

# Wisconsin River TMDL Modeling Overview

Adam Freihoefer

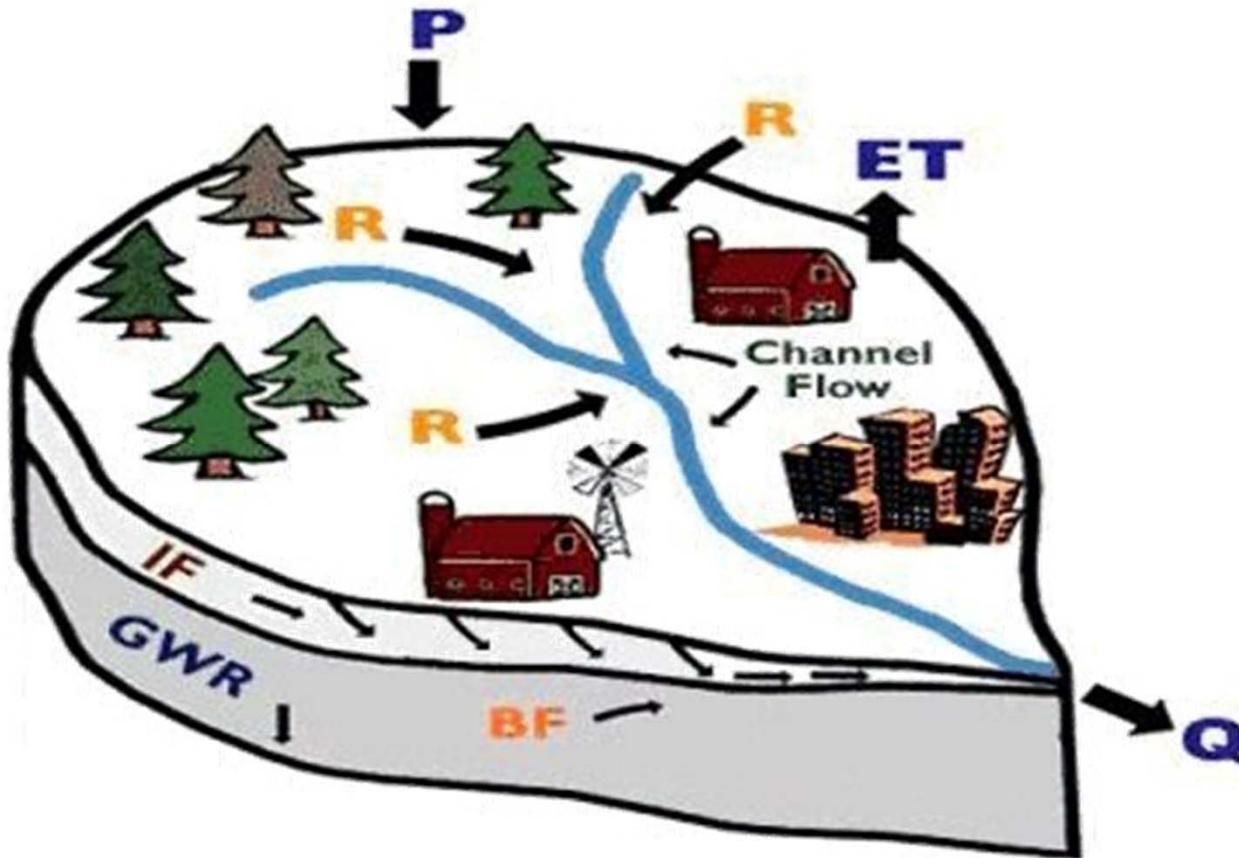
Wisconsin Department of Natural Resources

Wisconsin River TMDL Technical Stakeholder Meeting

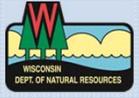
November 6, 2013



# Why Use A Model?



# Model Types



Watershed Loading

Receiving Water

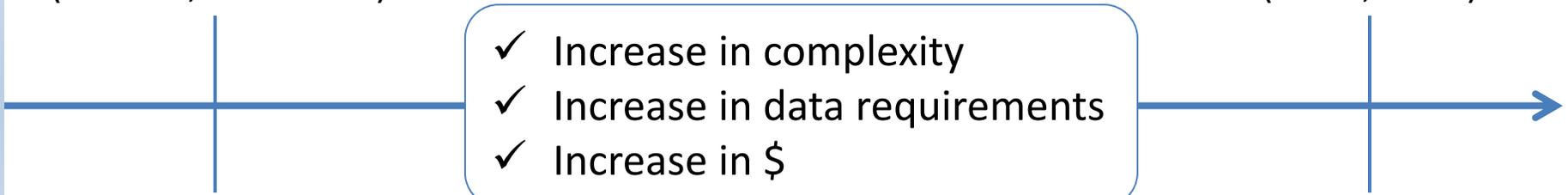
**Regression or  
Export Coefficient**  
(PRESTO, SPARROW)

