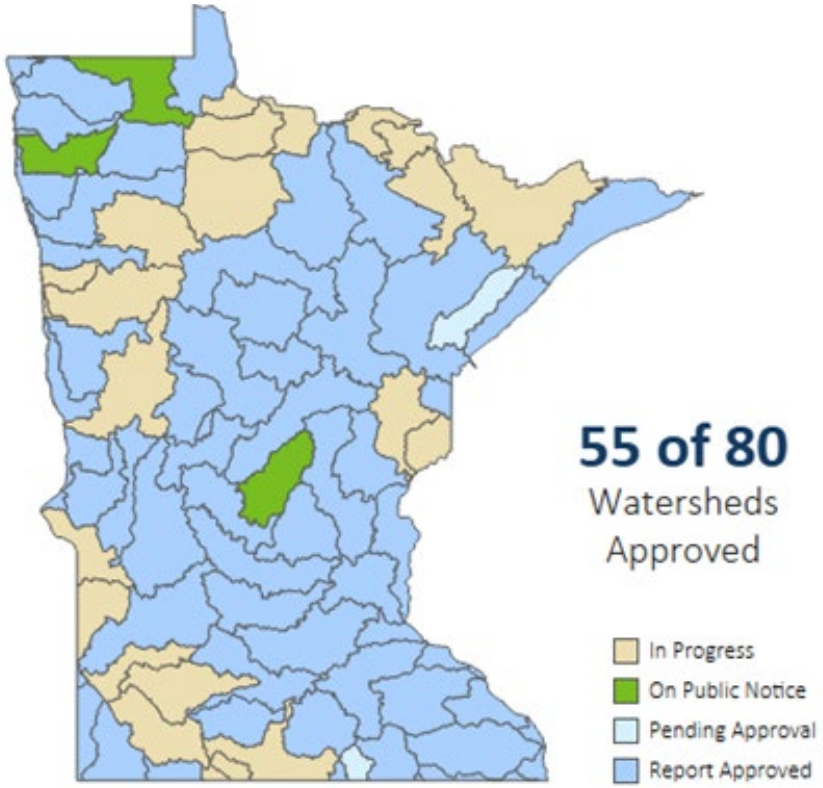
Milestone/Interim goals



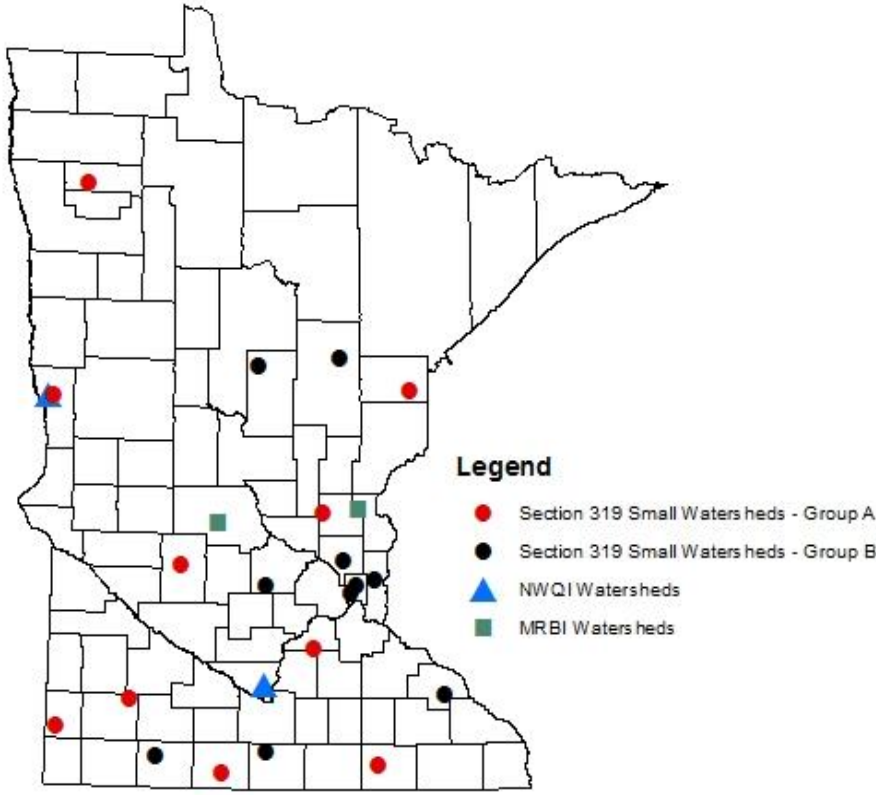

Final goals



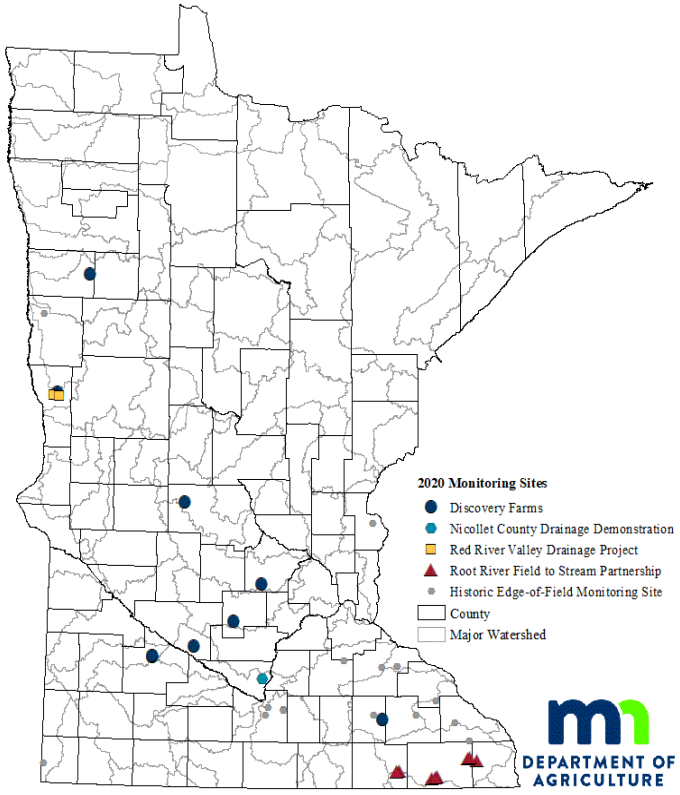
# Minnesota's watershed approach works at multiple scales




**Watershed science informing local planning across the entire state**




**Smaller-scale focus watersheds**




**Farm and field-scale implementation & monitoring**

# New private-public collaborative watershed partnerships developing

## Cannon River Agricultural Collaborative

## Headwaters Agricultural Sustainability Partnership (central Minnesota)

## Cedar River Watershed Partnership


- Central Farm Service
- Hormel Foods
- Land O'Lakes SUSTAIN
- MN Dept. of Agric. MAWQCP
- Mower County SWCD
- Environmental Initiative

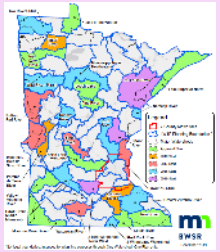
# **Presentation Outline**: progress with BMP adoption

**Progress Part 1**

Large-scale Program Advances


**Progress Part 2**

Local Watershed Approach



**Progress Part 3**

Changes in Rural & Urban Lands

**Progress Part 4**

Changes in Water

# How can we tell if practices are being adopted?

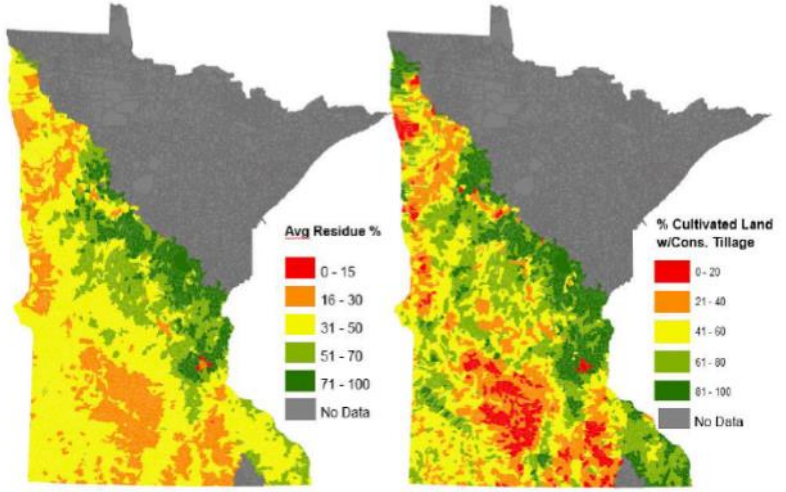
**A. Adoption through government support programs**

**B. Indicators of broader overall adoption**

1. U.S. Census of Agriculture
2. MN surveys
3. Satellite imagery
4. Fertilizer sales & nutrient use efficiency

**C. Permitting – reporting & inspections**

1. Wastewater point sources
2. Urban stormwater
3. Feedlots & manure spreading
4. Septic systems



# A. Adoption through government programs

## New tracking system for state and federal programs

**NRCS -** federal EQIP, CSP, RCPP

**BWSR -** eLINK-tracked state cost-shared BMPs

**BWSR** - CREP and RIM tracking

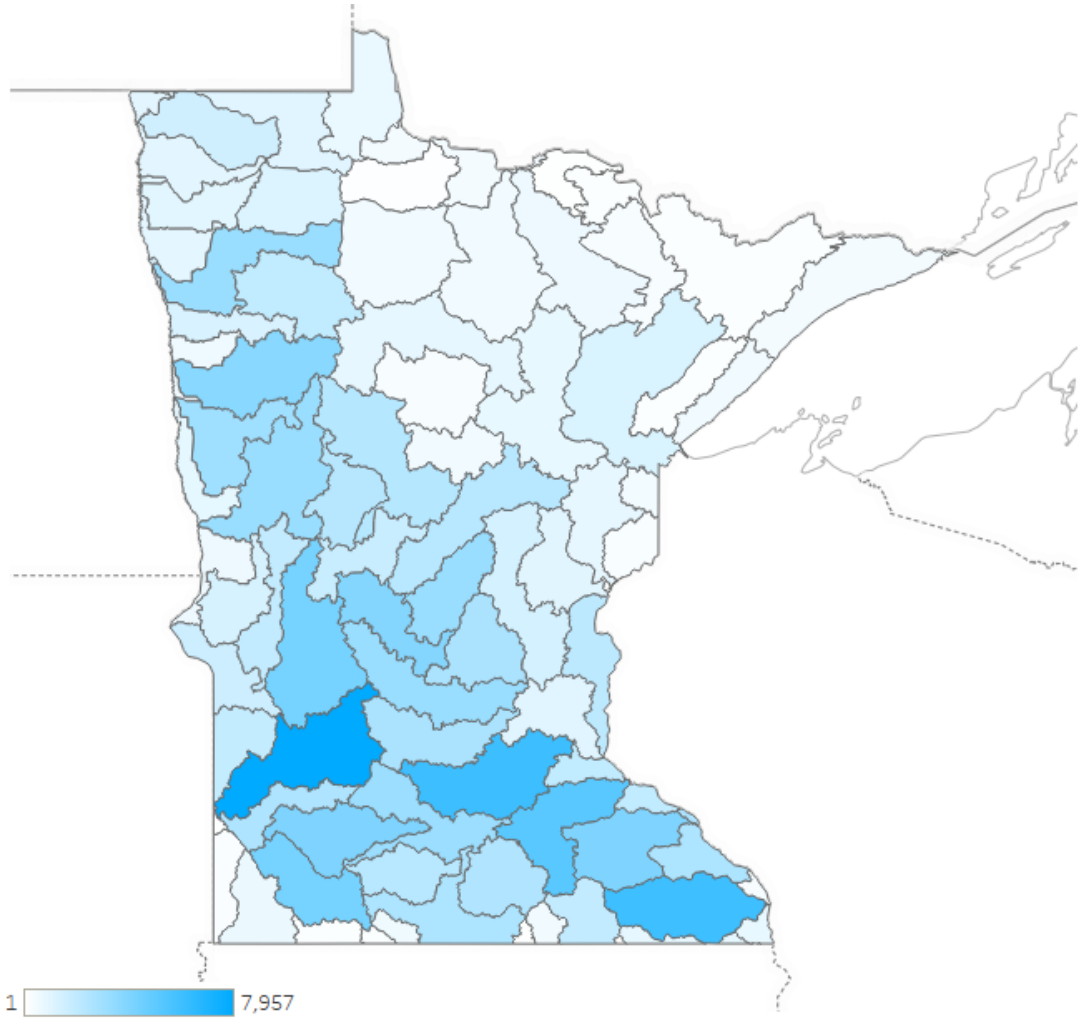
**MDA** – Ag BMP Loan Program, Ag Water Quality Cert.

