Bolstering Water Quality Monitoring and Modeling via the Minnesota Clean Water Legacy Act

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Presentation Outline

- Background and cooperative passage of CWLA
- Progress made in implementing CWLA
- Current expanded monitoring efforts
- New watershed monitoring, assessment, and management approach

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Why Impaired Waters are a Priority for Minnesota

- Most surface water of the 48 contiguous states
- Critical to $10 billion/year tourist industry, healthy agriculture and business economy
- Water quality top priority for public
- Number is growing: Approximately 40% of assessed waters found to be impaired
- Impacts on economic growth

Legacy Act History: Recognizing Challenges and Needs

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Legacy Act History: A Case Study on the Power of Partnerships

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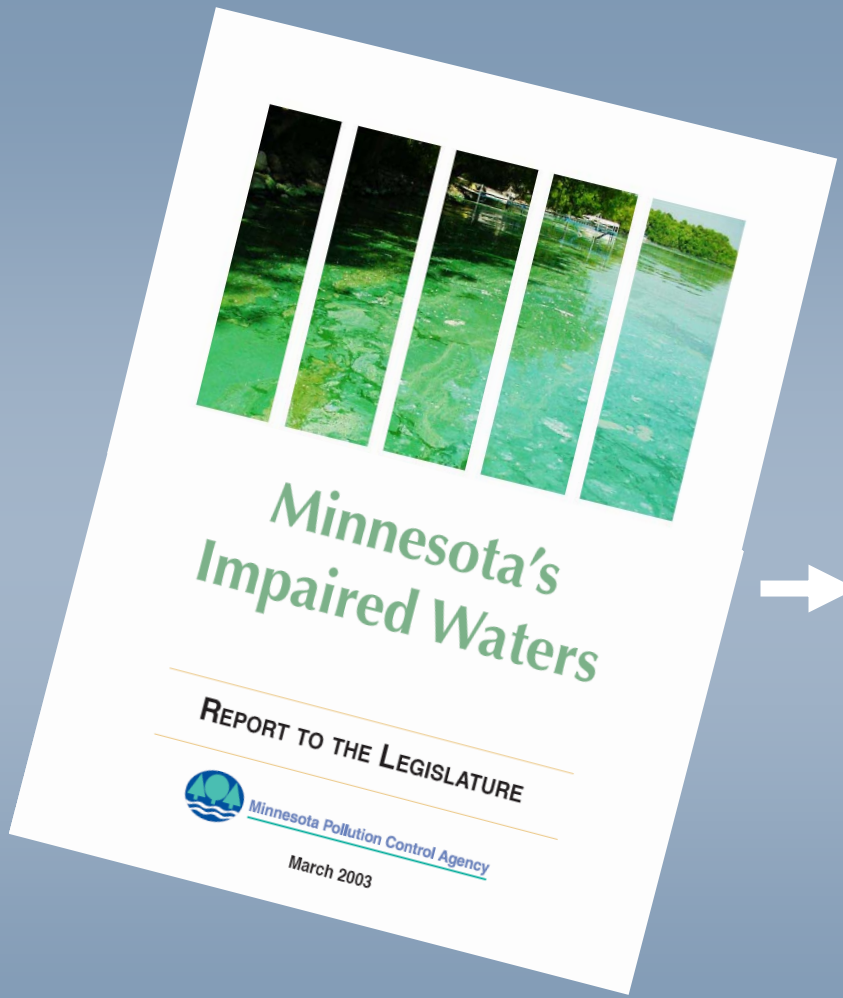

Impaired Waters Stakeholder Process

POLICY FRAMEWORK July 2003 – February 2004

MINNESOTA ENVIRONMENTAL INITIATIVE

Stakeholder process

- Governor outlined clean water vision in June 2003
- Policy Work Group organized (“Group of 16”)
- Partners Group (“Group of 40”)
- Public Stakeholder Input Group (200+)
- Process essential to:
  - bring diverse interests to the table
  - reach consensus on policy framework

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Stakeholder Groups

- Business
- Ag producer groups
- Environmental organizations
- Educational institutions
- Tribal governments
- Soil and Water Conservations Districts
- Watershed Districts
- Local units of government
- State agencies
- Federal agencies

Stakeholder process

- Stakeholder products needed to address:
  - Impaired waters program structure
  - Assessment needs
  - TMDL needs
  - Restoration activities
  - Funding options

2003 Key Policy Recommendations

- No new program established
- State leadership and coordination, local implementation
- Comprehensive assessment of state surface waters every 10 years
- Clear, understandable science supporting each TMDL
- Prevent new impairments
- Restoration must include monitoring for effectiveness
- Annual funding need ≈ $80 million in state fees; remaining $50 million leveraged from federal, private sources
- Clean Water Council to advise on funding, policy, and program

Summary of Annual Resource Needs

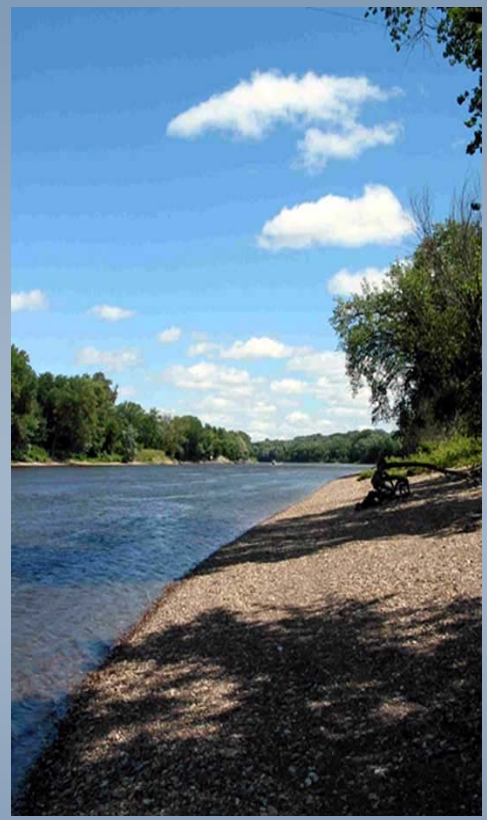
Activity	Annual need (millions)
Assessment (state coverage in 10 yrs)	**$8**
TMDL studies (2004 list)	**$9**
Nonpoint source restoration and protection	**$145 ($110–$180)**
Point source restoration and protection	**$108 ($54-$161)**
Total	**$270 ($182-$359)**

[1] Impairments for conventional pollutants only

[2] Annual restoration estimates for 10-year period

Clean Water Legacy Act

- Signed by the Governor in 2006
- Chapter 114D of state law
- Provided initial General Fund appropriation of $25 million for FY07
- $54 million FY08-09 appropriation for
  - Monitoring
  - TMDLs
  - Restoration
  - Protection



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CWLA Funding - one time General Fund appropriations

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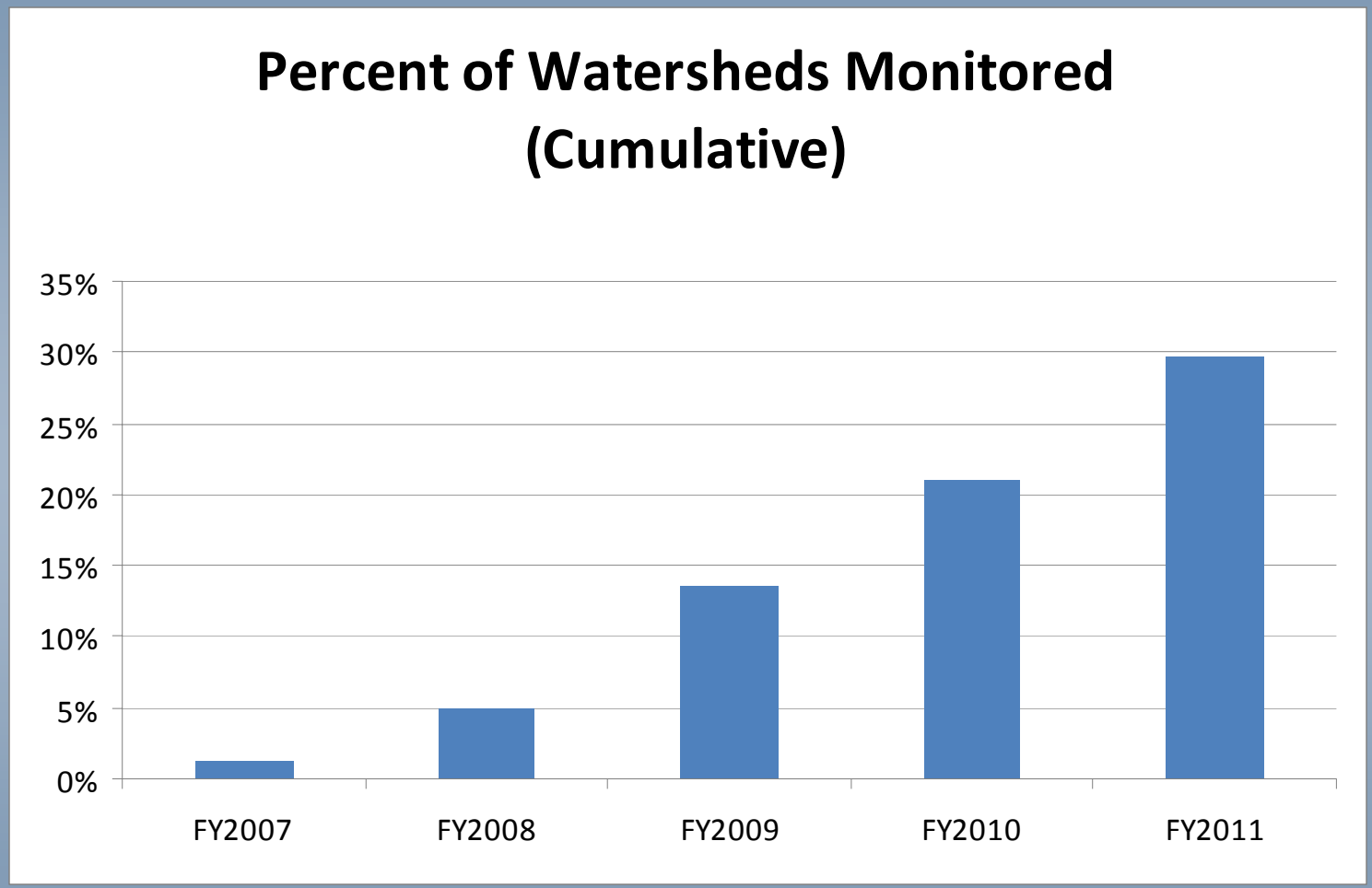
CWLA Total Appropriations:	Fiscal Year 2007 (millions $)	Fiscal Year 2008-09 (millions $)
Assessment & Monitoring Subtotal	$2.140	$14.524
TMDL Development Subtotal	$3.170	$20.610
Nonpoint Source Protection & Restoration Subtotal	$12.330	$20.341
Point Source Protection & Restoration Subtotal	$8.410*	$0.000*
TOTAL	$24.950	$53.975