**Empirical**  
(BATHTUB)

- ✓ Increase in complexity
- ✓ Increase in data requirements
- ✓ Increase in \$

**Mechanistic**  
(SWAT, HSPF)

**Mechanistic**  
(CE-QUAL-W2, WASP)



# Model Selection

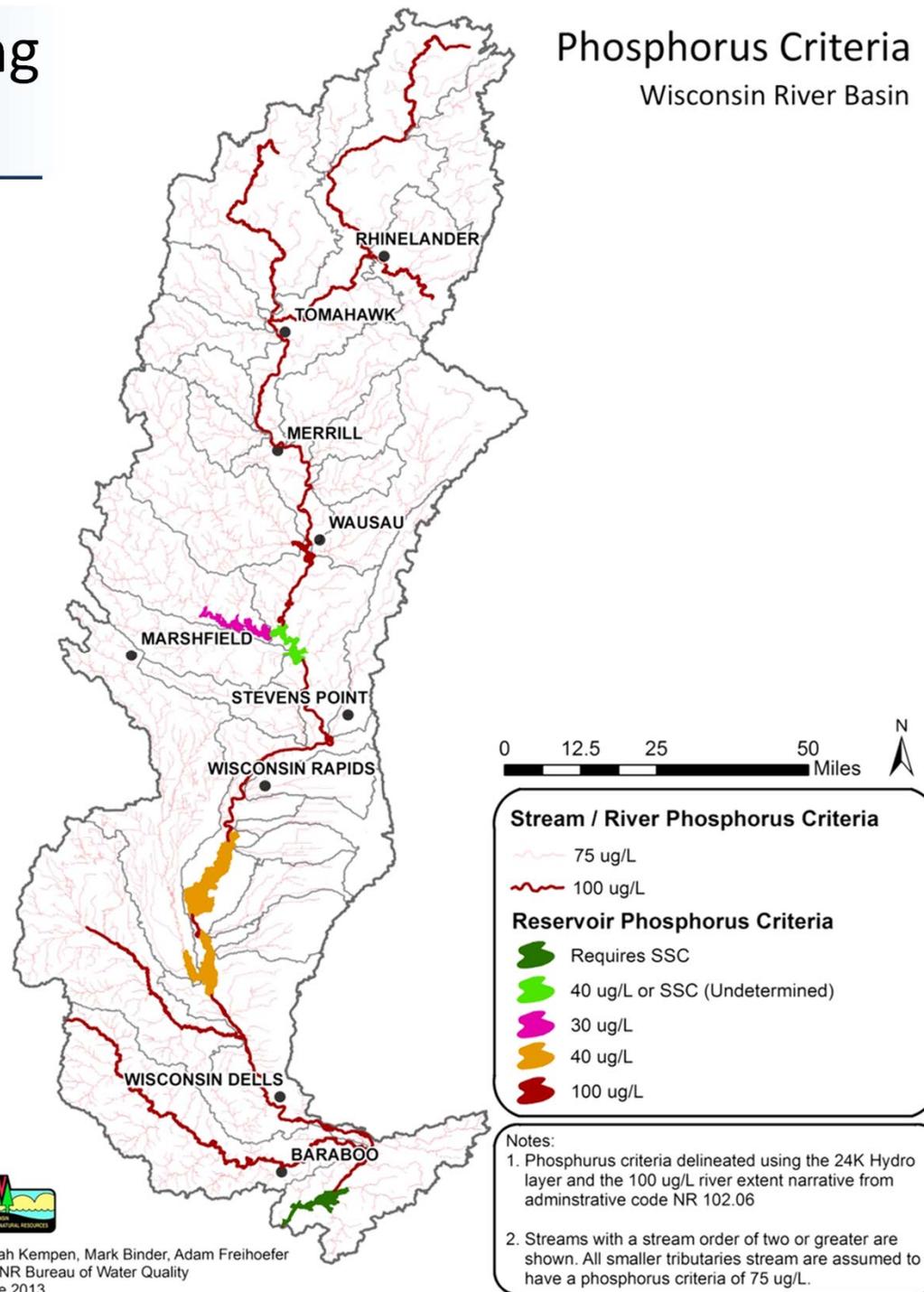
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- Why select an empirical / regression based model vs. a mechanistic model?
  - ✓ Complexity of system
  - ✓ Ability of model to answer specific question  
(*daily vs. annual result, algal bloom extent*)
  - ✓ Cost
  - ✓ Staff knowledge in models
  - ✓ Data availability and model data requirements