**MPCA** – Clean Water Partnership & 319 program

## Aggregated and tracked at 4 scales

1. Subwatershed (HUC12)
2. Major watershed (HUC8)
3. Major drainage basin
4. Statewide

# HUC8 watershed tracking of government-supported BMPs



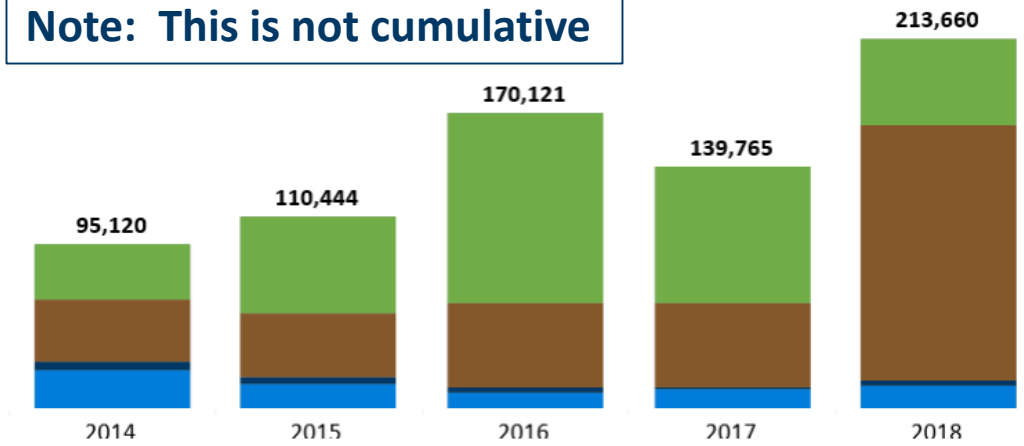

| BMPs Installed 2004-2018 | BMP Count |
|---|---|
| Tillage/residue management | 11,382 |
| Designed erosion control & trapping | 10,236 |
| Nutrient management (cropland) | 9,992 |
| Septic System Improvements | 7,874 |
| Converting land to perennials | 7,696 |
| Open tile inlet & side inlet improvements | 7,136 |
| Stream banks, bluffs & ravines protected/restored | 6,073 |
| Buffers and filters - field edge | 5,348 |
| Add living cover to annual crops in fall/spring | 4,508 |
| Habitat & stream connectivity management | 4,026 |
| Pasture management | 3,087 |
| Drainage ditch modifications | 2,715 |
| Agricultural tile drainage water treatment/storage | 1,184 |
| Urban Stormwater Runoff Control | 1,114 |
| Changing rotations to less erosive crops | 455 |
| Feedlot runoff controls | 173 |
| Forestry Management | 138 |
| Wetland restoration/creation | 104 |
| In Lake Management | 4 |
| Other | 51,878 |
| **Grand Total** | 135,123 |

www.pca.state.mn.us/water/healthier-watersheds

# Major River Basin & Statewide tracking of new BMPs adopted each year through government programs


https://www.pca.state.mn.us/water/nutrient-reduction-strategy

**Note: This is not cumulative**




**Living Cover (326,657 acres total)**
Practices that reduce nutrient and soil loss by keeping plants growing continuously, including the Fall and Spring months. Common practices include cover crops and conservation cover.

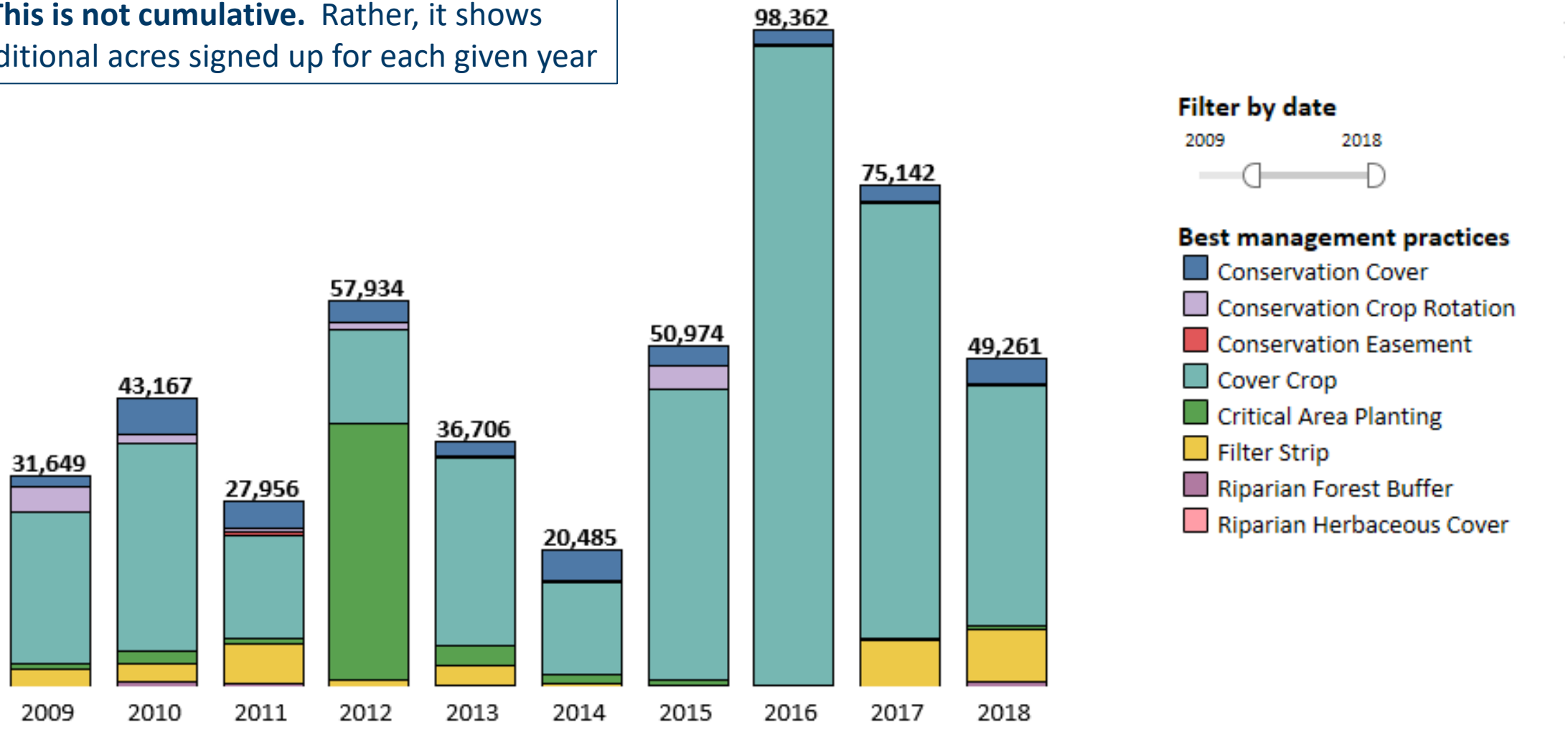
**Cropland Erosion Control (317,642 acres total)**
Designed to reduce runoff and soil losses. This group consists primarily of farming practices that leave crop residue on the surface or structural practices that reduce or capture runoff and eroded soil.

**Drainage Water Retention and Treatment (15,678 acres total)**
Practices designed to slow down waters leaving tile-drained landscapes or otherwise treat tile-waters for nutrient removal prior to entering streams. Wetland restoration and controlled drainage management are the most common practices, but other emerging practices include saturated buffers and bioreactors.

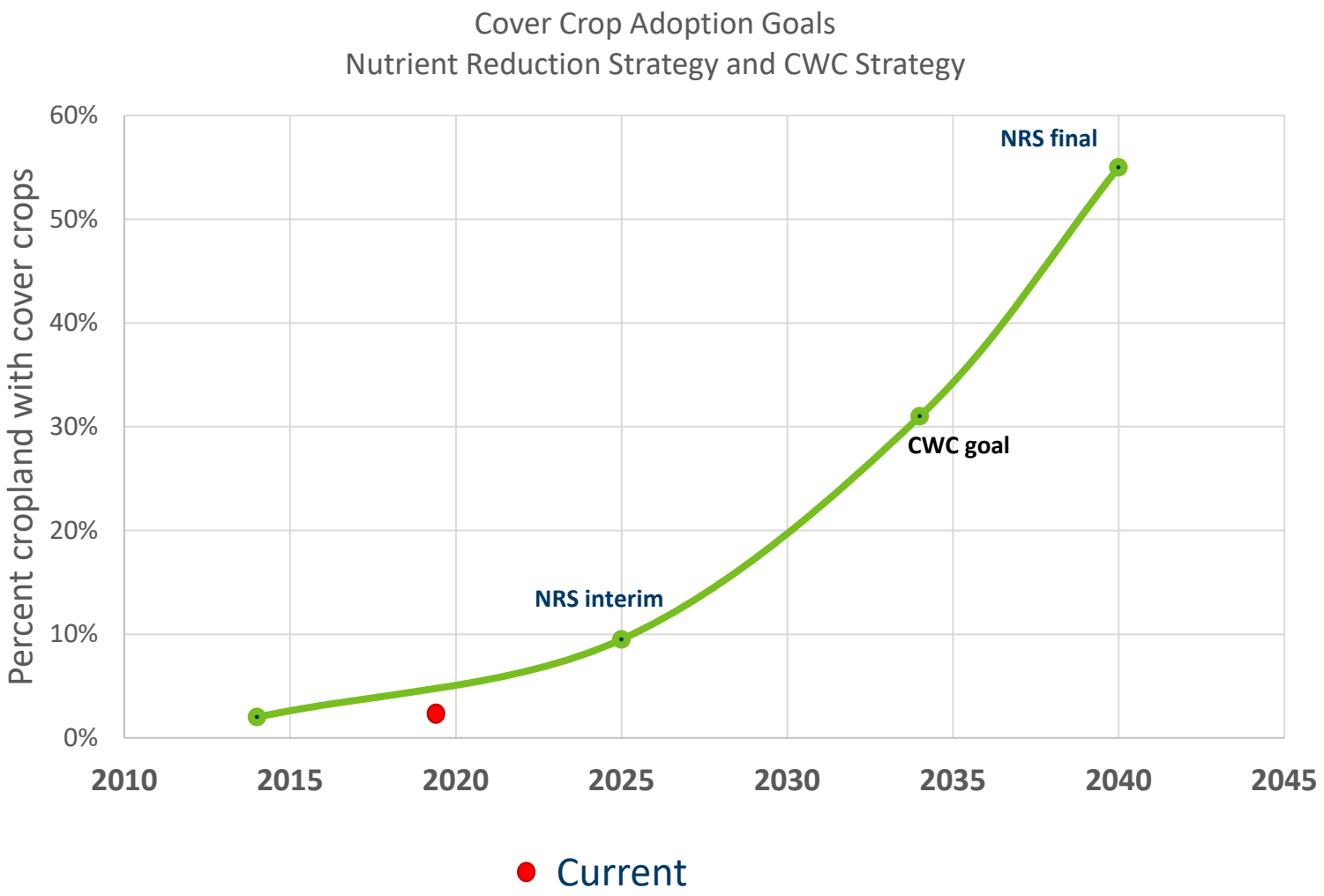
**Nutrient Management (69,134 acres total)**
Managing the amount, form, placement, and timing of nutrient and soil amendments such that nutrients are used most efficiently by the crops, at the same time minimizing leaching and runoff to surface and ground water.