Next Challenge: Long Term Dedicated Funding

- November ballot initiative approved by 2008 Legislature to dedicate portion of state sales tax to Clean Water, Natural Resources, Arts
- If approved by voters, $91 million annually will be allocated to Clean Water protection and restoration

Monitoring ramp-up due to CWLA Funding



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Stream Assessment ramp-ups due to CWLA funding

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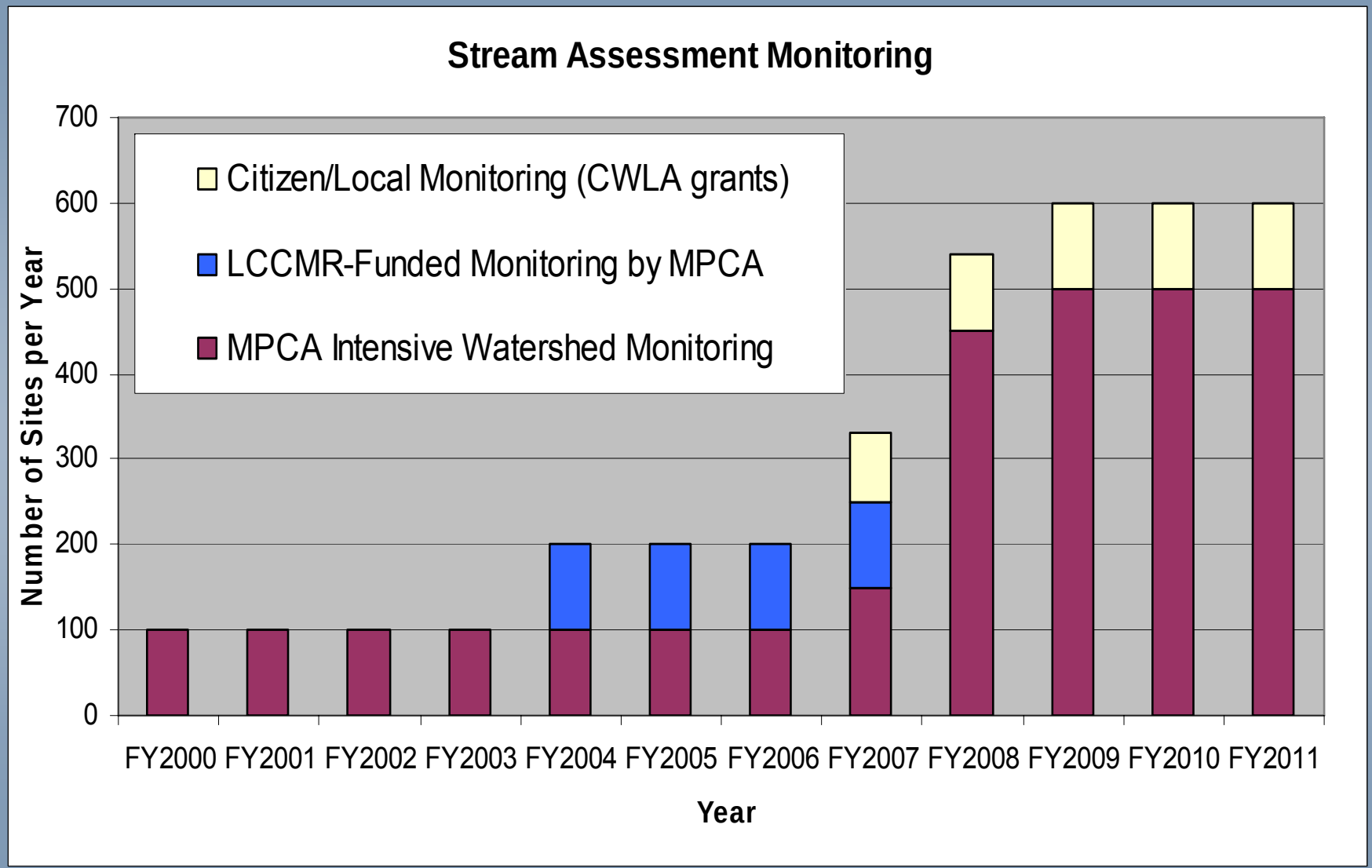
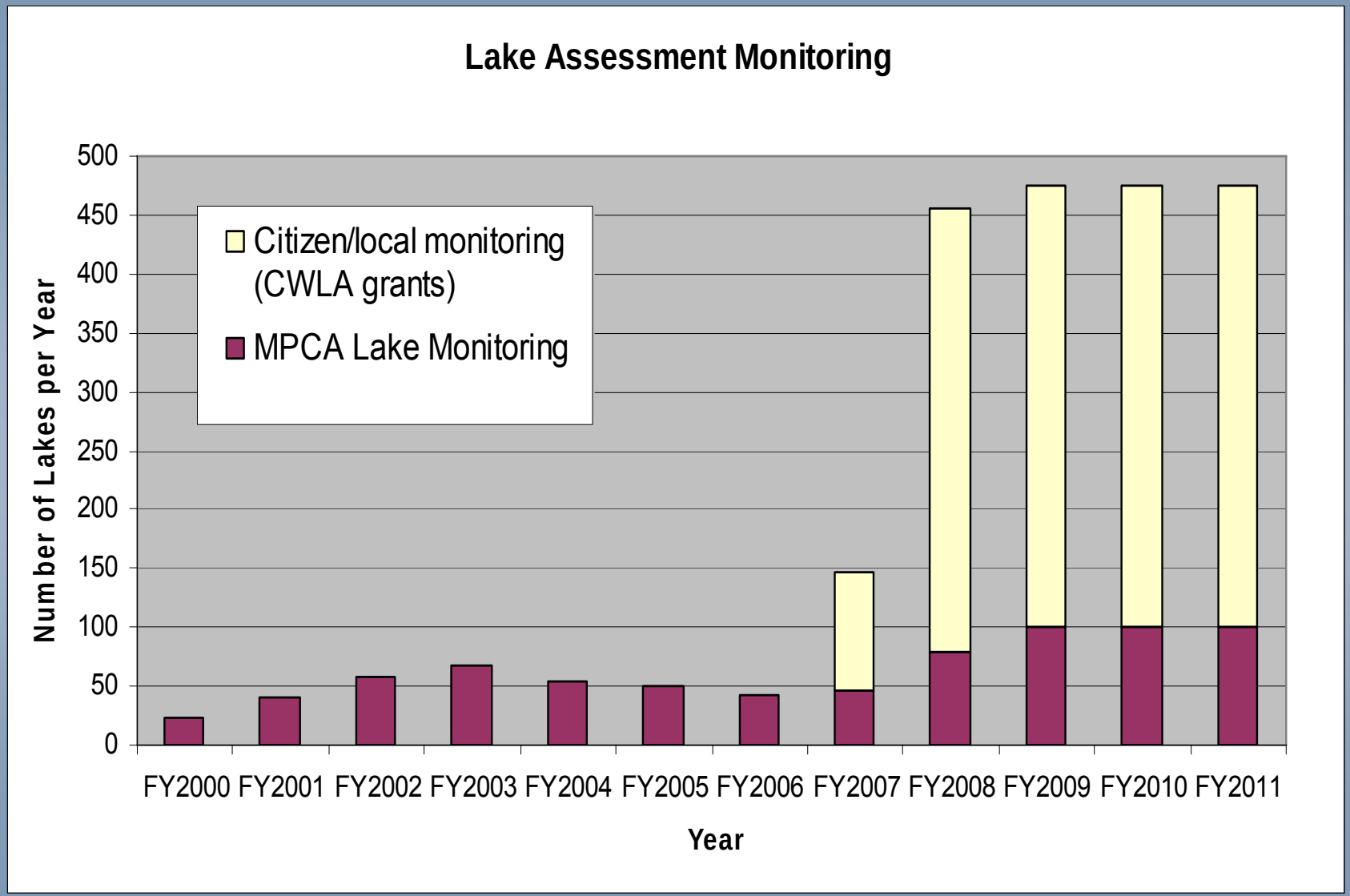