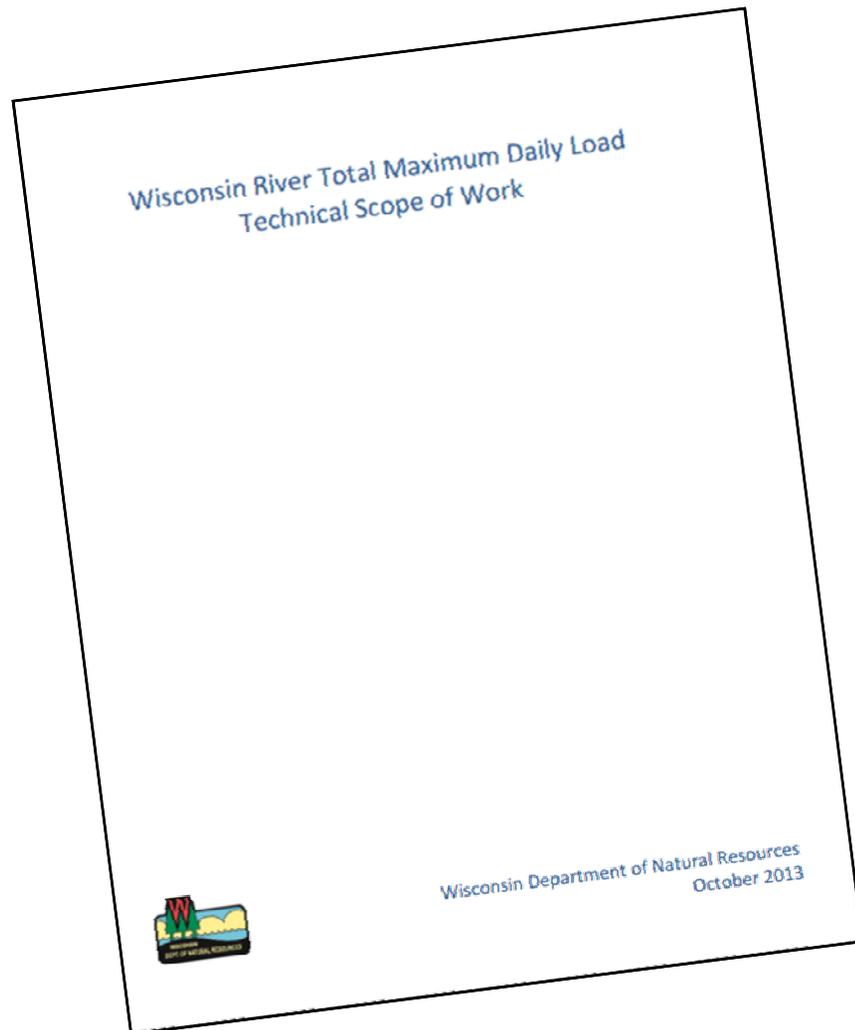
# What questions are we trying to answer with the models?

- What is the loading capacity of the receiving water?
- Does the water body meet the current loading capacity?
- What is the distribution of point and nonpoint contributions?
- What are the critical time or flow periods?

## Phosphorus Criteria Wisconsin River Basin



Sarah Kempen, Mark Binder, Adam Freihoefer  
WDNR Bureau of Water Quality  
June 2013