# **Statewide tracking example**: New acres of living cover added each year through gov't programs

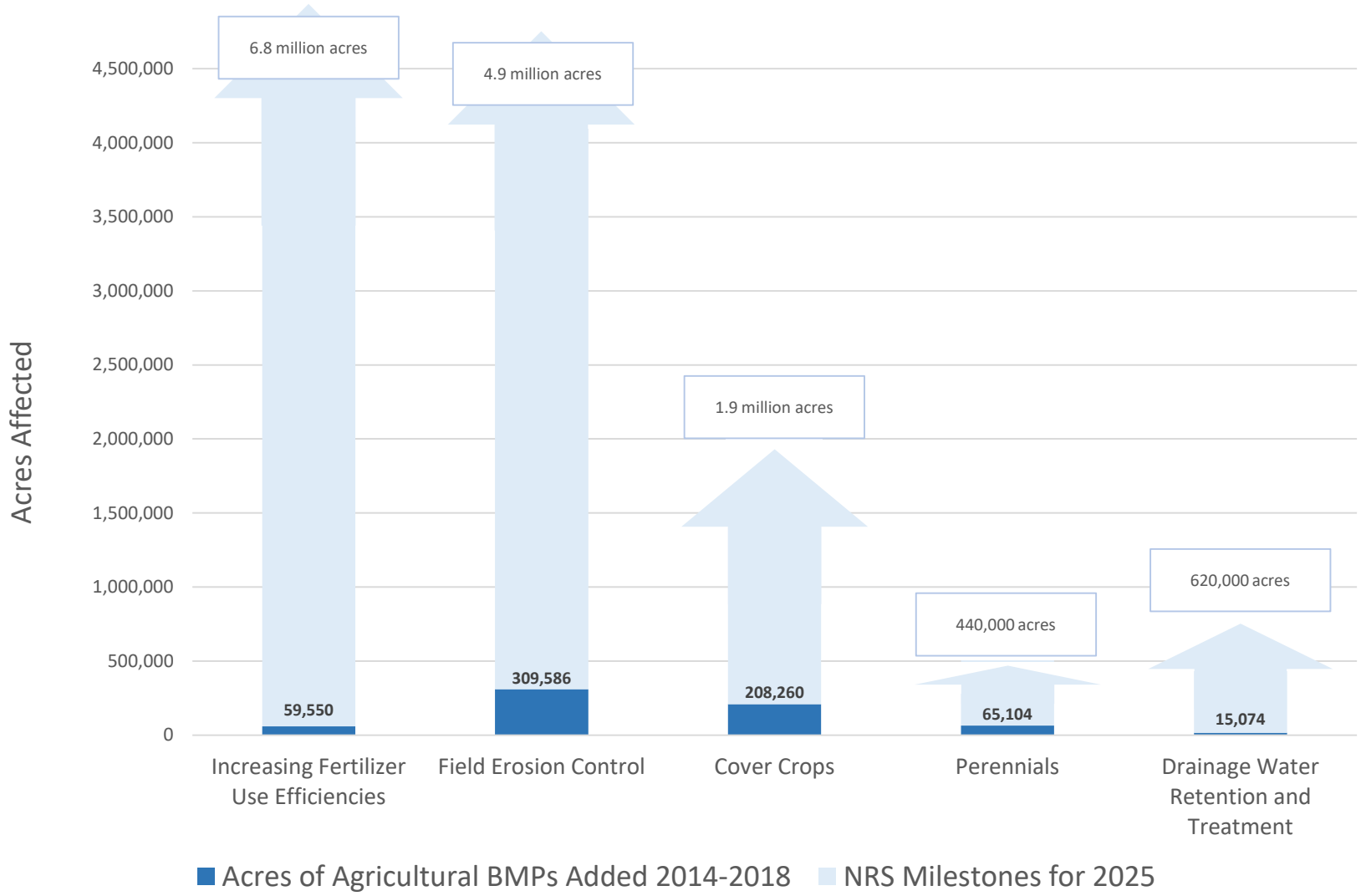
**Note: This is not cumulative.** Rather, it shows new additional acres signed up for each given year



# Practices needing widespread increased adoption



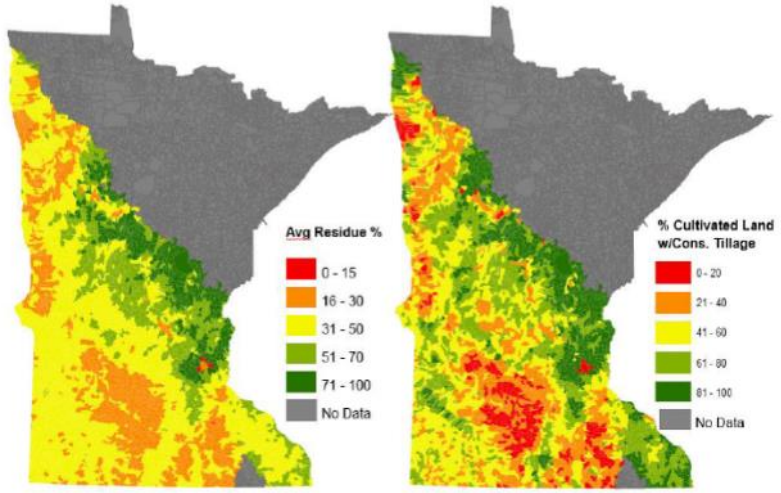
# Government program BMPs (2014-18) compared to Nutrient Reduction Strategy milestone scenario for 2025



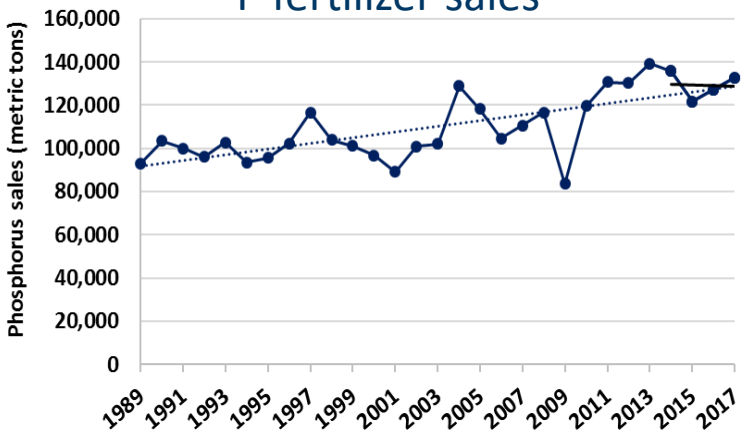

Note: dark blue acres do not include private adoption outside of government programs

# Multiple indicators in combination start to tell a story

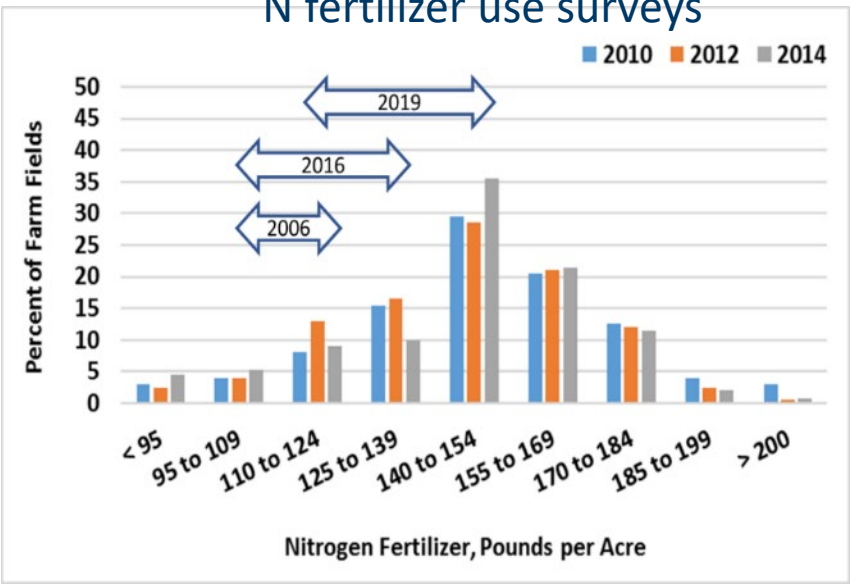
## Crop residue cover - satellite



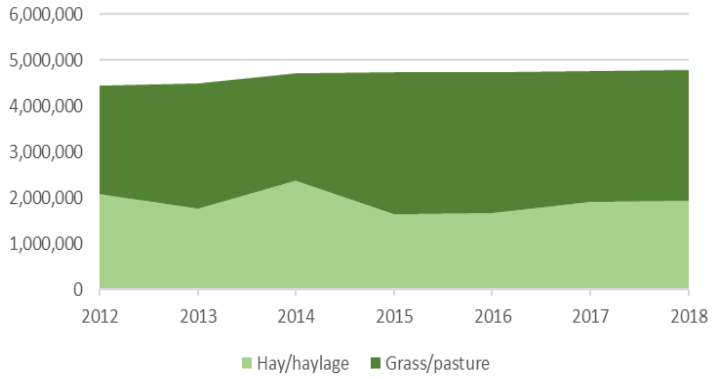

## P fertilizer sales



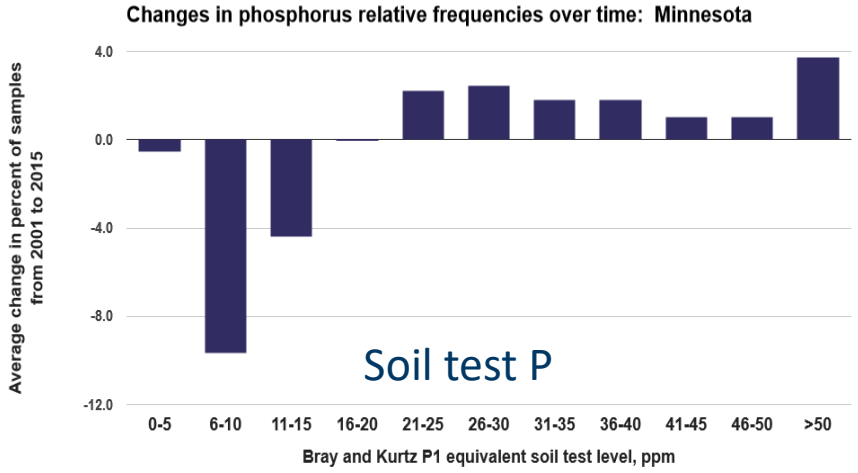

## N fertilizer use surveys



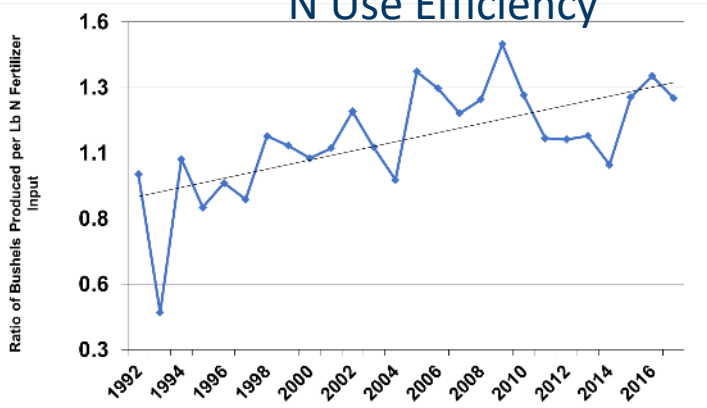

## Grass, pasture, hay - satellite




## Soil test P




## N Use Efficiency



# How can we tell if practices are being adopted at needed scales?

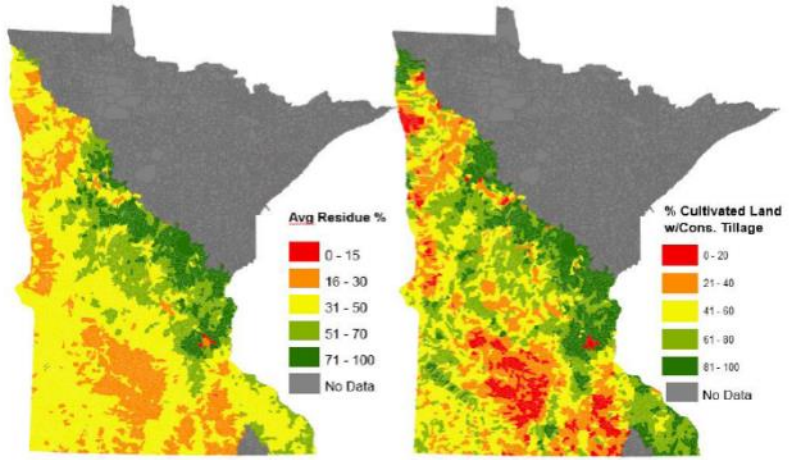
A. Adoption through government support programs (previous 3 slides)

B. Indicators of broader overall adoption

   1. Census of Agriculture and surveys
   2. Satellite imagery
   3. Fertilizer sales
   4. Nutrient use efficiency trends

C. Permitting – reporting & inspections

In combination indicates MN is falling short of Nutrient Strategy BMP scenarios



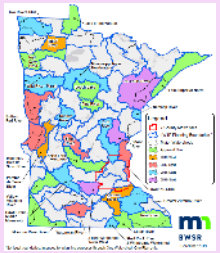
# **Presentation Outline**: trends in the water