Lake Assessment ramp-ups: citizen and MPCA monitoring



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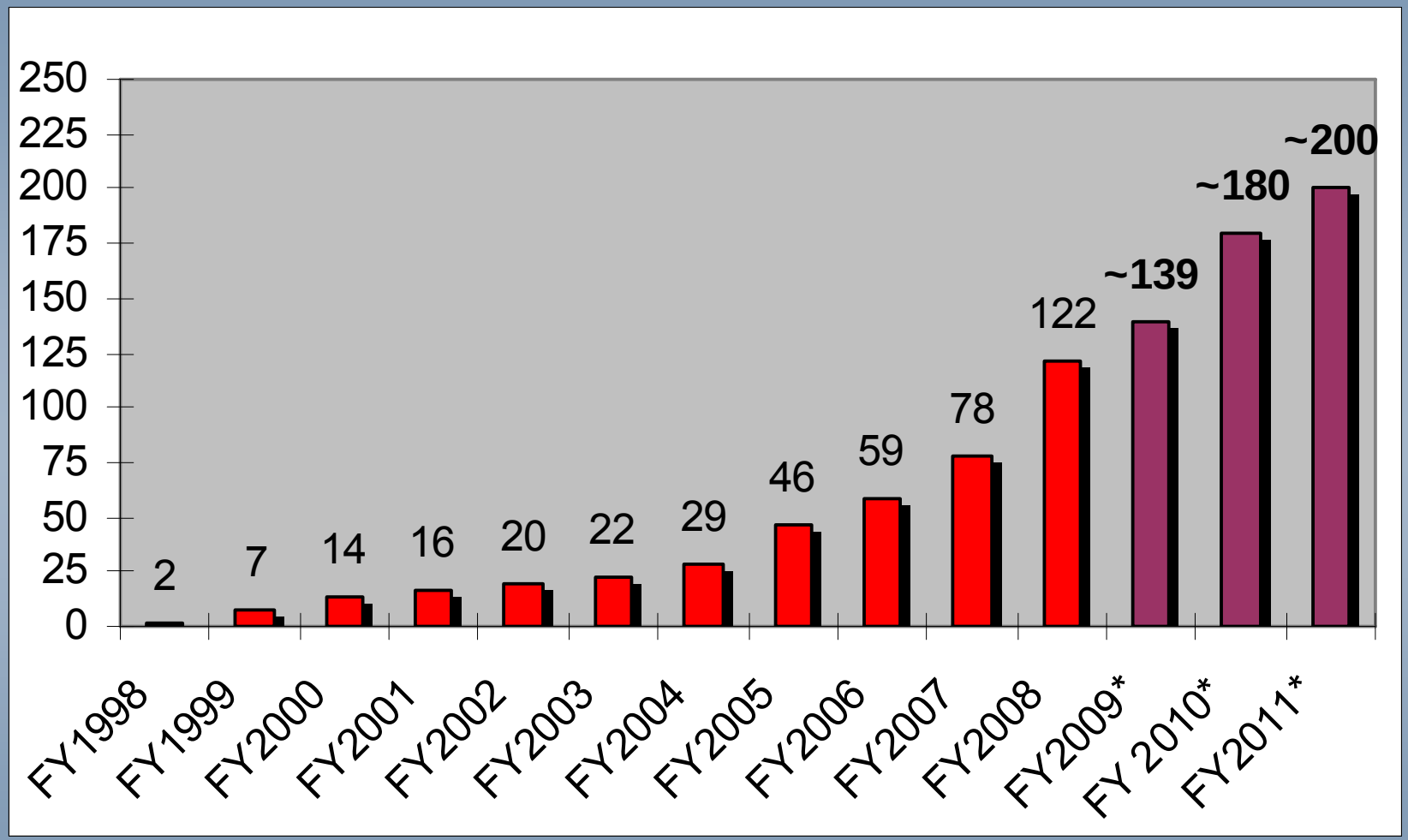
Number of TMDL Projects Started- Cumulative



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Modeling Approaches

- Completed TMDLs:
  - Load Duration Curve Approach: 10
  - Watershed model (mixed land use): 2 HSPF, 1 SWAT
  - Channel Routing Model: 2 HSPF, 1 QUAL-TX
  - Urban Run-off Model: 1 XP-SWMM, 1 P8
  - Lake Model: 2 BATHTUB, 1 MINLEAP
- Draft TMDLs:
  - 1 – Load Duration Curve Approach

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Approved TMDLs in Minnesota

Conventional Parameters

December 2007

Lower Otter Tail R.
Turbidity (2/2007)
1 impairment

Long Prairie R.
Dissolved Oxygen
(8/2005)
7 impairments

Chippewa R.
Fecal Coliform
(1/2007)
10 impairments

Pomme de Terre R.
Fecal Coliform
(12/2007)
1 impairment

N. Branch Sunrise R.
Fecal Coliform
(2/2007)
1 impairment

Shingle Cr.
Chloride
(2/2007)
1 impairment

Twin and Ryan Lakes
Nutrients (11/2007)
4 impairments

Lake Independence
Nutrients (2/2007)
1 impairment

Lower Minnesota R.
Dissolved Oxygen
(9/2004)
1 impairment

Chippewa R.
Ammonia
(10/2004)
1 impairment

Carver and Bevens Cr.
Fecal Coliform (3/2007)
4 impairments

Lower Canon River
Turbidity (7/2007)
2 impairments

Lower Mississippi and
Cedar River Basins
Fecal Coliform
(4/2006)
39 impairments

South Branch
Yellow Medicine R.
Fecal Coliform
(9/2004)
1 impairment

Blue Earth R. Subbasin
Fecal Coliform (6/2007)
21 impairments

N

Legend

- County Boundaries
- Major Watersheds
- Basins

Approved TMDL studies are shown in various colors grouped by project.

Date of US EPA approval is shown in parentheses.