## Two General Types of Models Used to Answer Questions

### Watershed Loading Models

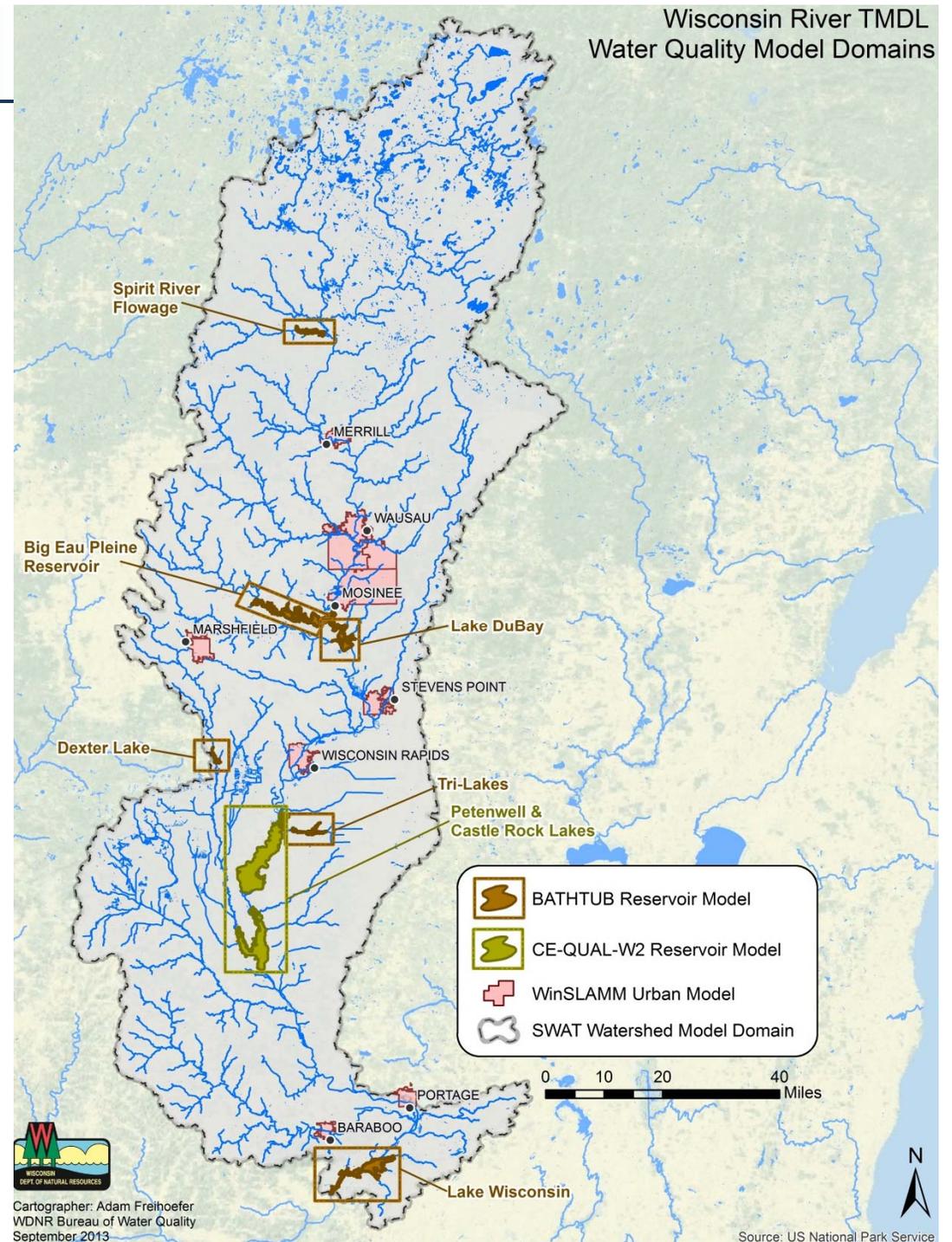
- Watershed response
- Urban / stormwater response