**Progress Part 1**

Large-scale Program Advances


**Progress Part 2**

Local Watershed Approach



**Progress Part 3**

Changes in Rural & Urban Lands

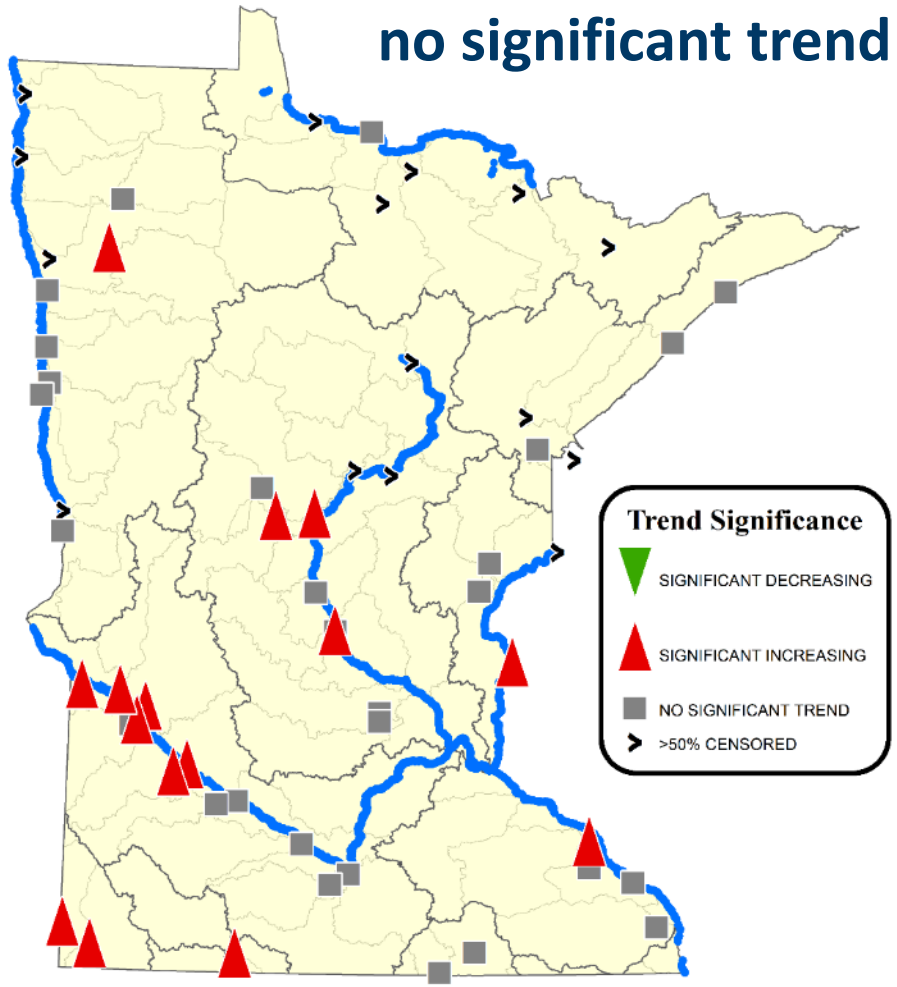
**Progress Part 4**

Changes in Water

# 10-year nutrient concentration trends

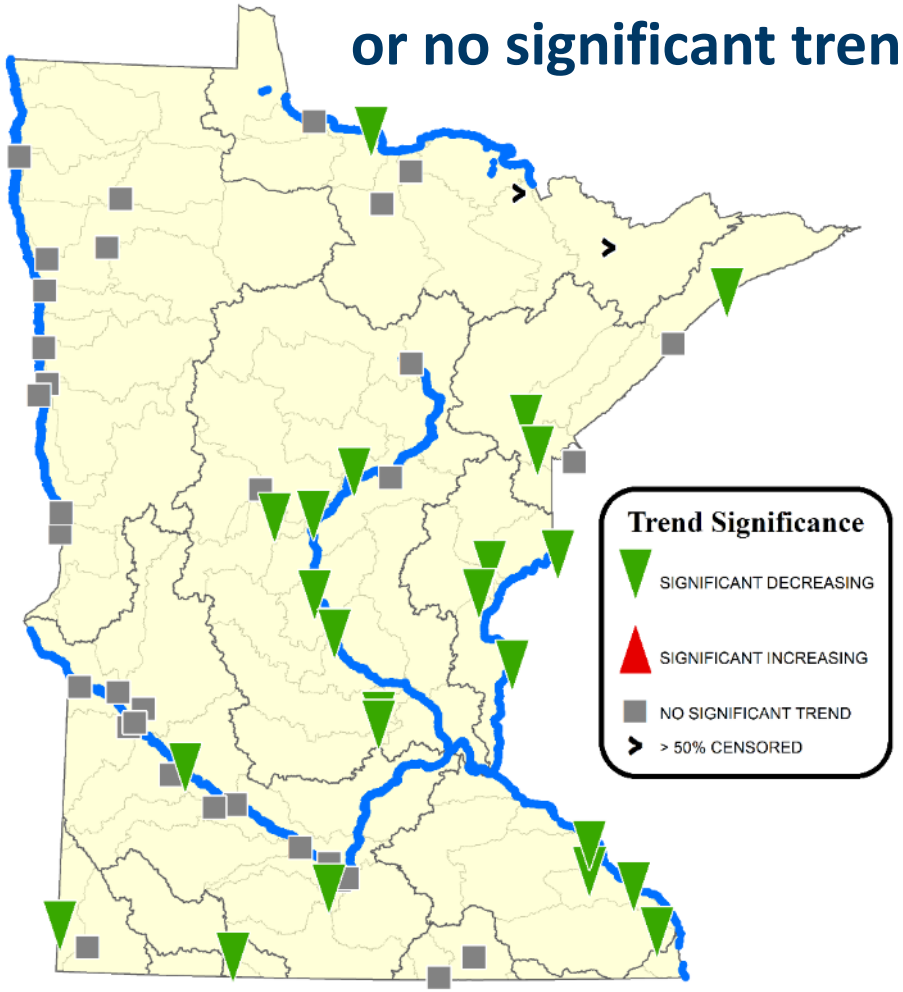
Nitrate + Nitrite
2008-2017

**Nitrate – increasing or no significant trend**




Total Phosphorus
2008-2017

**Phosphorus – decreasing or no significant trend**



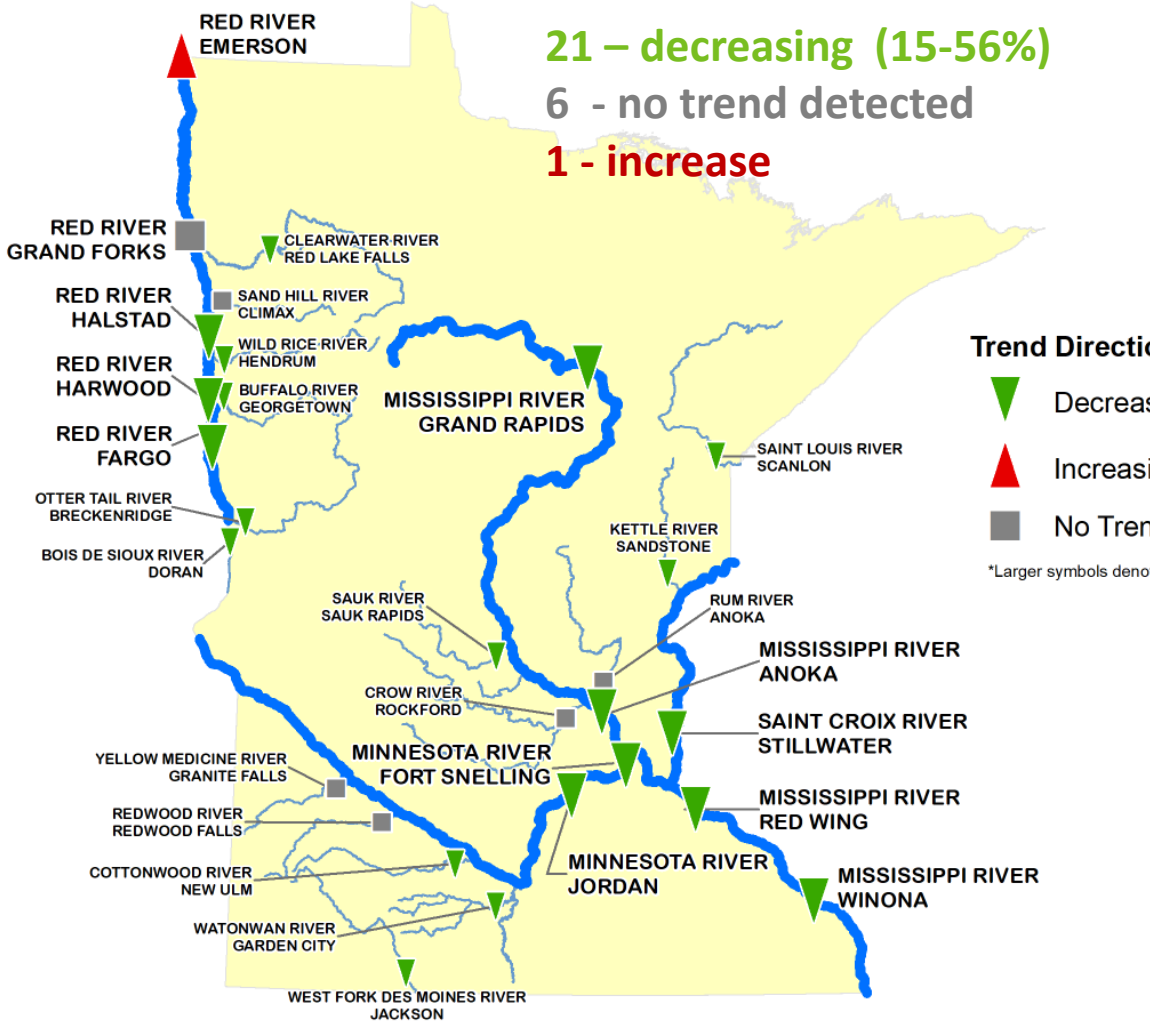
# 20-year nutrient concentration trends

## Phosphorus (~1999-2018)

21 – decreasing (15-56%)