0 25 50 Miles

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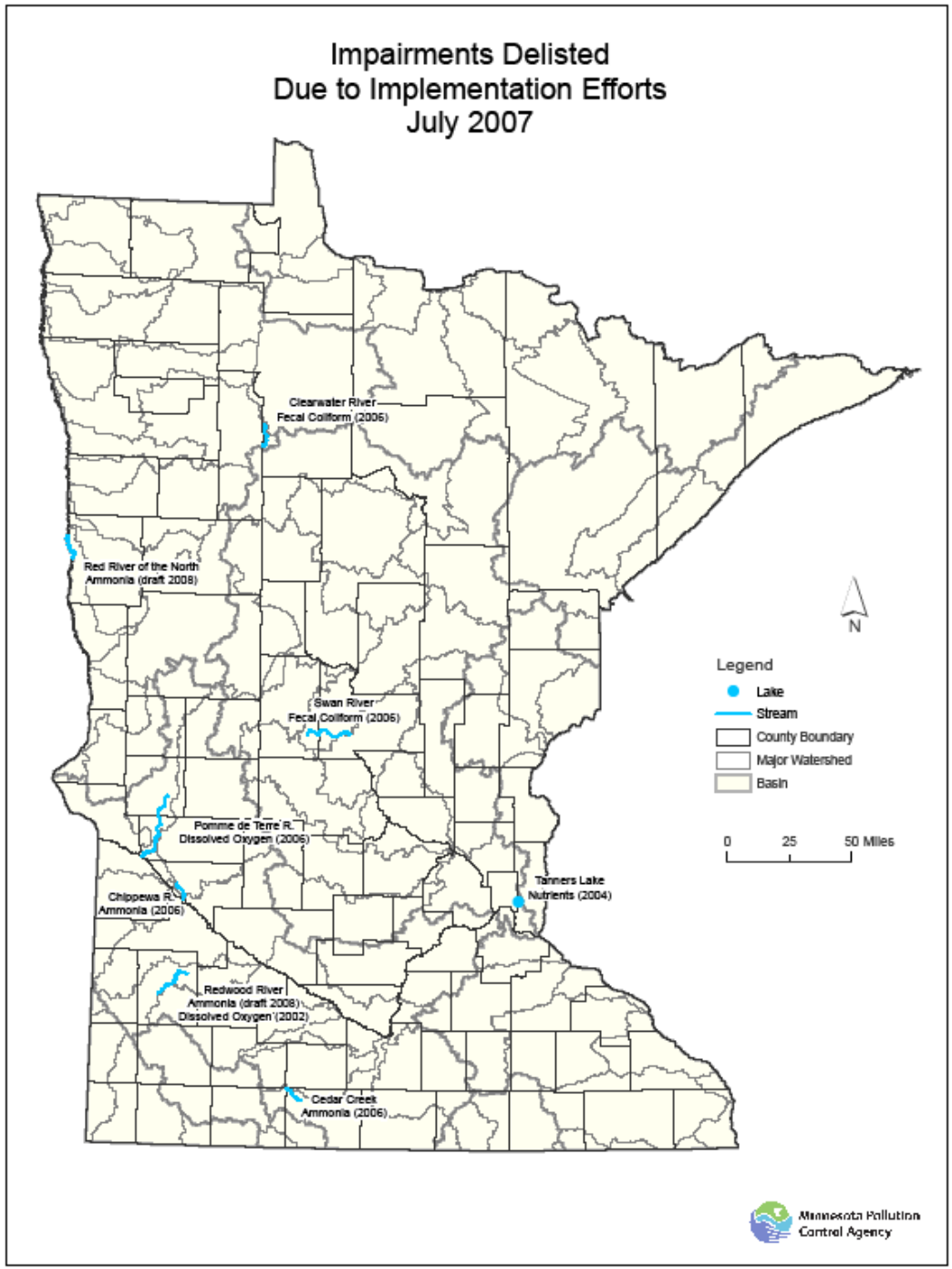
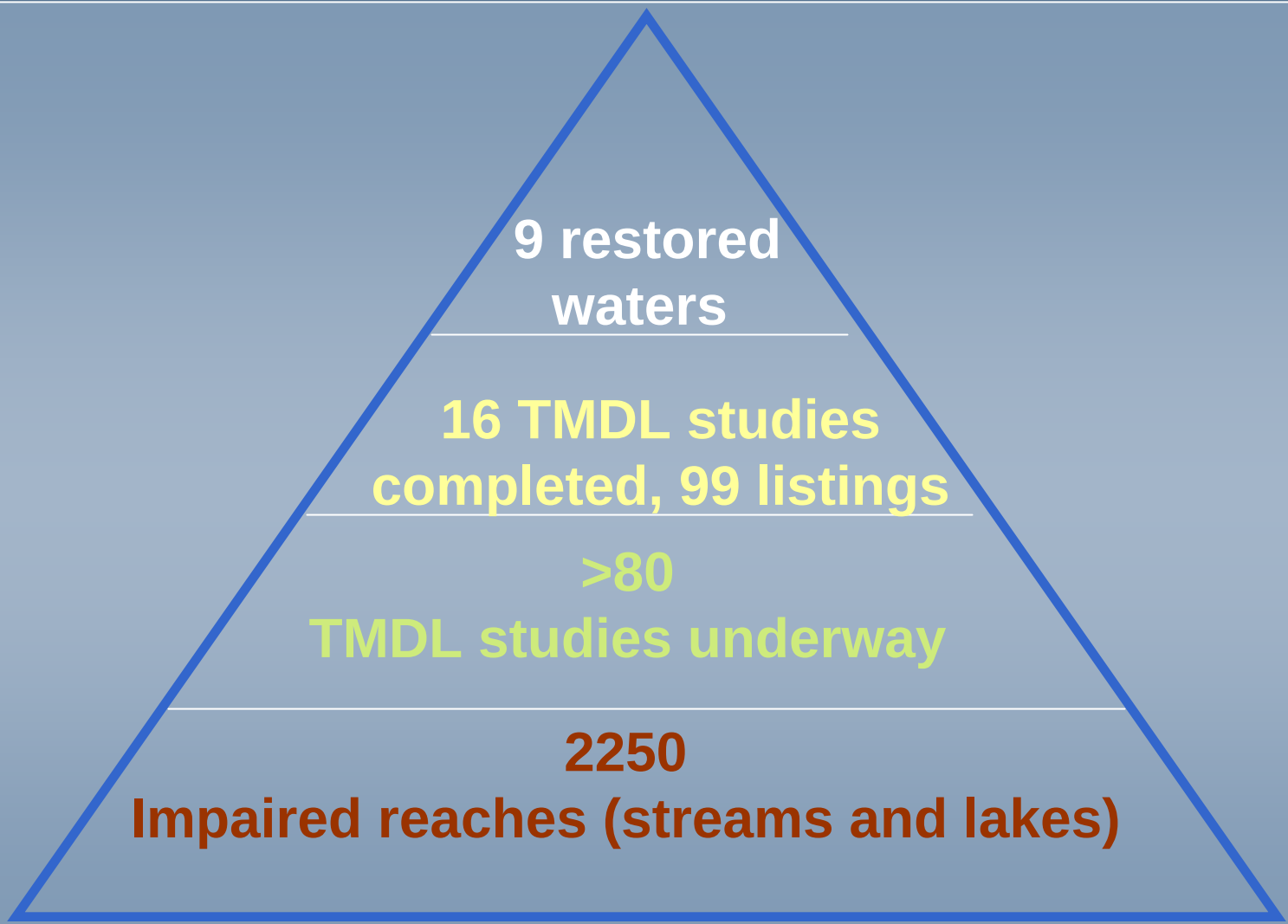
Impairments Delisted Due to Implementation Efforts July 2007



Progress to Date in Developing TMDL Studies in Minnesota



Data as of 3/10/08

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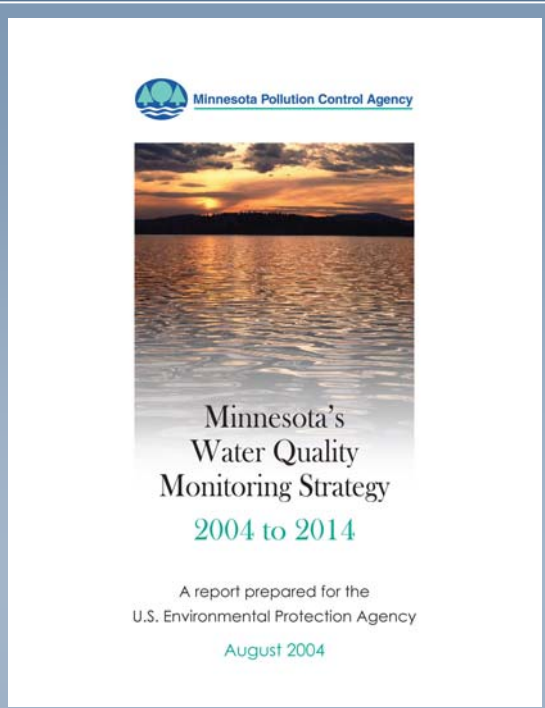
Monitoring Progress

- Strategy Developed in 2004
- Four data-collection components:
  - MPCA Monitoring
  - Monitoring by Other Agencies/ Local Gov't
  - Remote Sensing
  - Volunteer Monitoring
- 100% "coverage" over 10 years for priority waters (streams, lakes > 500 acres)
- High-quality data



MPCA Condition Monitoring

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- Long-term river trends
- Major watershed loading
- Integrated stream monitoring
  - Biological, chemical, physical
- Lake assessment monitoring
  - MPCA and volunteer-assisted
- Citizen Lake and Citizen Stream Monitoring
- Wetland monitoring
- Also developing approaches to increase monitoring efficiency

Intensive Watershed Monitoring Design – Bridge the TMDL Gap!

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- Unbiased assessment of each watershed
- Obtain assessment data on all indicators
- Locate impaired watersheds
- Provide information for the stressor identification/TMDL development process
- Shorten the delay between assessment and TMDLs (minimize pre-TMDL monitoring)
- Efficiently use monitoring resources
- Time trends-effectiveness monitoring

Intensive Watershed Monitoring 10-year Schedule

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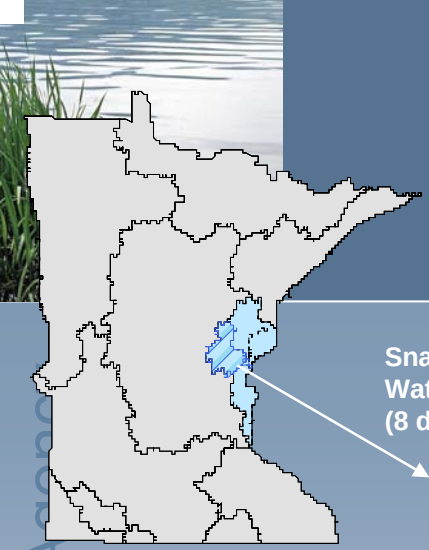
Roll-out by major watershed:

- **Phase 1 (first year): Systematic sampling of watersheds (8-11-14 digit HUC scale)**
  - **Sampling design**: pour point method
  - **Objectives**: Determine condition of the watersheds, locate watersheds with impairments, time trends in the future
  - **Program support**: 305b/303d assessments

