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The Statewide Application of Hydrologic Simulation Program FORTRAN (HSPF) Models to Support the Business Needs of the Minnesota Pollution Control Agency

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The Statewide Application of Hydrologic Simulation Program FORTRAN (HSPF) Models to Support the Business Needs of the Minnesota Pollution Control Agency

Charles Regan and Timothy Larson Minnesota Pollution Control Agency

The MPCA has the following Business Needs for building models:

1. Conventional Parameter TMDLs
2. Dissolved Oxygen TMDLs
3. River Nutrient Compliance Testing
4. Point Source Effluent Limits (individual facilities)
5. Pollutant Trading (watershed wide)
   - Point - Point
   - Point - Nonpoint
6. MS4 Permitting Support
7. Support of Stressor Identification Development
8. Conservation Targeting Support
9. Non-point Land-use Planning
10. Other General Uses

Stressor Identification Support
- State Variables: fluxes available at intervals ranging from annual to hourly
  - Physical (flow alteration, connectivity)
    - Depth
    - Velocity
    - Flow rate
    - Water temperature
  - Chemical
    - Nitrogen
    - Phosphorus
    - Dissolved Oxygen
  - Biological
    - Algal biomass
    - Chlorophyll-a

Conservation Targeting Support
- HSPF
- GIS
- On the Ground Observation
- Identify key areas
- Site specific hot spots

Maps courtesy of Tom Pearson MPCA.

Assist with the development of TMDLs

1. Turbidity
   - Minnesota River Basin Turbidity TMDLs
   - Addressed 18 impaired reaches on the mainstem and tributaries
   - Considered a wide range of flow conditions

2. Dissolved Oxygen
   - Lower Minnesota River Dissolved Oxygen TMDL Project
   - Addressed D.O. levels near Jordan and Shakopee
   - Simulated contributions from both point and non-point sources
   - Focused on low-flow conditions August-September 1988

WWTP Permitting: Scenario Development

Mankato WWTP Permit (2007)
- Varied discharge flow volumes and P loads
- 150 combinations modeled
- Coupling of Middle and lower Minnesota River models
- Downstream impacts of in-stream nutrient loading and cycling

MS4 Allocation Development
- Explicit MS4 Area Representation
- MS4 Annual Load Output

Graphic courtesy of Kim Laing MPCA.

Graphic courtesy of Jason Love RESPEC.

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Pollutant Trading

Minnesota River Basin Permit (2005)
- In-stream nutrient cycling
- 10 linked 8-digit HUC HSPF models
- Geographic discount factors
- Based on Jordan equivalent units

HSPF Modeling in Minnesota

HSPF Modeling in Minnesota

Minneapolis has an abundance of water resources which require protection or rehabilitation. The United States Environmental Protection Agency (EPA) requires the Minnesota Pollution Control Agency (MPCA) to carry out the Total Maximum Daily Load (TMDL) Program within the State of Minnesota. Minnesota has already identified sources of pollution from non-point source areas, identified point source areas, and the majority of those point source areas are only partially covered by the current list of TMDL projects. The MPCA has developed and maintained a list of TMDL projects, some of which are listed below. These studies have been performed to complete the Permitting of point source discharges, pollutant trading, and compliance testing for impending river nutrient criteria. The HSPF has been developed and has the ability to meet these needs. The MPCA has responsibilities in the regulation of non-point source and, more explicitly, in the permitting of point source facilities. Presently, the issuance of an effluent permit has been included in the MPCA’s responsibilities in the regulation of non-point source facilities. The development of flows occurring at the outlet of Unnamed Tributary from 1996 to 2009 has been performed. A nested scale approach has been included in this analysis. The development of flows occurring at the outlet of Unnamed Tributary from 1996 to 2009 has been performed. A nested scale approach has been included in this analysis. The development of flows occurring at the outlet of Unnamed Tributary from 1996 to 2009 has been performed. A nested scale approach has been included in this analysis.