6 - no trend detected

1 - increase

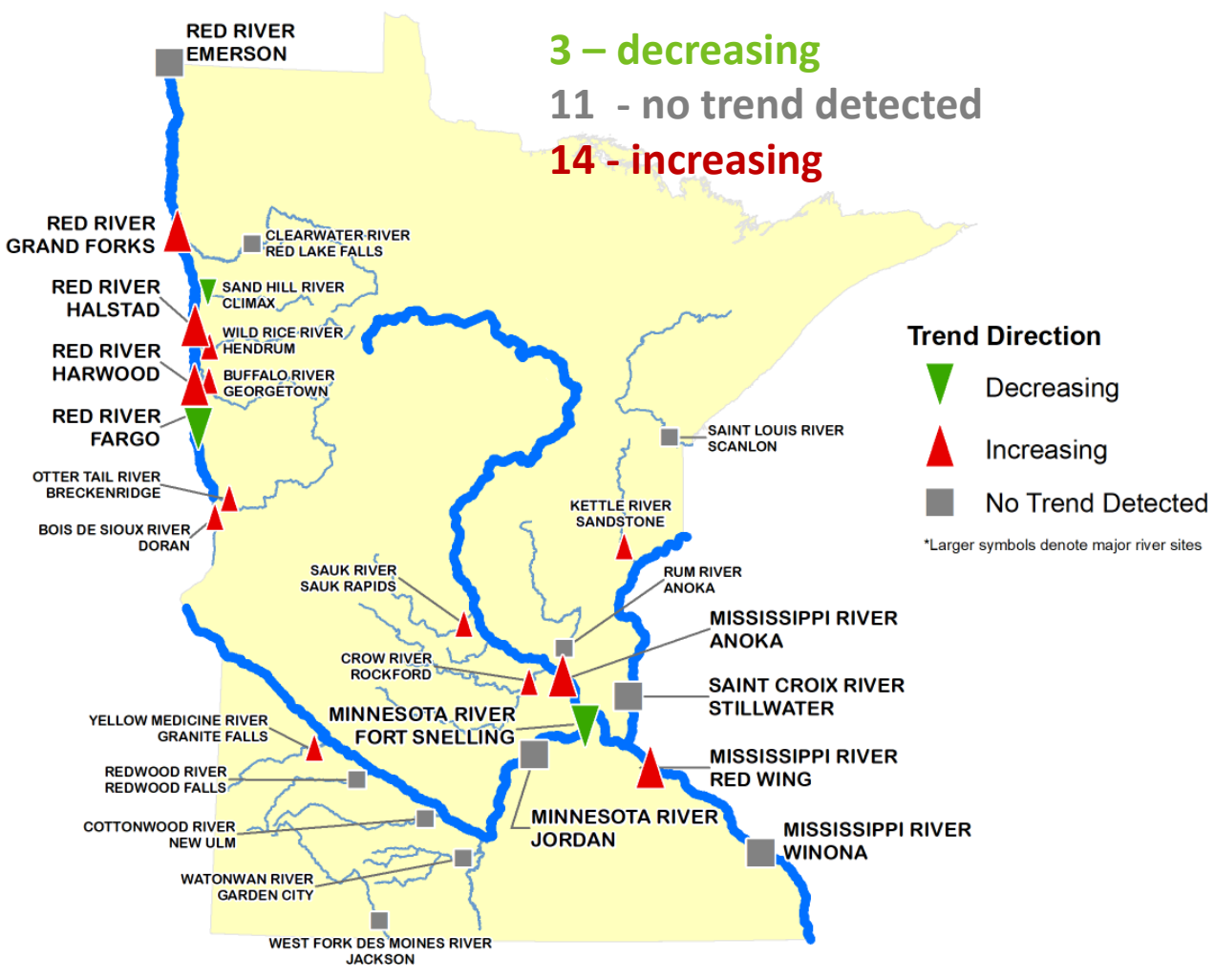



## Nitrate (~1999-2018)

3 – decreasing

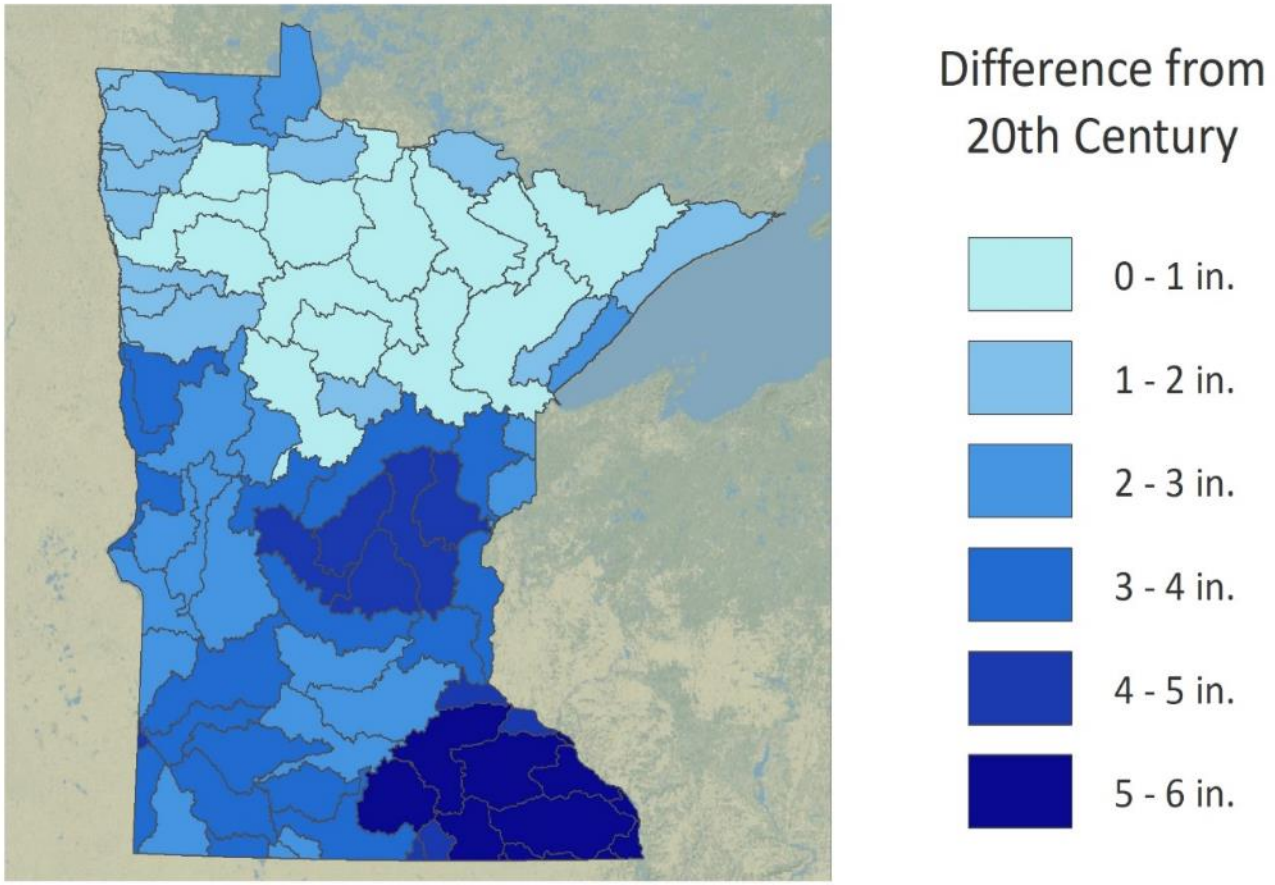
11 - no trend detected

14 - increasing



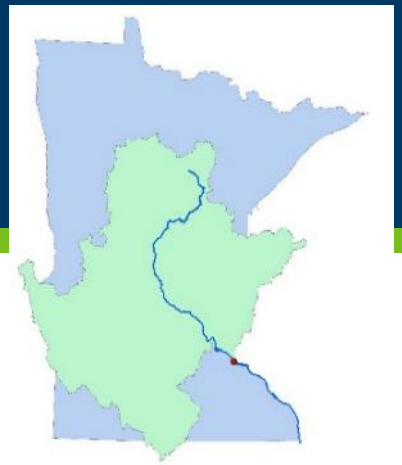
# More precipitation leading to higher nutrient loads

## Annual Precipitation Departure, 2000 - 2019



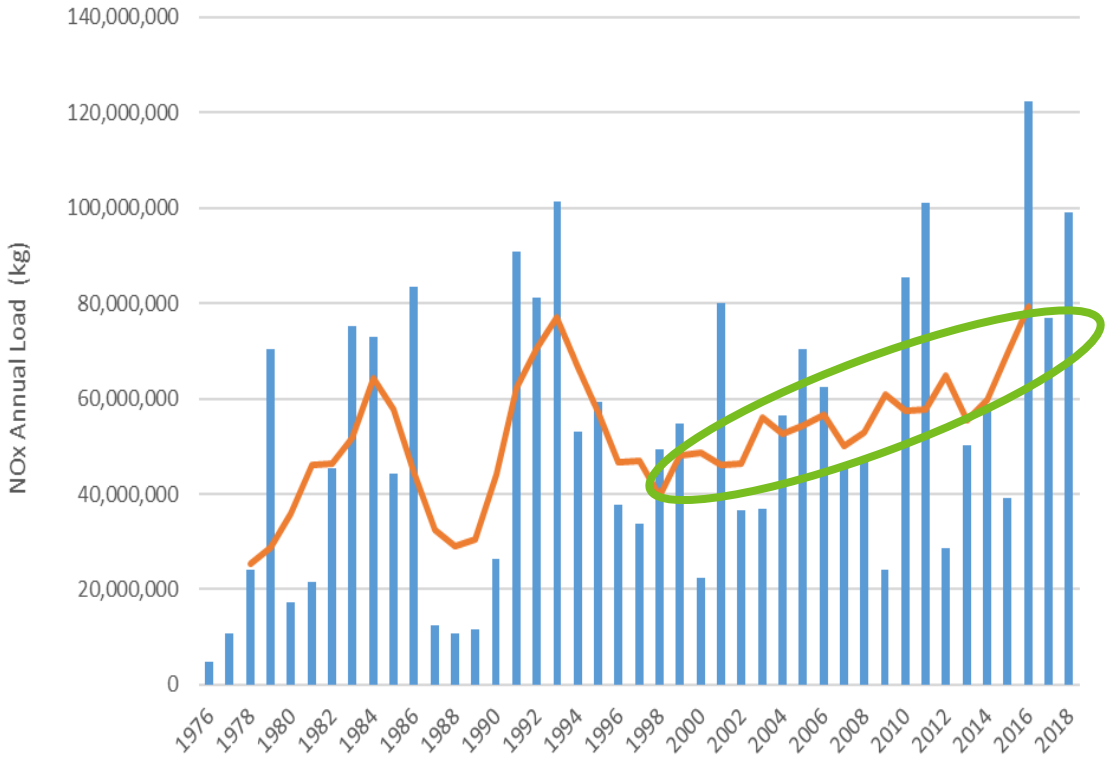

Source:

DNR State Climatology Office and the DNR Watershed Health Assessment Framework

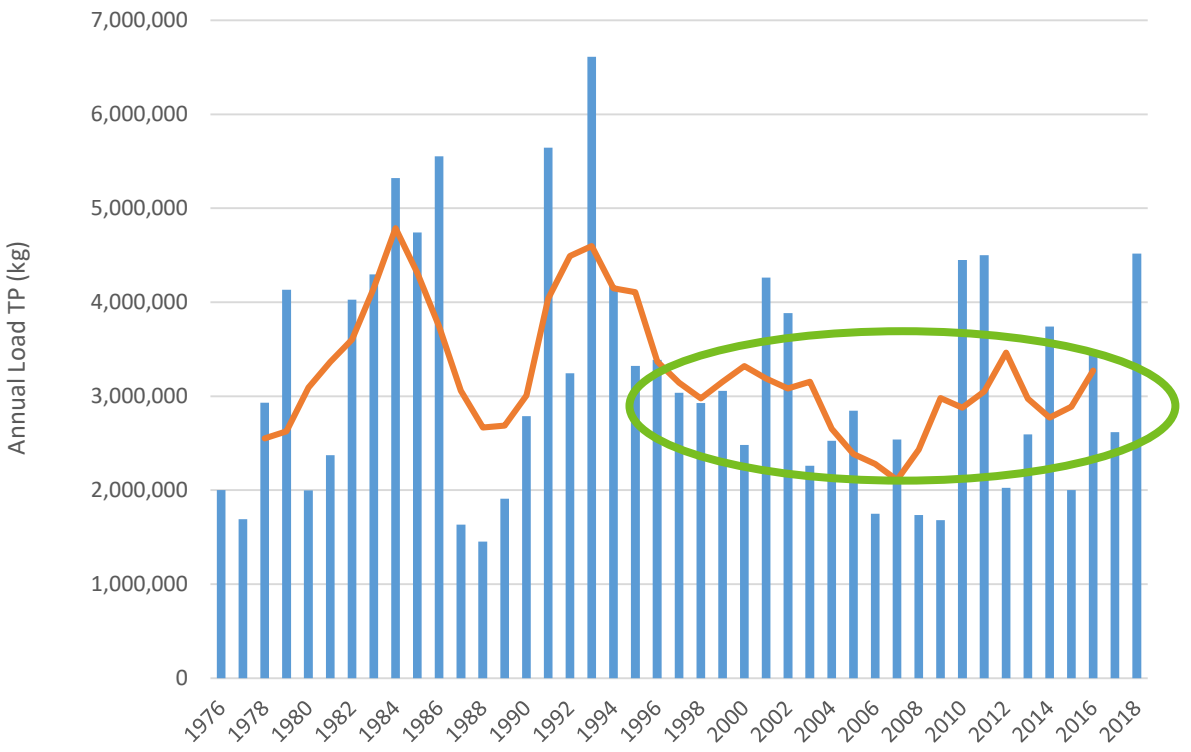


# Nitrate and phosphorus loads
## Mississippi River at Red Wing

### Nitrate loads increasing since late 1990's

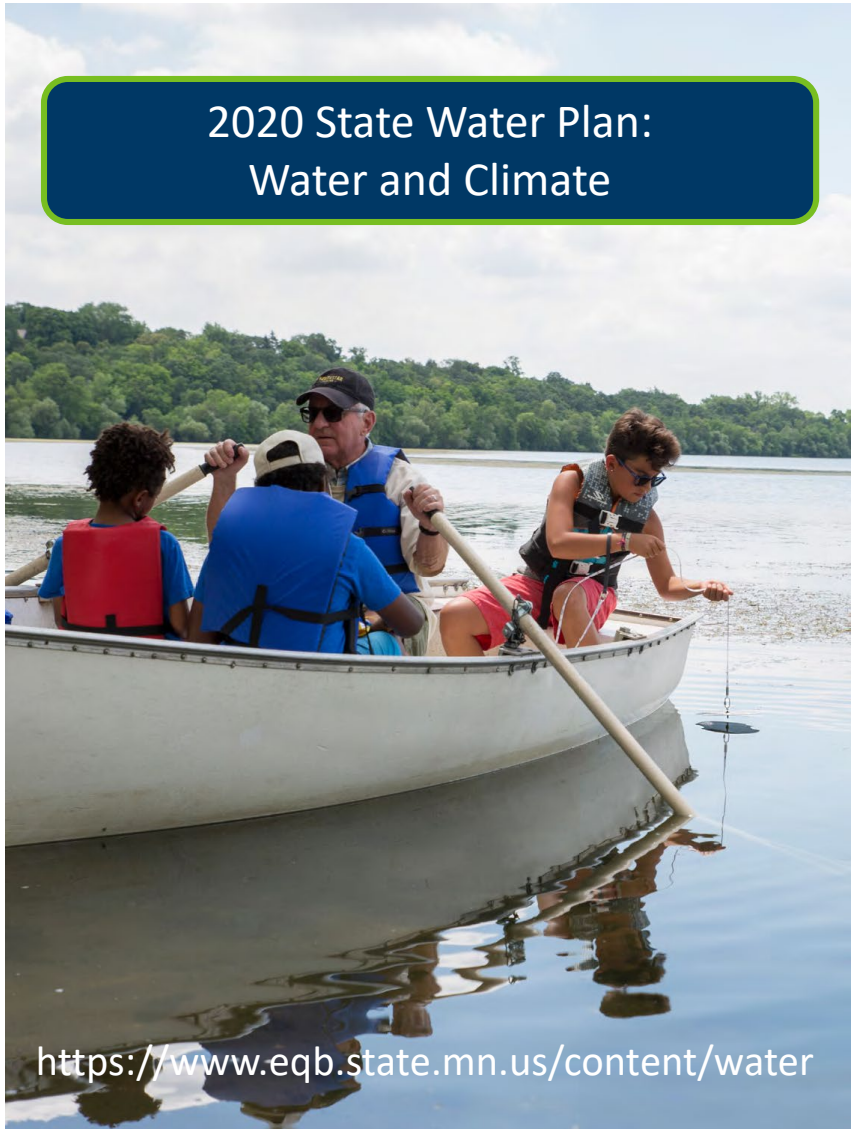



### Phosphorus loads with no detected trend since late 1990's



# In Conclusion

- 5-year progress report recently completed
- Advanced 30+ large-scale programs affecting nutrients
- Agricultural BMP adoption not keeping pace with scenarios outlined in nutrient strategy
- Wastewater – over 70% reduction in phosphorus; nitrogen is now highly-monitored
- River phosphorus concentrations decreased 20-50% (20 yrs) – but higher river flows offsetting load reductions
- River nitrogen concentrations and loads increasing by over 25% (20 yrs)
- **10-year Minnesota State Water Plan (Sept. 2020)**
  - Combining nutrient & climate practices to reduce & mitigate effects of climate change