- **Phase II (second year): Tailored intensive monitoring of impaired watersheds (11 digit HUC scale)**
  - **Sampling design**: multiple methods as needed
  - **Objective**: identify source(s) and cause(s) of impairment(s)
  - **Program support**: 305b/303d, TMDL development, stressor ID and diagnostics

New Approaches: Intensive Watershed Monitoring



- Biological monitoring for determination of aquatic life use support (n=58)
- Monitoring for determination of aquatic recreation and aquatic life use support (n=11)
- Monitoring for determination of aquatic consumption, aquatic recreation, and aquatic life use support (n=1)

Snake River Phase I

0 2 4 8 Miles

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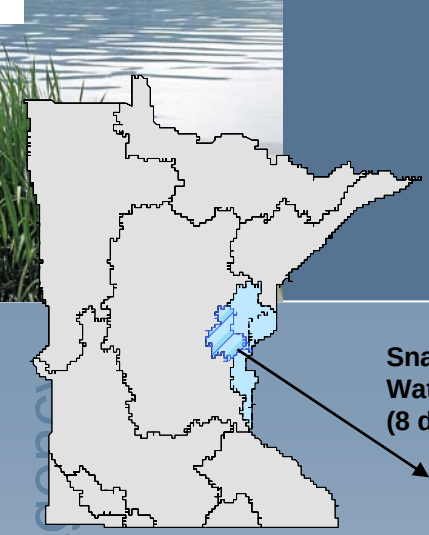
Snake River Watershed Pilot



Monitoring for determination of aquatic consumption use support (n = 1)
Fish Hg and PCBs, Permanent Load station

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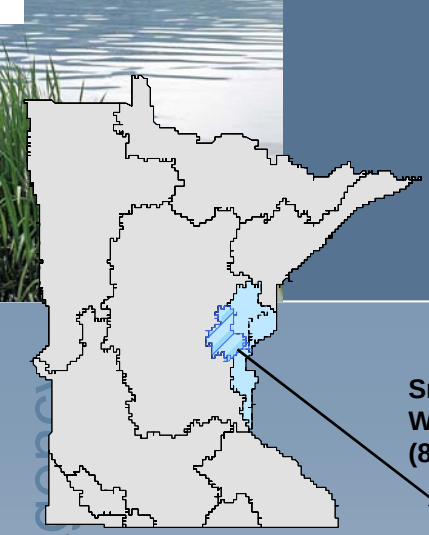
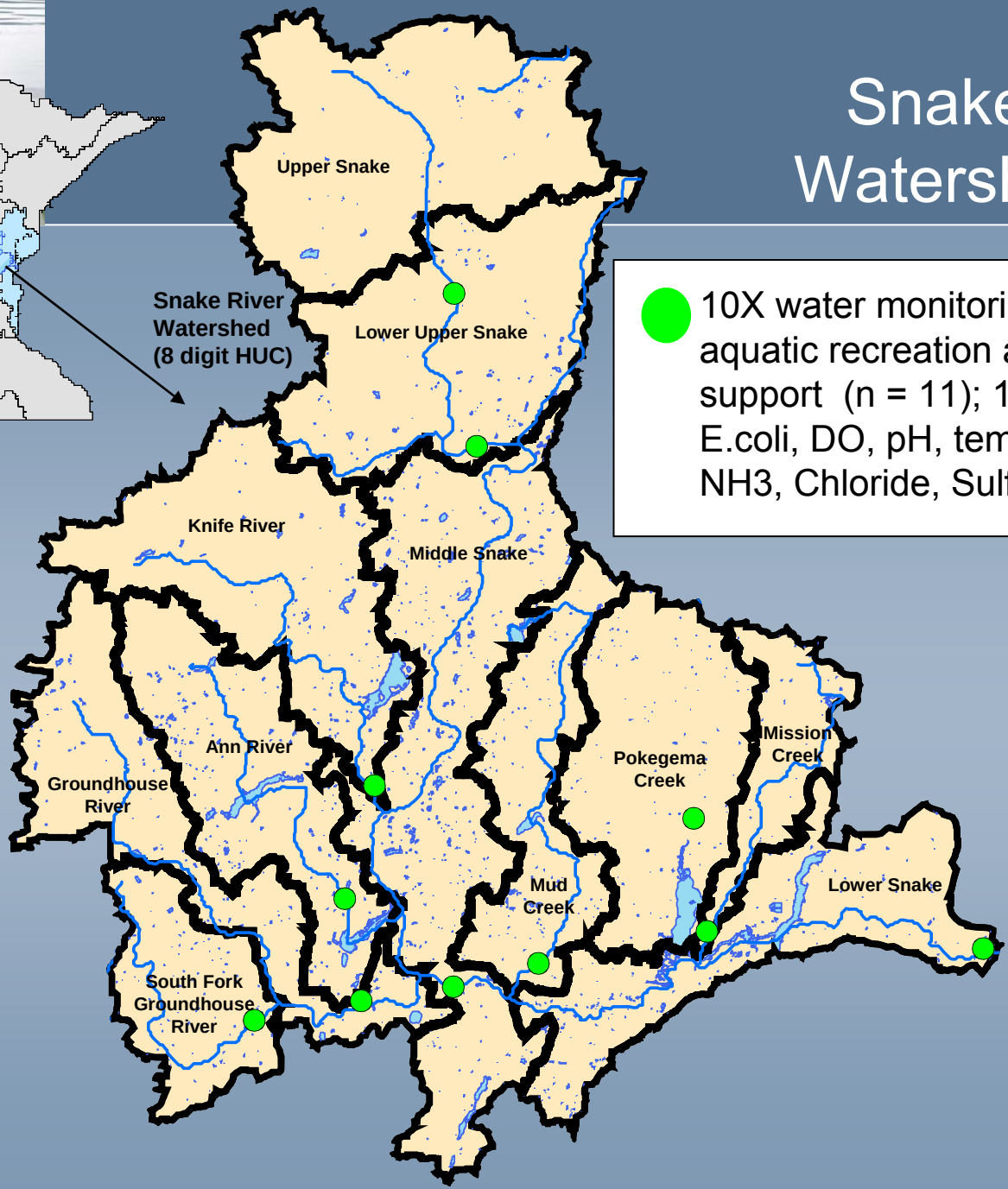
Snake River Watershed Pilot





- 10X water monitoring for determination of aquatic recreation and aquatic life use support (n = 11); 11-digit HUC level E.coli, DO, pH, temp.,TSS, P, Nitrite+Nitrate, NH3, Chloride, Sulfate

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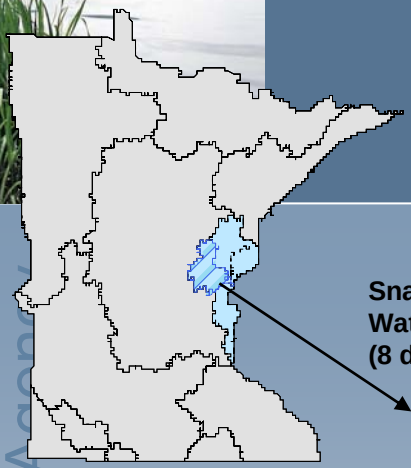
Snake River Watershed Pilot



Biological monitoring for determination of aquatic life use support (n = 58); 14-digit HUC level

