



# Models for Assessing Phosphorus Risk

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Putting PSAT in Context

# Principles for P modeling and planning

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Identifying P sources is inexact. Base conclusions on multiple information sources.

Include a description of confidence.

Show the range of possible conclusions.

Large P sources are not necessarily the biggest or only opportunities for reductions.

All players can do their part and respect each others' constraints.

# Stages where modeling is used

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- Identify a phosphorus problem
- Define water quality targets.  
Develop TMDLs.
- Identify P sources and opportunities for reductions.
- Implement reduction activities.

PSAT will be most useful in the last two stages.

# In-Lake Models

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## MinLEAP (MN Lake Eutrophication Analysis Procedure)

- Screening tool to identify “problem” lakes
- Requires minimal inputs
- <http://www.pca.state.mn.us/water/charting.html>

## BATHTUB

- Links nutrient flows through multiple lakes
- Considers watershed P loads (sources)
- <http://www.cee.odu.edu/model/bathtub.php>

# Watershed Models

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- Identify P sources in the watershed
- Define potential to reduce P loading

## Minnesota P Source Assessment Tool

- Relatively easy to learn and use
- Inputs required: land use acreage, population, condition of septic systems, livestock lots, and permitted dischargers
- <http://www.mnpi.umn.edu/psat.htm>

# Other Watershed Models

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- More elaborate models may require specialized software and training
- May estimate actual P loads
- May model variation within the year
  - Allows assessment of critical conditions
- Extensive input requirements, may include:
  - Daily weather
  - Land use and management
  - Size and shape of water bodies and watershed
  - Point sources
  - Local measurements for calibration.

# Other Watershed Models

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## **BASINS** (Better Assessment Science Integrating point and Nonpoint Sources)

- ArcView-based analysis system integrating several models (<http://www.epa.gov/waterscience/basins/>)

## **HSPF** (Hydrologic Simulation Program-Fortran)

- Simulates hydrology and water quality in a watershed using time steps of 1 minute to 1 day.  
<http://water.usgs.gov/software/hspf.html>

## **P8 and SLAMM**

- Assess pollution from urban catchments  
<http://www.walker.net/p8/>  
<http://winslamm.com/prod01.htm>

## **SWAT** (Soil and Water Assessment Tool)

- Basin-scale model to quantify the impact of land management practices in large, complex watersheds  
<http://www.brc.tamus.edu/swat/>

# Site-Specific Models

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- Use to refine implementation plans
- How do management practices affect P sources?
- Inputs required: management and landscape information

## MinnFARM

- Assesses feedlot runoff
- [http://www.manure.umn.edu/applied/open\\_lots.html](http://www.manure.umn.edu/applied/open_lots.html)

## MN P Index

- estimates relative P loss from individual ag fields
- [www.mnpi.umn.edu](http://www.mnpi.umn.edu)