# Thank You!

www.pca.state.mn.us/water/nutrient-reduction-strategy

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CLEAN WATER LAND & LEGACY AMENDMENT

H2Ohio

2020 ILLINOIS NLRS PARTNERSHIP WORKSHOP
NOVEMBER 6, 2020

JOHN MATHEWS
OHIO EPA– DIVISION OF SURFACE WATER

# Lead Up To H2Ohio

## 2000 – 2010

- Increase in Harmful Algal Blooms (HAB) in Western Lake Erie Basin

## 2010

- Ohio Phosphorus Task Force Report
- HAB closes Grand Lake St. Marys beaches

## 2013

- Ohio Farm Bureau Federation – Healthy Waters Initiative
- Ohio Nutrient Reduction Strategy
- Ohio Phosphorus Task Force Report II

# Lead Up To H2Ohio

## 2015

- Additions to Ohio's Nutrient Reduction Strategy

## 2019

- Gov. DeWine pushes water quality as a top priority and supports long-term funding
- July 2019 H2Ohio established in state biennium budget

## 2020

- First sign-up for H2Ohio for agricultural practices.
- Ohio Agricultural Conservation Initiative

OACI
Ohio Agriculture Conservation Initiative

THE FERTILIZER INSTITUTE
OSIA
National Center for Water Quality Research
Ohio AgriBusiness Association
Ohio Federation of Soil and Water Conservation Districts
OHPORK OHIO PORK COUNCIL
Ohio Environmental Council
American Farmland Trust SAVING THE LAND THAT SUSTAINS US
FARM BUREAU
OHIO SOYBEAN COUNCIL
EDF ENVIRONMENTAL DEFENSE FUND Finding the ways that work
OHIO POULTRY ASSOCIATION
The Nature Conservancy
Ohio Corn&Wheat
Ohio Cattlemen's Association

**The *Ohio Agriculture Conservation Initiative (OACI)* is an unprecedented partnership between agriculture, conservation, environmental, and research communities to recognize farmers for their dedication to utilize established methods to improve water quality in Ohio and to increase the number of best management practices being implemented on farms.**

- Create a universally **recognized farmer certification program**, with a pilot program beginning in early 2020, that will help increase adoption of best management practices and recognize farmers who demonstrate a commitment to continuous improvement.
- Create a **confidential farm practices assessment** that will benchmark best management practices adoption and track progress toward our goals

# Available Cash for the State Fiscal Biennium 2020-2021

**(SFB: July 1, 2019 – June 30, 2021)**

**ODA: $30.3 million**

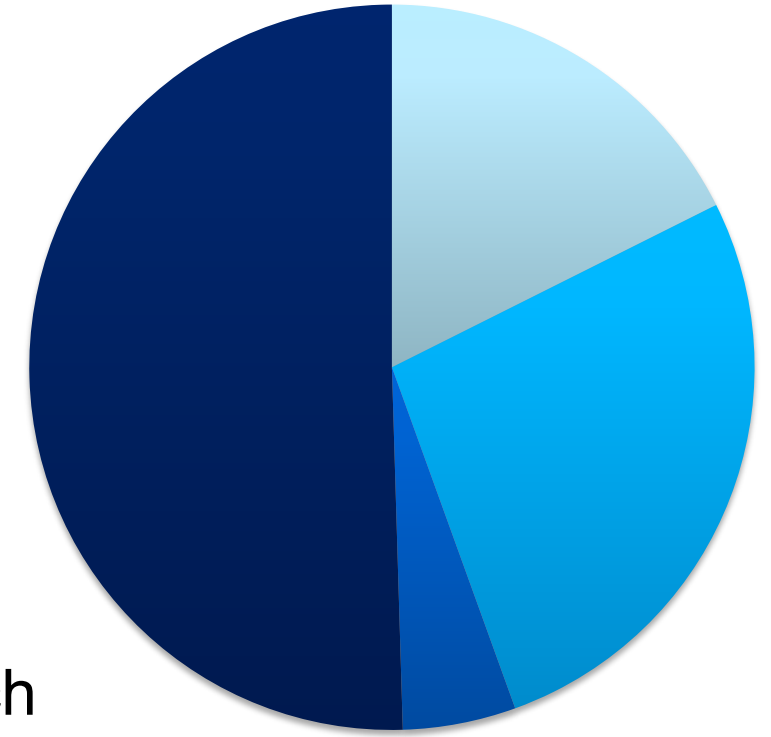
Agricultural best management practices for water quality

**ODNR: $46.2 million**

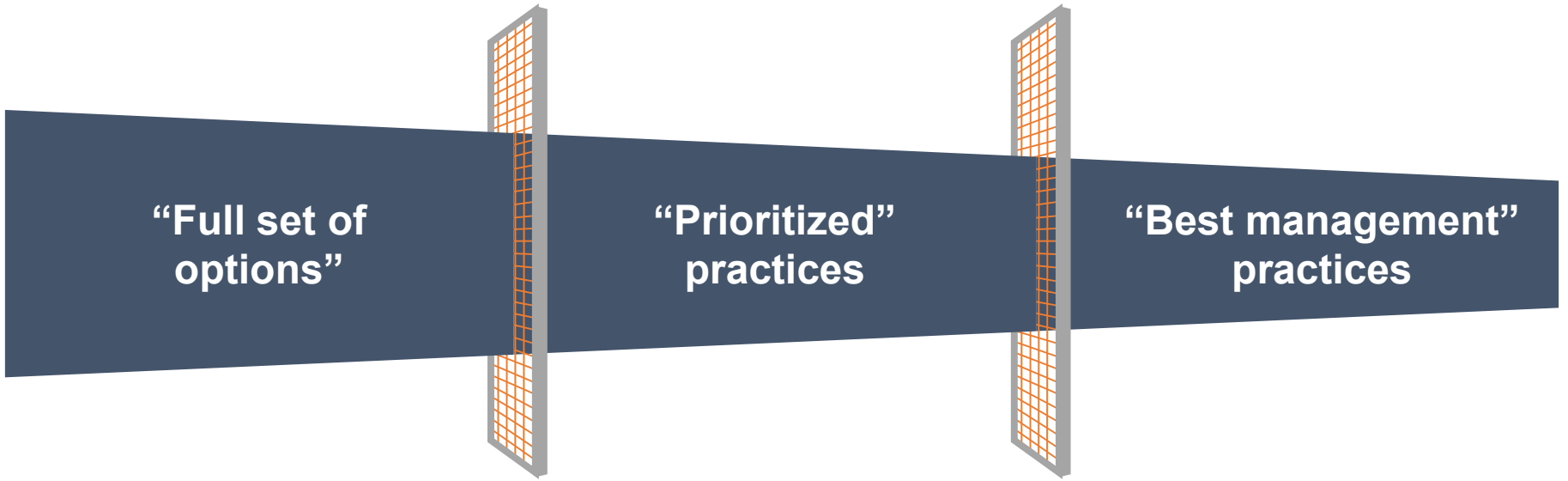
Support, maintain and create wetlands throughout the state

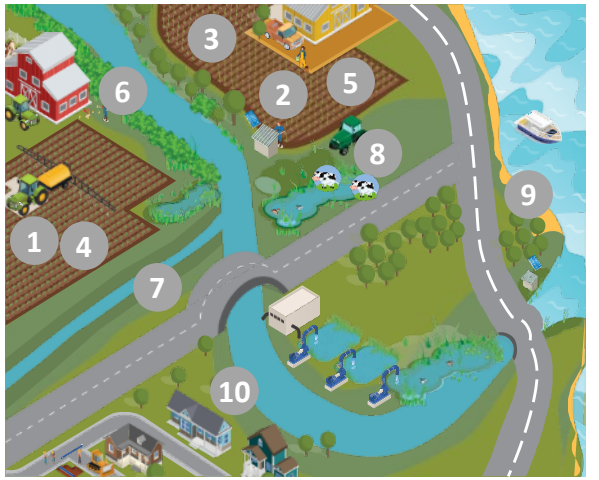
**Ohio EPA: $8.675 million**

Support watershed planning, scientific research and data collection, infrastructure improvements addressing lead, and technology R&D



# H2Ohio used science and economics to identify 10 practices that achieve 40% phosphorus reduction




**100+**

of phosphorus reduction practices based on agronomic & scientific research

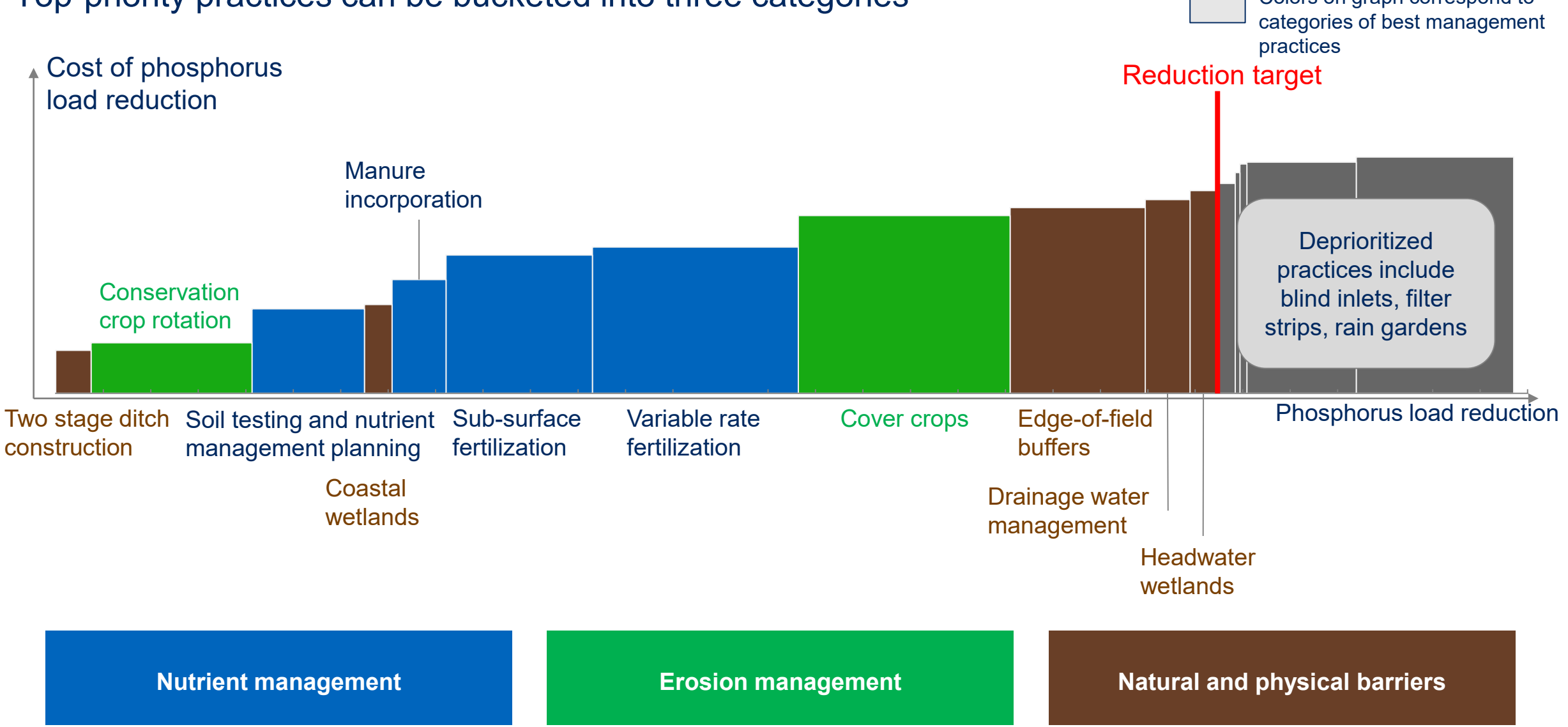
**30+**

Management practices chosen for impact potential based research, interviews, & quantitative modeling

**10**

Best management practices that will play a major role in reducing phosphorus runoff by 40%

# Top-priority practices can be bucketed into three categories



H2Ohio

# Phosphorus Reduction Best Practices

1. Soil testing
2. Variable-rate fertilization
3. Subsurface nutrient application
4. Manure incorporation
5. Conservation crop rotation
6. Cover crops
7. Drainage water management
8. Two-stage ditch construction
9. Edge-of-field buffers
10. Wetlands

# Ten Cost Effective Practices

1

**Voluntary Nutrient Management Planning:** Nutrient management plans give farmers information on where to place fetilizer, when, and how much.