Fish, Inverts, 1x WQ, Habitat, 1X Flow Temp logger, Land use

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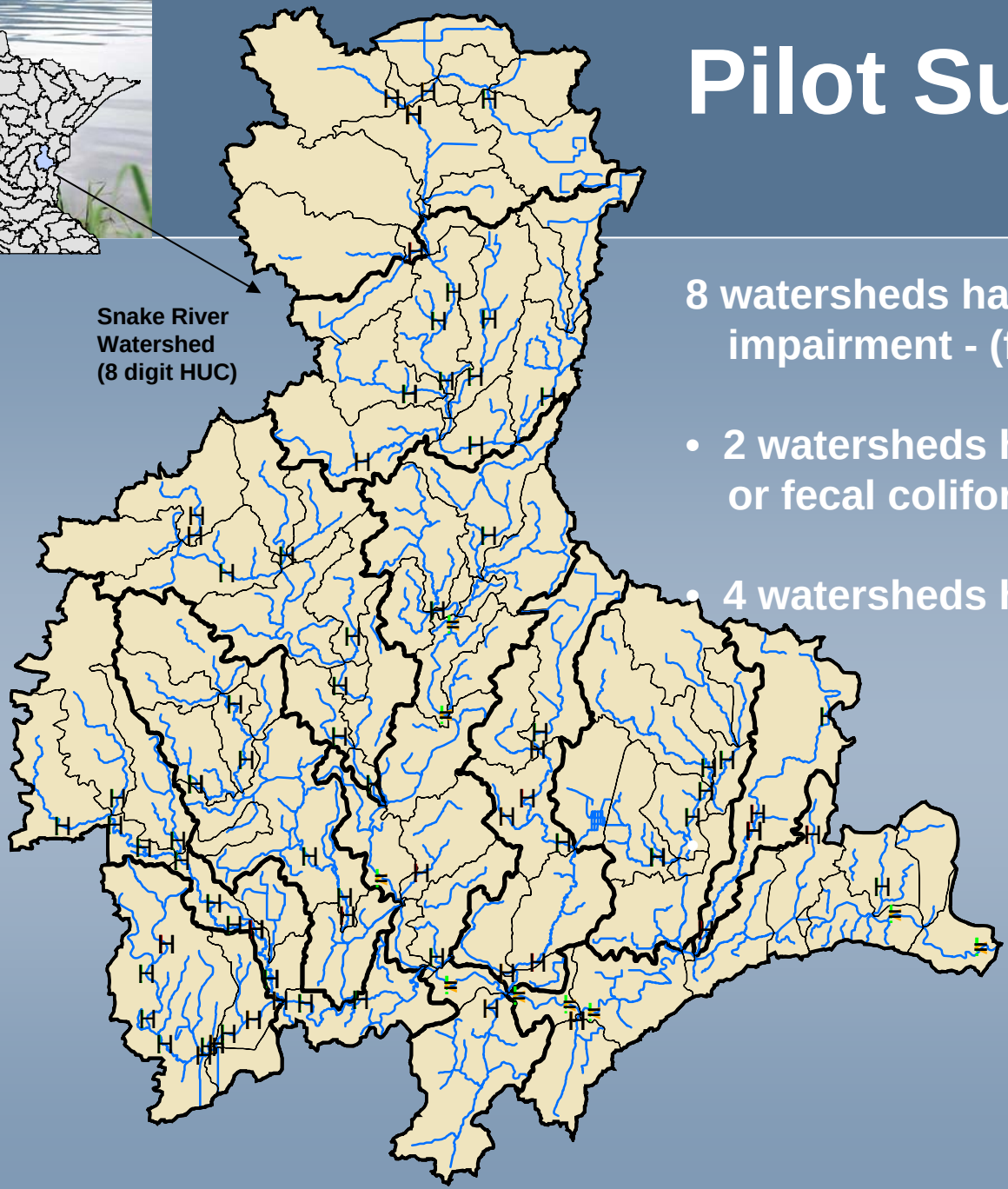
Pilot Summary



8 watersheds have at least one biological impairment - (fish IBI)

- 2 watersheds have elevated E.coli or fecal coliform
- 4 watersheds have elevated nitrite/nitrate
- Low D.O. is a concern in Mission Creek
- no indication other parameters collected are of concern: chloride, TSS, P, ammonia, sulfates

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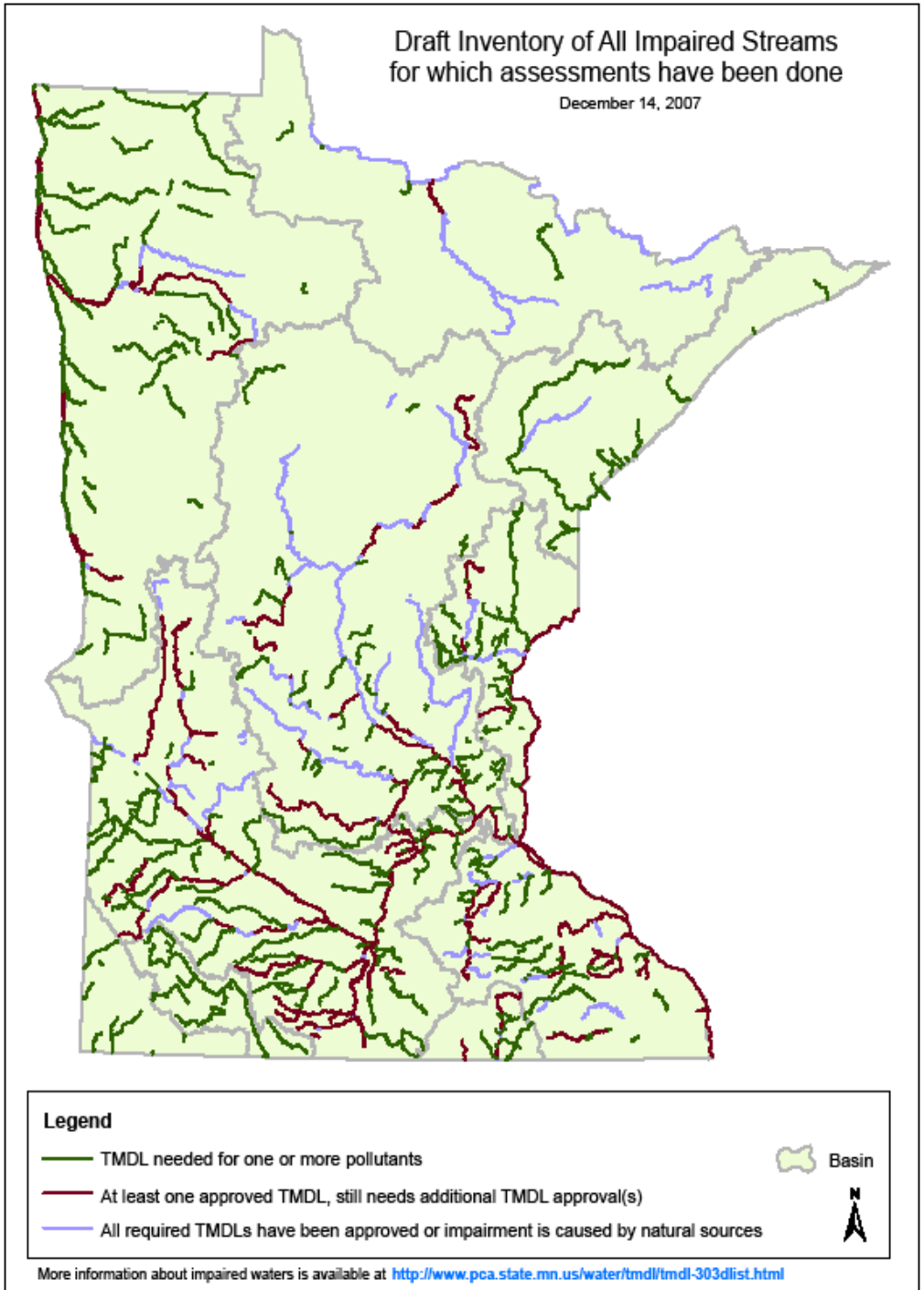
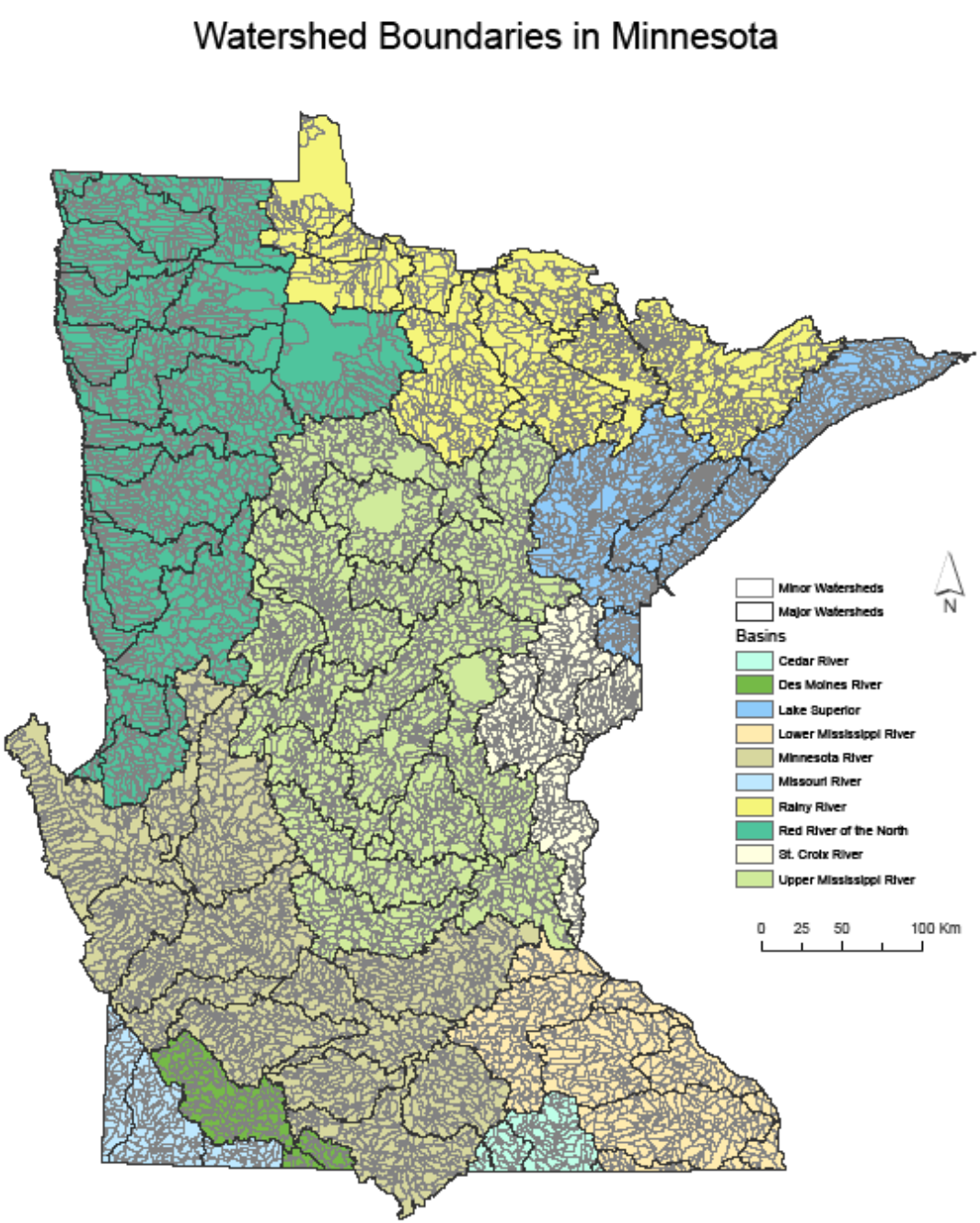


CONCERNS

- As monitoring ramps up, will result in more listings.
- May complete a TMDL only to need to return to same locality to do another.
- Current approach has been driven by the listing process, lacks predictability.
- Close segments likely have similar problems; potential efficiencies by doing TMDL and implementation at the same time.