### Receiving Water Models

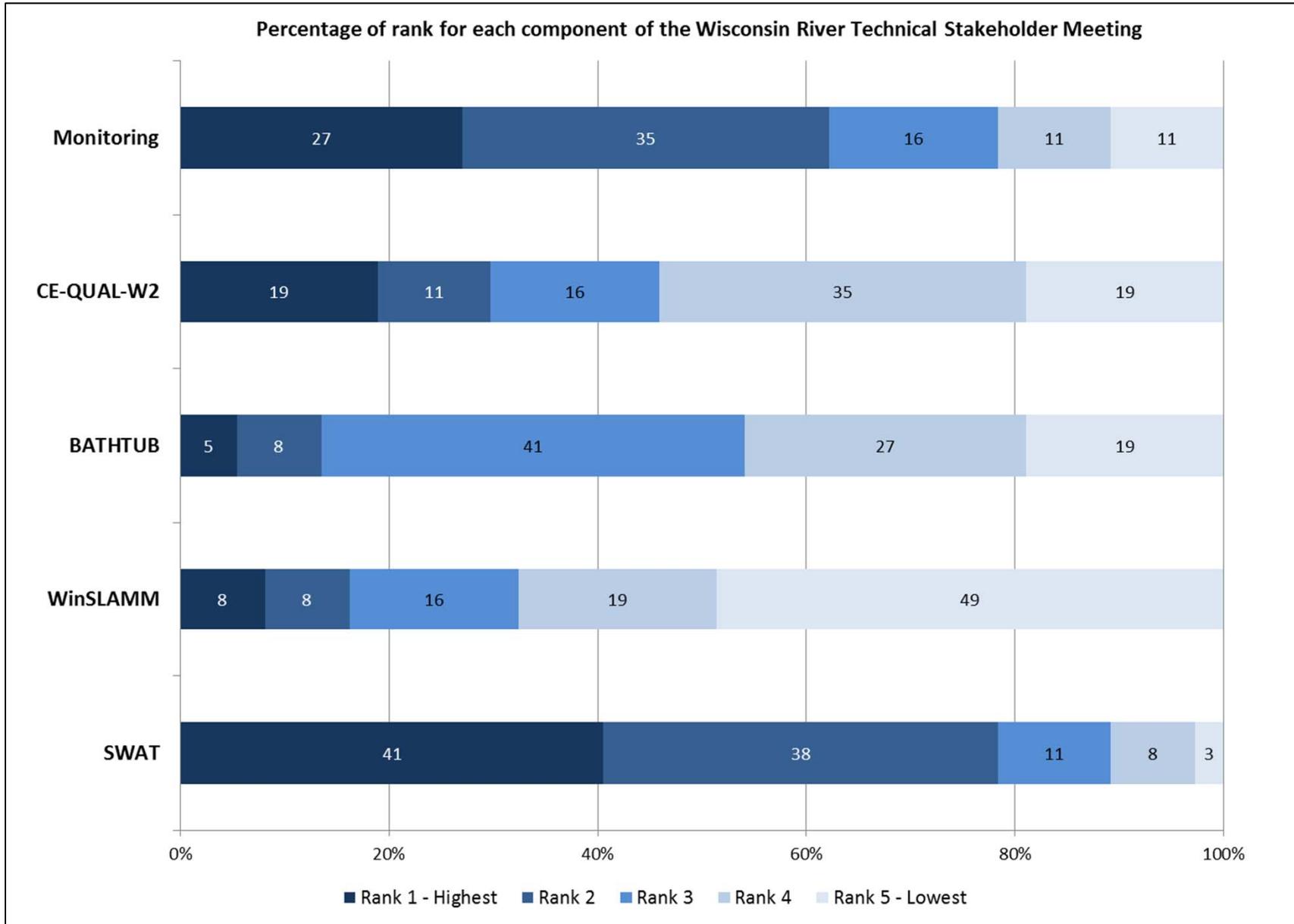
- Empirical reservoir response
- Mechanistic reservoir response

# Model Domains

- Watershed response
  - ✓ Entire basin
- Urban / stormwater response
  - ✓ Urban Areas  
*MS4, cities and villages*
- Empirical reservoir response
  - ✓ Spirit River Flowage
  - ✓ Big Eau Pleine Reservoir
  - ✓ Lake DuBay
  - ✓ Dexter Lake
  - ✓ Tri Lakes
  - ✓ Lake Wisconsin
- Mechanistic reservoir response
  - ✓ Petenwell
  - ✓ Castle Rock



# Attendee Survey Results



# Attendee Survey Results



Why choose  
BATHTUB vs.  
CE-QUAL-W2?

Why use county  
wide soil phosphorus  
data?

Is medium density  
residential w/o alleys  
acceptable to use for  
the all urban?

What  
inputs/variables  
drive the models and  
to what extent?



# The Modeling Project Team



Staff	Model	Organization	Location
Tom Beneke	SWAT	WI DNR	Madison, WI
Matt Diebel	Model Integration Database	WI DNR	Madison, WI
Adam Freihoefer	SWAT	WI DNR	Madison, WI
Ann Hirekatur	WinSLAMM	WI DNR	Madison, WI
Theresa Nelson	SWAT, Model Integration Database	WI DNR	Madison, WI
James Noren	CE-QUAL-W2	Corps of Engineers	St. Paul, MN
Pat Oldenburg	BATHTUB	WI DNR	Eau Claire, WI
Aaron Ruesch	SWAT, GIS Support, Programming	WI DNR	Madison, WI

*Technical support provided by others in WI DNR and USACE including Cory McDonald and Zhonglong Zhang*