2

**Variable-rate fertilization:** Applying specific fertilizer levels based on the need of each sub-acre to reduce fertilizer application without risk of losing yield.

3

**Subsurface nutrient application:** Applying specific fertilizer below the surface to reduce nutrient loss.

4

**Manure incorporation:** Mixing manure into the soil to keep it in place and minimize nutrient loss.

5

**Conservation crop rotation:** Planting certain crops that reduce erosion and enrich the soil thus reducing runoff and sediment delivery.

6

**Cover crops:** When planted after the main harvest, cover crops reduce erosion, hold nutrients in the soil, and improve soil health.

7

**Drainage water management:** Slowing down runoff to give phosphorus more time to settle back in the soil.

8

**Two-stage ditch construction:** Creating modified drainage ditches to slow water flow and allow the phosphorus to settle.

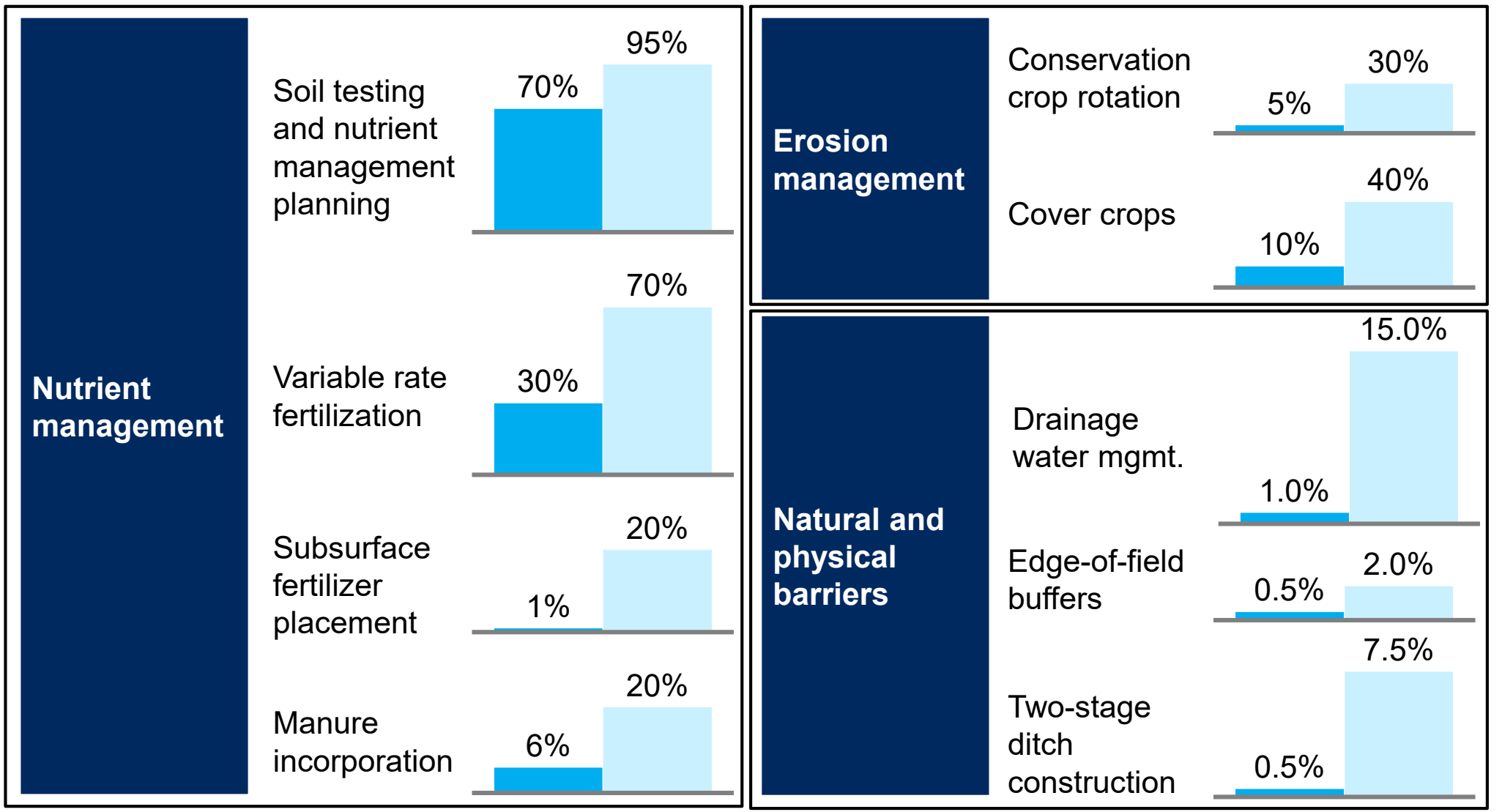
9

**Edge-of-field buffers:** When trees, shrubs or strips of grass are planted along farm fields in the right place, the plants hold on to phosphorus and prevent its release into the water.

10

**Wetlands:** Wetland vegetation and soils absorb phosphorus, slow down the movement of water, offer a natural filtering process, and allow phosphorus to settle.

# **Goals for agricultural best practices**: significantly increasing adoption rates of the highest priority practices can help meet reduction targets



**Staged launch**: H2Ohio at ODA will start in Maumee before expanding to the rest of Ohio

**2020:** Maumee sub-basin


**14 counties**

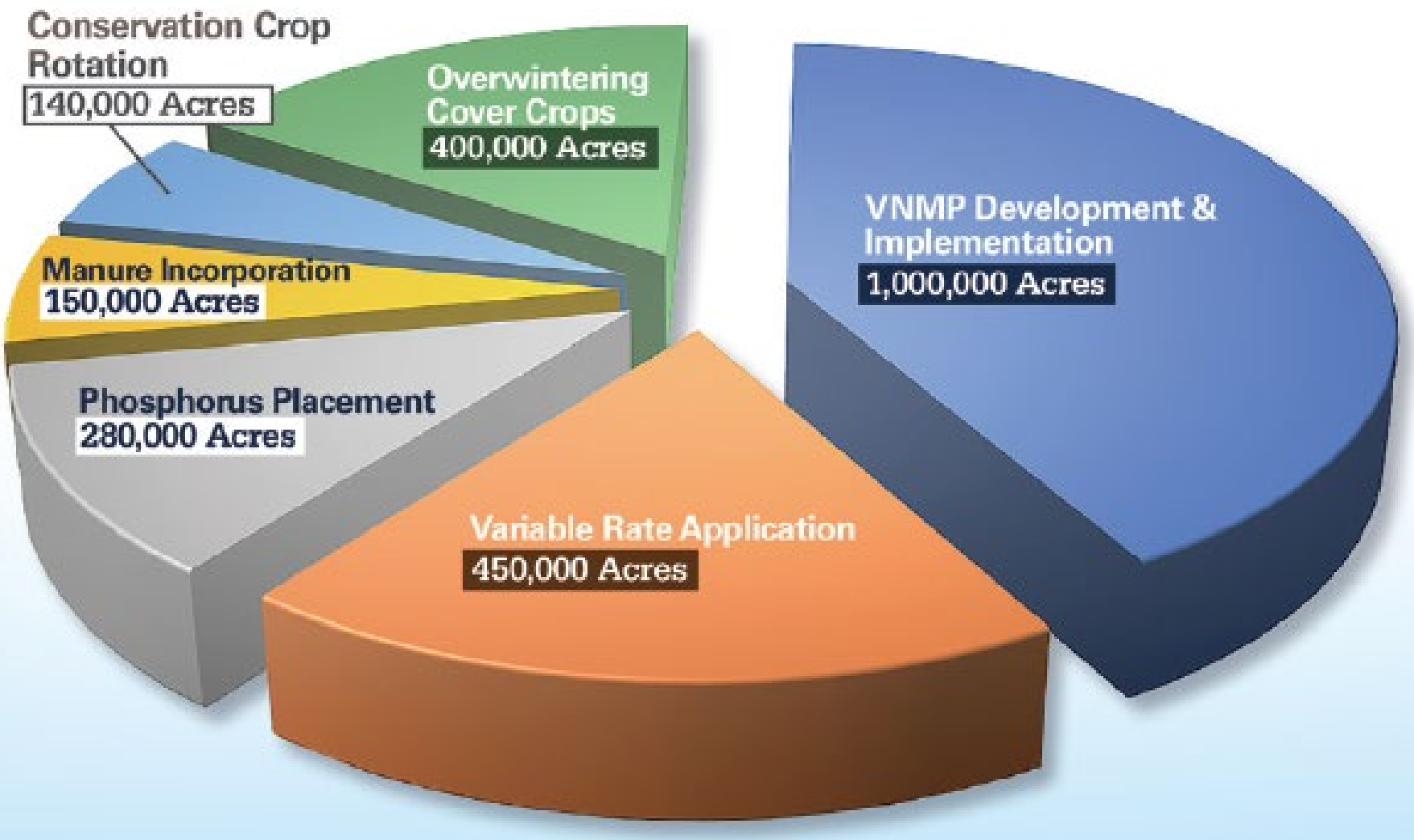
**2021:** Western Lake Erie Basin


**22 counties**

**2022:** entire state of Ohio


**88 counties**

# H2Ohio Cropland Practice Goals



# H2Ohio Statewide Projects


– Western Lake Erie Basin (WLEB)

– Maumee River Watershed

– Lake Erie/Ohio Watershed Divide

## Lake Erie Basin Projects

1 Cullen Park Wetland Restoration
2 Grassy Island Flow-through Wetland Restoration
3 Maumee Bay State Park Wetland Reconnection
4 South Shore Wetland Reconnection Projects
5 Muddy Creek Bay Wetland Restoration
7 Inner Bay Shoals & Islands Restoration
9 Inner Bay Coastal Wetlands Restoration
10 St. Joseph Confluence Wetland Reconnection
11 St. Joseph River Restoration Project
13 Oak Openings Preserve Wetland Restoration
15 Little Portage Nutrient Reduction & Coastal Wetland Restoration
16 Redhorse Bend Preserve Wetland Restoration
17 Forder Bridge Floodplain Reconnection
20 Oakwoods Nature Preserve Wetland Restoration Project
21 Oakwoods Nature Preserve Wetland Restoration Project
22 Fruth Outdoor Center Wetland Restoration
23 Andreoff Wetland Restoration
24 Sandusky River Headwaters Preserve Wetland & Habitat Restoration
25 Van Order Wetland & Forest Restoration
26 Navarre March Wetland Restoration & Reconnection

## Ohio River Basin Projects

A Burntwood-Langenkamp Wetland Conservation Area
B Brooks Park Wetland Creation & Water Quality Initiative
D East Fork Lake Nutrient Reduction & Wetland Initiative