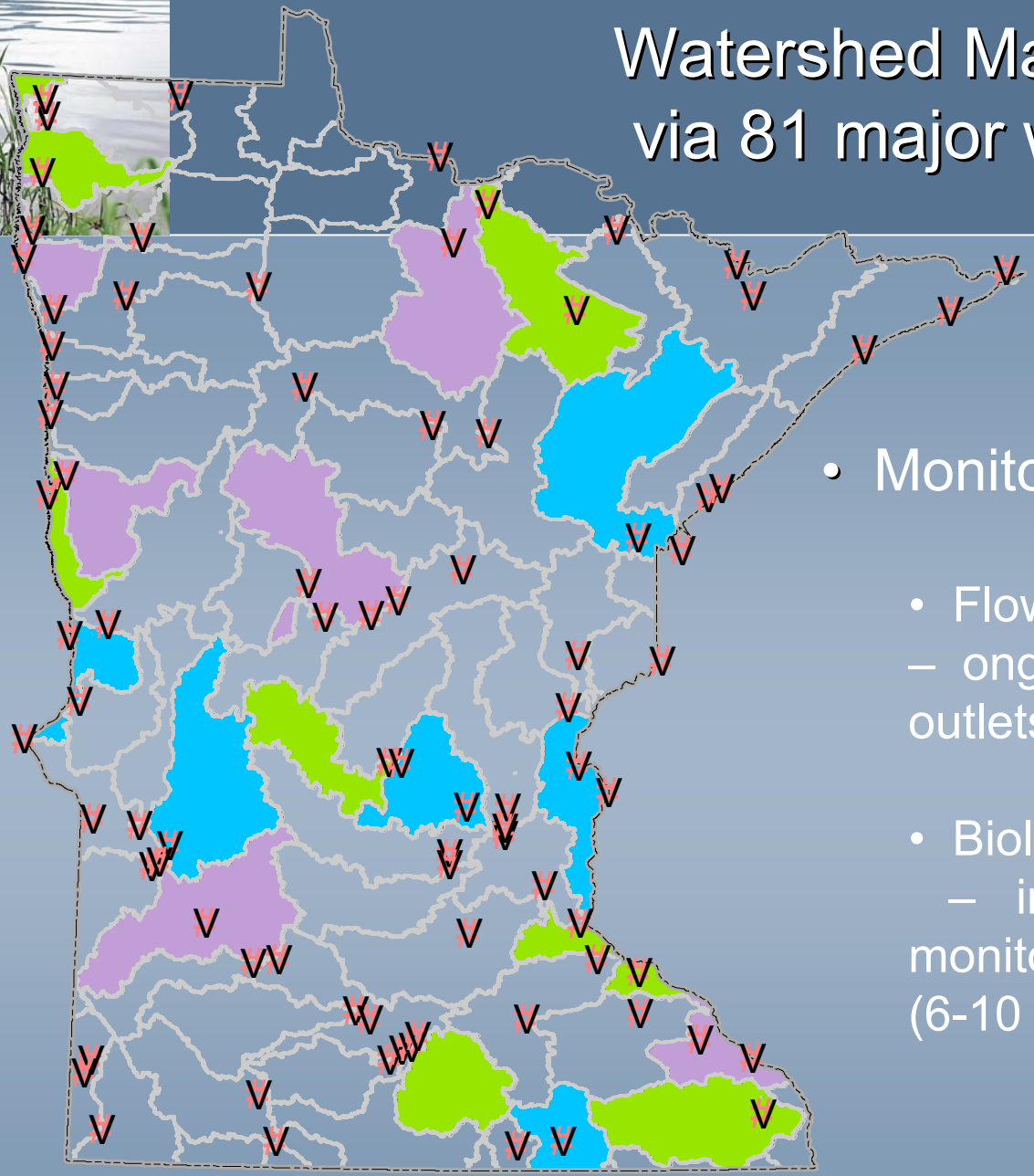


FUTURE APPROACH

- What is the right scale and pace?
  - Lake Pepin too large.
  - Some individual segments are too small.

- Manage water quality through a ten year cycle of monitoring, planning and implementation via the 81 Major watersheds.

Watershed Management via 81 major watersheds



- Monitoring and Assessment
  - Flow/chemical/load monitoring – ongoing at 81 watershed outlets
  - Biological/Physical monitoring – intensive watershed monitoring on a 10 year cycle (6-10 per year)

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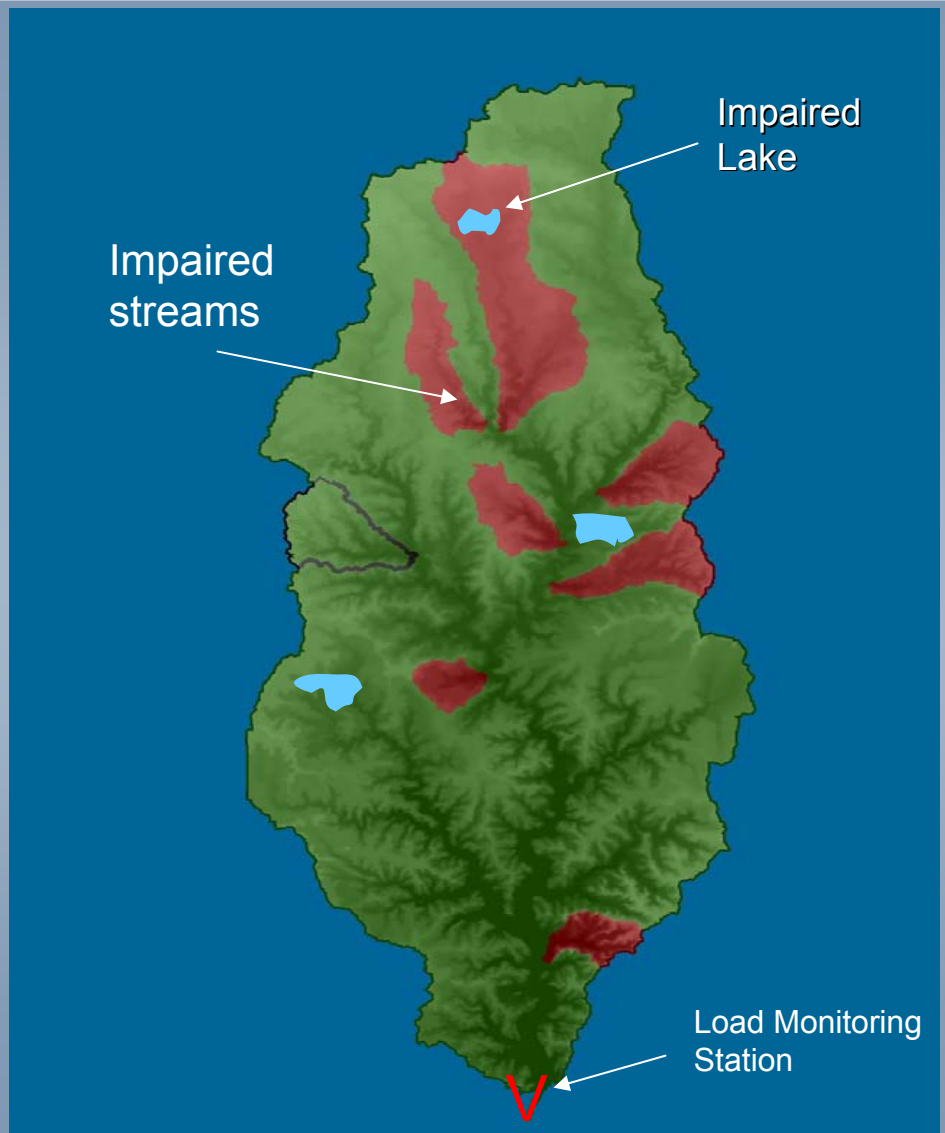
Watershed Management Plan



- **Addresses TMDLs for impaired subwatersheds**
- **It is a protection strategy for unimpaired subwatersheds**
- **It integrates the implementation plan for both TMDLs and protection strategies**

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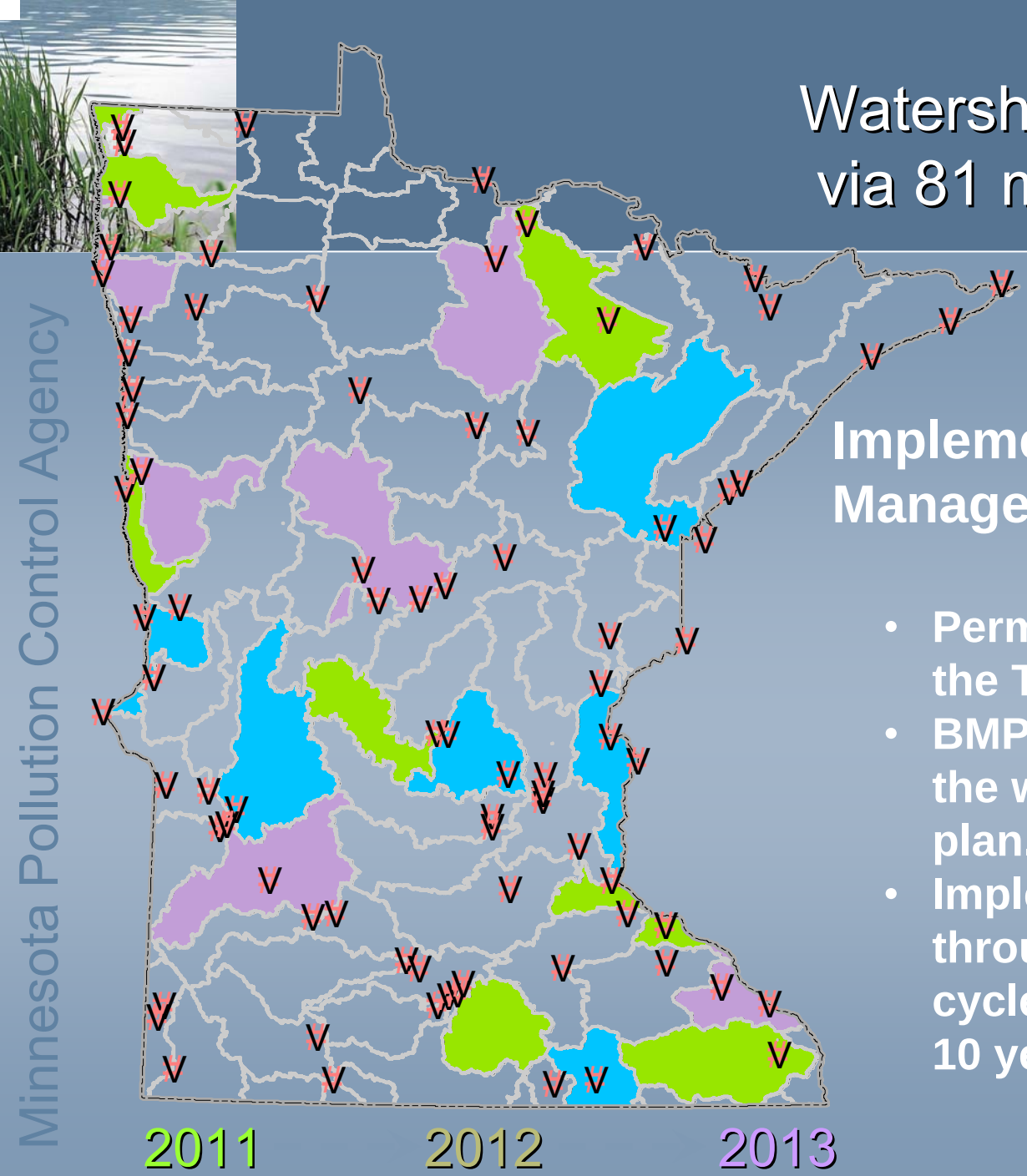
Watershed Management via 81 major watersheds



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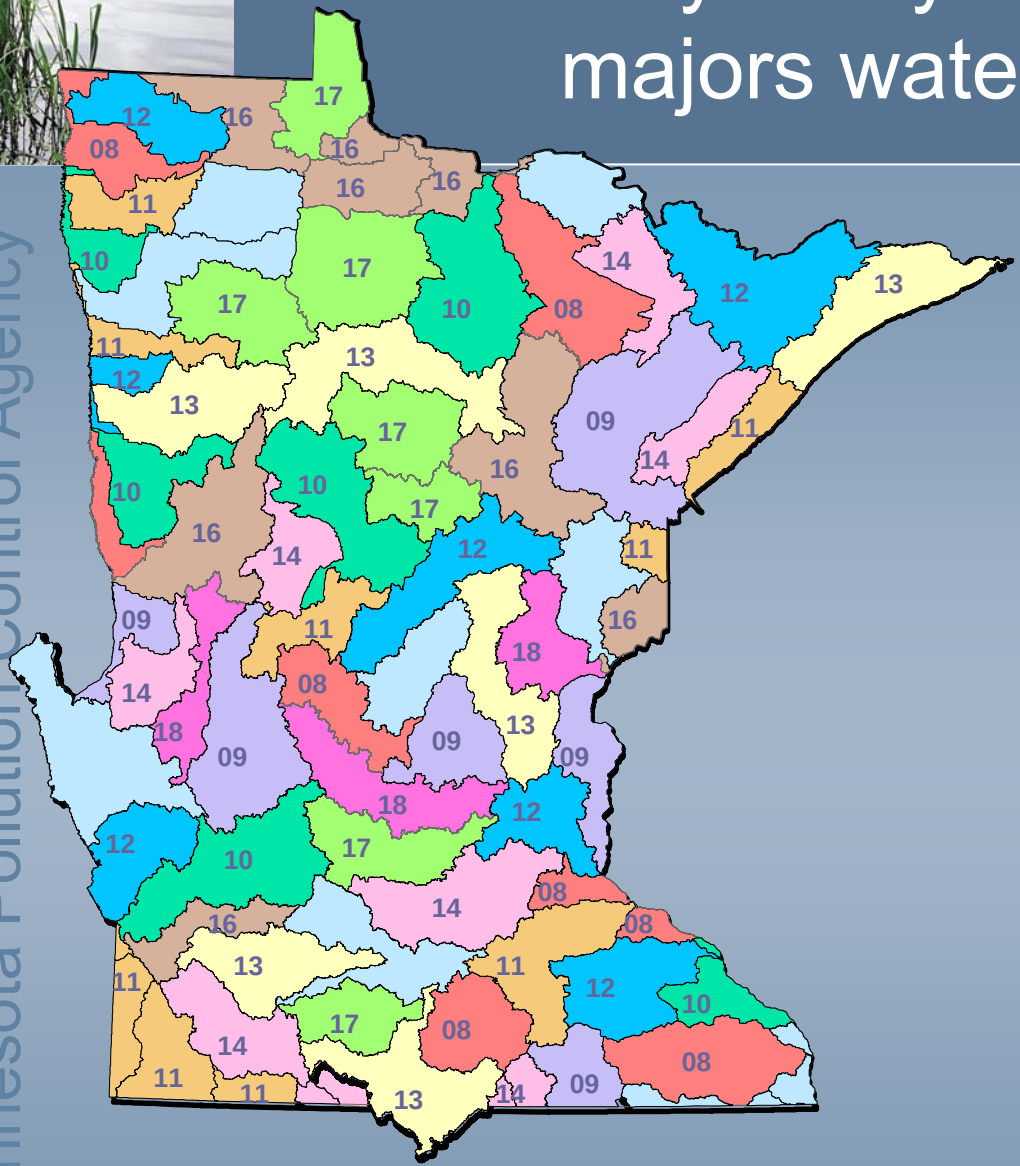
Implementation of Watershed Management Plan:

- Permit requirements follow the TMDL.
- BMP implementation follows the watershed management plan.
- Implementation continues through the next monitoring cycle until the plan is updated 10 years later.

10 year cycle through the 81 majors watersheds



Legend

- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
- 2018

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Rotating through the major watersheds on a 10 year cycle

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Watershed Management Planning
- TMDL
- Protection Strategy
- Implementation Plan

Implementation Activities
- BMPs
- Permits
- etc

Monitoring and Assessment
- Condition monitoring
- Effectiveness monitoring

Watershed Management via 81 major watersheds

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Pros

- Get through all watersheds in 10 years
- Integrates impaired/unimpaired into a single management plan.
- Preventative approach
- Watershed focus
- Impaired waters list isn't the driver
- Predictable cycle
- Engage everyone in the watershed
- It's a plan people can understand
- Starts an ongoing cycle of management and evaluation
- Can integrate source water protection

Cons

- Some watersheds wait 10 years
- Will take a few years to transition to this approach
- Depends on long term stable funding
- Unusual events could disrupt cycle

Questions?

- Contact Information:

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