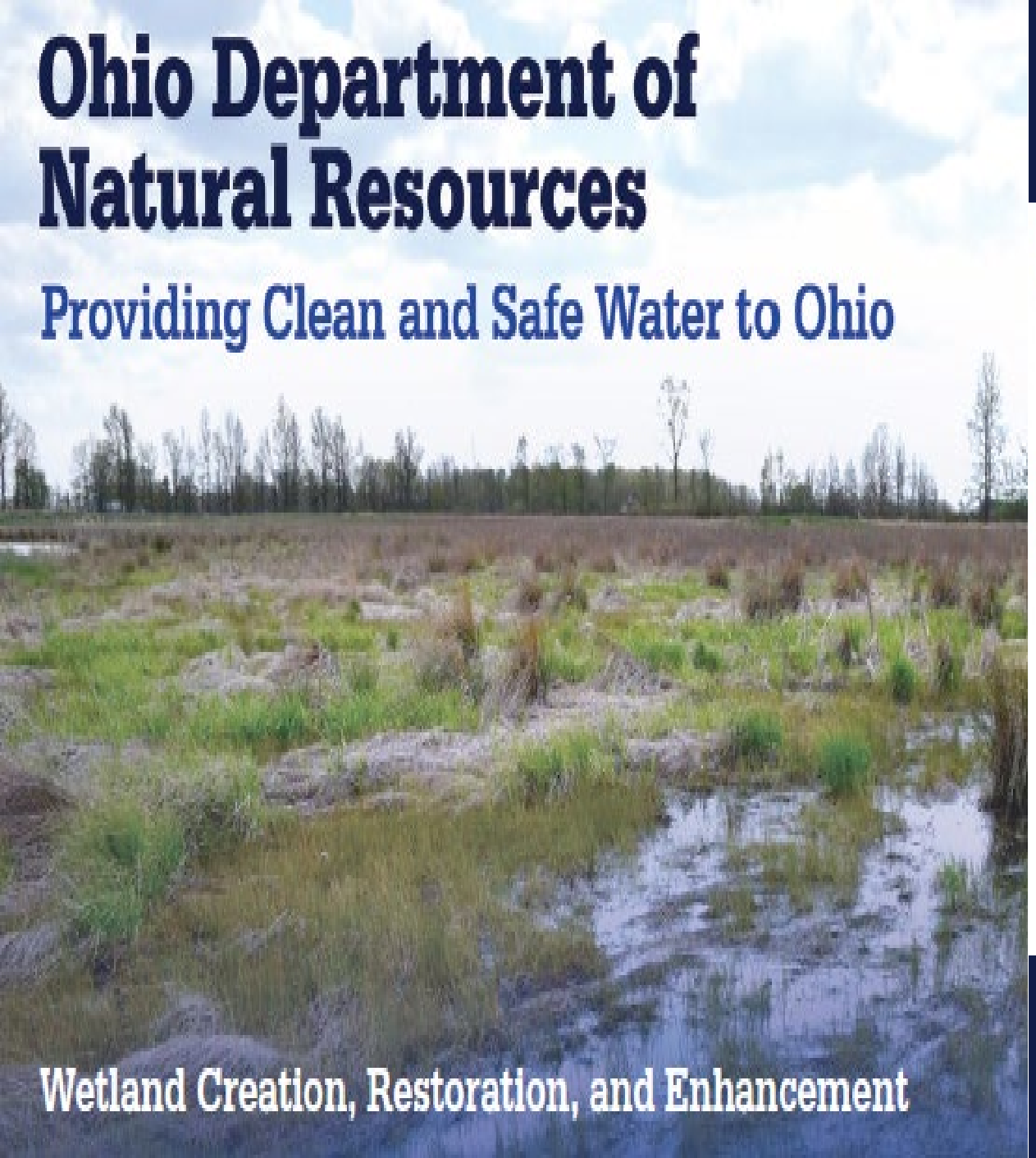
- Coastal Projects

- WLEB and Other Statewide Projects

**A brief description of each ODNR H2Ohio project follows.**

# Ohio Department of Natural Resources

## Providing Clean and Safe Water to Ohio



## Wetland Creation, Restoration, and Enhancement

**$3.3 Million**
allocated to establish an independent project monitoring program

**26**
wetland projects in contract

**90**
number of Ohio threatened or endangered species dependent on wetlands; many will benefit from this additional habitat

**60,000**
acres of watershed filtered by wetland projects

**3,535**
wetland acres to be created, restored, or enhanced

**12**
nonprofit conservation partners engaged

**$28.9 Million**
to support wetland project implementation

# ODNR H2Ohio Prioritized wetland projects based on:

1) Priority location: Highest nutrient contributing watersheds first (Maumee River and Western Lake Erie Basin watersheds)

2) Those that receive drainage and may treat a large area of agricultural landscape,

3) Those having sizable wetland pool area relative to the contributing watershed, and

4) Those offer additional benefits, such as ease of design-build execution or assured long-term support from project partners.

# Ohio Environmental Protection Agency

## Providing Clean and Safe Water to Ohio

**$4,210,000**

For seven critical water and sewer projects

four drinking water projects in Columbiana, Coshocton, Noble, and Pike counties serving more than 4,000 people in rural Ohio.

three wastewater projects in Miami, Meigs, and Williams counties serving 600 people and 250 homes.

**180**

Home sewage treatment systems to be replaced

**185**

lead service lines to be replaced at daycares totalling $725,000

**Increased Monitoring and Data Collection**

installing an additional 20 rain gages to improve weather forecasting and rainfall estimates in northwest Ohio.

**$1,750,000**

Amount to go to seven local health districts for replacement of household sewage treatment systems

**$23 Million**

In leveraged local, state, and federal funds

Ohio has nearly one million homes served by household sewage treatment systems.

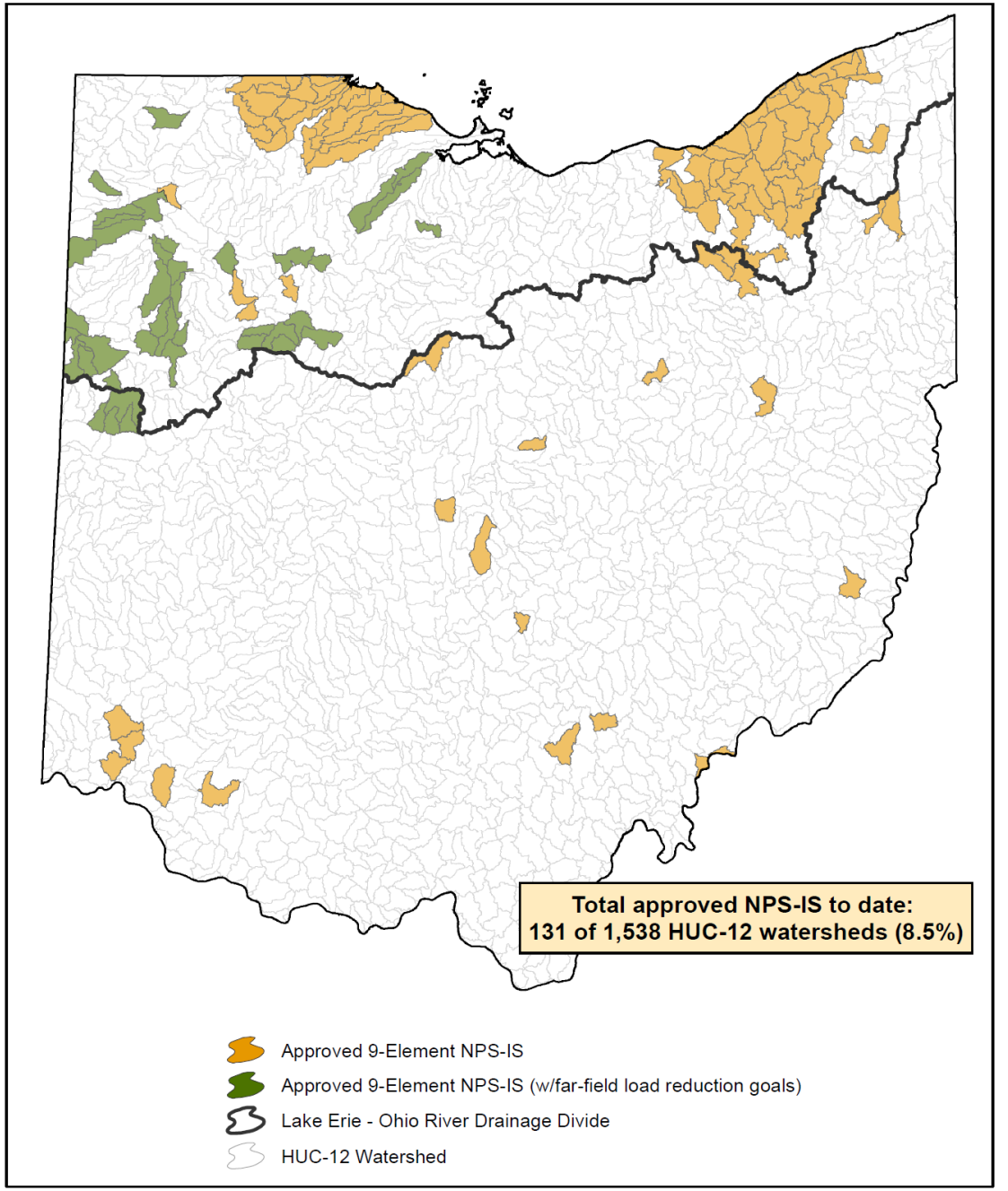
H2Ohio funds will repair and replace failing systems which contribute to poor water quality in Lake Erie.

The health departments in Erie, Ottawa, Paulding, Putnam, Sandusky, Williams, and Wood counties are receiving funds to repair or replace an estimated 180 systems.

# First Year Investments

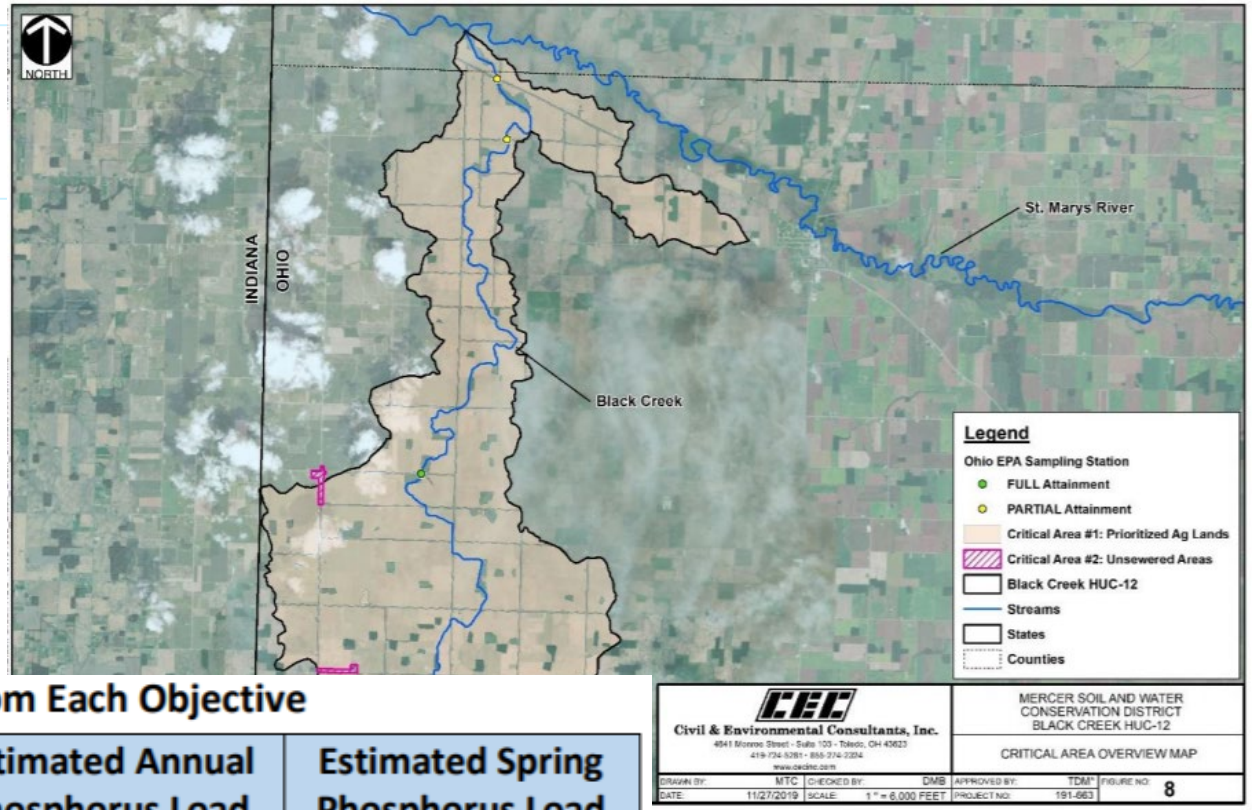
After the first year, the H2Ohio Initiative has invested $66,740,000 throughout Ohio on nutrient reduction, wetlands restoration, infrastructure construction, monitoring, and water technology.

# Increasing Nonpoint Implementation Strategies to the Ohio River Basin



# Increasing Nonpoint Implementation Strategies to the Ohio River Basin

# Black Creek Example




*2 Critical Area Overview*

**Table 13: Estimated Nutrient Loading Reductions from Each Objective**

| Objective Number | Best Management Practice | Total Acreage Treated | Estimated Annual Phosphorus Load Reduction (lbs) | Estimated Spring Phosphorus Load Reduction (lbs) |
|---|---|---|---|---|
| 1 | Grassed Waterways[a] | 1,100 | 440 | 280 |
| 2 | Drainage Water Management Structures and Saturated Buffers | 500 | 250 | 160 |
| 3 | Nutrient Management (Planning and Implementation)[b] | 10,000 | 6,000 | 3,900 |
| 4 | Wetlands[c] | 3,750[d] | 1,970 | 1,280 |
| 5 | Cover Crops | 8,600 | 1,200 | 780 |
| | **TOTAL** | **24,350*** | **9,860** | **6,400** |

*(Source Model: Spreadsheet Tool for Estimating Pollutant Loads (STEPL), Version 4.4, (USEPA, 2019))*

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